

# **PROJECT SELECTION HANDBOOK FOR DEPARTMENT OF EDUCATION: LIMPOPO PROVINCE**

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## **ABSTRACT**

Over the past decade, South Africa has experienced a rising pace of economic and social development which has facilitated the expansion of the basic social programs, especially in health and education. The education sector has been given a high priority by the National and Provincial authorities in order to eradicate illiteracy and to step up the scope and standard of education in public schools. As such, capital appraisal of the potential projects carried out by the department is now the focus of increasing attention. As a part of the continuous effort by the Limpopo Provincial Government to improve the quality of public infrastructure delivery by its departments, this handbook focuses on the process of capital project selection by the Department of Education (DOE). The objective of this handbook is to assist the decision-makers at the DOE in the selection of capital projects for construction and for rehabilitation, using a ranking system being developed as an extension of cost-effectiveness and cost-utility analysis. The handbook shows that the overall effectiveness of budget spending can be maximized when the funds are allocated for school construction and/or rehabilitation according to a priority index.

**JEL codes:** D61, H43, H52, H75, I28

**Keywords:** education, cost-effectiveness analysis, school construction and rehabilitation, priority index, budget allocation, South Africa



**CAPITAL PROJECT SELECTION**  
**HANDBOOK FOR**  
**DEPARTMENT OF EDUCATION**

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# CONTENTS

|                                                                                |           |
|--------------------------------------------------------------------------------|-----------|
| <b>Chapter 1. Introduction.....</b>                                            | <b>4</b>  |
| 1.1 Overview of Handbook.....                                                  | 5         |
| <b>Chapter 2. Project Selection for Construction of New Class-Blocks .....</b> | <b>7</b>  |
| 2.1 Status Quo .....                                                           | 7         |
| 2.1.1 Background .....                                                         | 7         |
| 2.1.2 Challenges .....                                                         | 8         |
| 2.2 Cost-Utility Approach in Capital Project Selection.....                    | 10        |
| 2.2.1 Priority Index .....                                                     | 10        |
| 2.2.2 Definition of Index.....                                                 | 11        |
| 2.2.3 Estimation of Priority Index.....                                        | 13        |
| 2.3 Priority Index in Allocation of Budget for New Buildings.....              | 17        |
| 2.3.1 Role of Management Information System .....                              | 17        |
| 2.3.2 Example of Priority Index Estimation .....                               | 20        |
| 2.3.3 Budget Allocation .....                                                  | 22        |
| <b>Chapter 3. Rehabilitation of Existing Class-Blocks.....</b>                 | <b>27</b> |
| 3.1 Current Approach.....                                                      | 27        |
| 3.2 Priority Index in Rehabilitation of Existing Buildings .....               | 28        |
| 3.2.1 Nature of Decision-Making Problem.....                                   | 28        |
| 3.2.2 Building Condition.....                                                  | 28        |
| 3.2.3 Relative Rehabilitation Cost .....                                       | 30        |
| 3.2.4 Discounted School Priority Index .....                                   | 32        |
| 3.2.5 Rehabilitation Priority Index and Ranking .....                          | 34        |
| 3.3 Budget Allocation using Rehabilitation Priority Index.....                 | 36        |
| <b>Chapter 4. Conclusion .....</b>                                             | <b>38</b> |
| <b>Annex A. Analytical Framework.....</b>                                      | <b>40</b> |
| A.1 The Approach.....                                                          | 40        |
| A.2 Cost-Effectiveness Analysis vs. Cost-Utility Analysis.....                 | 40        |
| A.2.1 Estimation of Effectiveness-to-Cost Ratio.....                           | 41        |
| Effectiveness-to-Cost Ratio .....                                              | 41        |
| Costs Assessment.....                                                          | 42        |
| Discounting .....                                                              | 42        |

|       |                                            |    |
|-------|--------------------------------------------|----|
| A.3   | Cost-Utility Analysis.....                 | 43 |
| A.3.1 | CUA in Improvement of School Learning..... | 44 |
| A.3.2 | Alternatives with Subjective Outcomes..... | 45 |
| A.4   | Applicability of the Method.....           | 46 |

|                 |                                                                                                           |           |
|-----------------|-----------------------------------------------------------------------------------------------------------|-----------|
| <b>Annex B.</b> | <b>Application of Priority Index to Prioritarization of Selected<br/>Schools in Limpopo Province.....</b> | <b>48</b> |
| B.1             | Introduction.....                                                                                         | 48        |
| B.2             | Parameters and Data.....                                                                                  | 48        |
| B.2.1           | Available Information.....                                                                                | 48        |
| B.2.2           | Sample Characteristics.....                                                                               | 51        |
| B.2.3           | Parameters.....                                                                                           | 51        |
| B.2.4           | Priorities and Weights.....                                                                               | 53        |
| B.3             | Estimation of School Priority Index and Ranking.....                                                      | 55        |
| B.3.1           | Infrastructure Adequacy.....                                                                              | 55        |
| B.3.2           | Augmenting Factors.....                                                                                   | 58        |
| B.3.3           | Augmenting Score and Adjustment factor.....                                                               | 61        |
| B.3.4           | School Priority Index and Ranking.....                                                                    | 62        |
| B.4             | Allocation of Budget for New Class-rooms.....                                                             | 64        |
| B.4.1           | The Mechanism.....                                                                                        | 64        |
| B.4.2           | Distribution of Funds.....                                                                                | 70        |
| B.5             | Rehabilitation Priority Index.....                                                                        | 73        |
| B.5.1           | Data Requirements.....                                                                                    | 73        |
| B.5.2           | Relative Rehabilitation Costs.....                                                                        | 75        |
| B.5.3           | Impact of Loss of a Damaged Building on<br>School Priority.....                                           | 76        |
| B.5.4           | Rehabilitation Priority Index.....                                                                        | 79        |
| B.6             | Allocation of Funds for Rehabilitation.....                                                               | 81        |
| B.7             | Concluding Remarks.....                                                                                   | 82        |

## **LIST OF ABBREVIATIONS**

|      |   |                                                |
|------|---|------------------------------------------------|
| CRI  | - | Cambridge Resources International, Inc.        |
| DFED | - | Department of Finance and Economic Development |
| DTI  | - | Department of Trade and Industry               |
| EOCK | - | Economic opportunity cost of capital           |
| EMIS | - | Education management information system        |
| GIS  | - | Geographic Information System                  |
| MEC  | - | Member of the Executive Council                |
| MTEF | - | Medium term expenditure framework              |
| NPV  | - | Net present value                              |
| PI   | - | Priority index                                 |
| PV   | - | Present value                                  |
| RDP  | - | Reconstruction and Development Program         |

## **Chapter 1. Introduction**

The rising pace of economic and social development in South Africa over the past decade has facilitated the expansion of the basic social programs, especially in health and education. At the same time, the national and provincial authorities have worked to eradicate illiteracy and to step up the scope and standard of education in public schools.

The provision of the basic infrastructure facilities such as roads, water, electricity, and basic social programs in health and education, are the key to the development of the region. The education sector has been given a high priority by the National and Provincial authorities. As the department has been allocated substantial resources to eradicate infrastructure backlogs in the province, capital appraisal of the potential projects carried out by the department is now the focus of increasing attention. The capital project selection phase of an infrastructure management and delivery system is nothing else but an assessment of capital projects to ensure maximum economic output from budget allocation.

This handbook is a part of the continuous effort by the Limpopo Provincial Government to improve the quality of public infrastructure delivery by its departments. The focus of this handbook is on the process of capital project selection by the Department of Education (DOE). The existing project selection process is examined and a proposal is made for enhancement of its efficiency. The handbook should help the Department in prioritization of areas for the construction of new and for the rehabilitation of the existing schools. The prioritization is based on a ranking system being developed as an extension of cost-effectiveness and cost-utility analysis, described in Annex A to the handbook.

The appraisal methodology employed in this handbook is based on the comprehensive appraisal manual developed by Cambridge Resources International (CRI) for the Limpopo Provincial Government.<sup>1</sup>

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<sup>1</sup> “Integrated Investment Appraisal: Concepts and Practice”, Prepared for Department of Financial and Economic Development, Limpopo Provincial Government, South Africa, Cambridge Resources International, Cambridge, USA, March 2004.

The methodology outlined in the manual and adopted to South African realities represents a state-of-the-art tool for conducting an integrated financial, economic, stakeholder and risk analysis of new projects, as well as maintenance, and expansion decisions.

## **1.1 Overview of Handbook**

The mission of Limpopo Department of Education is to open the doors of learning to all citizens of the Province. A number of strategic goals have been set for the Department in terms of both quantitative and qualitative achievement of its mission. The main focus of the Department is on the primary and secondary systems, which comprise the majority of provincial learners. Before the 90's, the previous political leadership had largely neglected rural educational needs as the Department is now facing the challenge of delivering the basic level of educational standards to the communities in six provincial districts. The objective of this handbook is to assist the decision-makers at the DOE in the selection of capital projects for construction and for rehabilitation. An integration of project appraisal methodology into the standardized management system is viewed as a natural extension of the Government's capacity for infrastructure delivery.

The analysis of project selection at the Department of Education will cover two main processes: selection of schools for construction of new classrooms; and allocation of funds between the construction of new class-blocks and rehabilitation of the existing facilities. Thus, Chapter 2 is focused on the development of a priority index for prioritization of schools in the capital project selection for new class-block construction. The existing decision-making process is analyzed and suggestions are derived in terms of enhancement of its efficiency.

Chapter 3 looks at the allocation of funds between the constructions of new school buildings and the rehabilitation of the existing facilities. Since all physical structures deteriorate over time, a formal appraisal procedure must be in place to measure if it is worthwhile to invest into the rehabilitation of the particular buildings during this budget

period or to channel the available funds into the construction of new class-blocks elsewhere.

The conclusions and comments will be presented in Chapter 4. Following that chapter, Annex A lays out the analytical framework of cost-effectiveness and cost-utility analysis employed to derive the priority index. Annex B presents an illustrative case-study on budget allocation of funds for construction of new class-blocks for a sample of selected provincial schools.

## **Chapter 2. Project Selection for Construction of New Class-Blocks**

### **2.1 Status Quo**

#### **2.1.1 Background**

Over past years, the achievements in education in Limpopo Province have been very encouraging: both the coverage and quality of education at all levels have been improved. There is still a lot of room for further progress. One of the major obstacles is the lack of adequate infrastructure facilities such as schoolrooms, especially in rural communities. The government is committed to eradication of this problem through continuous identification of classroom backlogs and providing funding for these schools. A certain amount of budget is allocated to construction of new schools in the province.

The process of identification is facilitated through an annual school survey, as mandated by the National Department of Education, and also through direct appeals by schools to the six regional education boards in Limpopo. Thus, if a community school has 2 standard class-blocks, each with 4 classrooms that are designed for 40 seats, then the capacity of the school is 320 pupils. Assume that the same school has a roster of 600 pupils and the classes are becoming more and more crowded from year to year. Right now, the seat shortage is 280 for this school and, expressed in terms of the number of standard classrooms, this is a backlog of 7 rooms, or 1.75 class-blocks.

At present, the calculation of backlogs is being done from the Education Management Information System (EMIS) that are conducted annually. Each school reports this information to the regional education board, which, in turn, summarizes all the reports and submits to the Department of Education. Having collected all reports from the six regional boards, the Capital Selection Committee ranks all the backlogs identified, and then allocates the available budget funds to individual schools. The prioritization of the school building projects is being done based on the EMIS data collected and on the reports from the circuit and district officers. The selected construction projects for the

schools marked for the current year are then consolidated to produce the annual business plans.<sup>2</sup>

The construction of class-blocks has been standardized by the national government regulations, according to strictly specified parameters of building materials and construction process. In 2002, the cost of construction of one standard class-block was set at R 420,000. The Department places a request to the Department of Public Works to carry out the construction of new class-blocks. The selection of constructor, management and quality control is all facilitated by the Department of Public Works. The Department of Public Works has its own construction teams and if they are available, the construction is done by internal teams. But if not, then the Department of Public Works will put the class-blocks on tender for a private contractor.

Given that the funds available are unlikely to meet all the needs for new school-block construction, in the absence of any formal project evaluation of the economic and social impacts, there has to be an element of subjectivity in the present process selection.

### **2.1.2 Challenges**

The Limpopo Department of Education is characterized by shortages of class-rooms and related infrastructure. At present, the class-room backlog stands at around 13,000. Many schools, especially in rural areas, lack the basic utilities such as electricity, telecommunications, water and sanitation. This situation prevails, despite the great effort undertaken since 1997. Some 7,000 class-rooms were built during the period between 1995 and 2001, and an additional 800 class-rooms were commissioned in year 2002.<sup>3</sup>

At the current rates, it will take about 10-15 years to overcome the backlogs. To remedy the situation, the Department has increased the infrastructure spending by more than 100% over 2002 and 2003. Although this assists in providing a greater number of class-rooms, the fact that not enough funds are available for preventive maintenance is still of major concern. Projections made by the Department of Public Works indicate

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<sup>2</sup> “Strategic Plan for 2003 – 2006”, Department of Education, Limpopo Provincial Government, Polokwane, South Africa (2002), p. 64.

that the Department will require over one billion Rand for maintenance only. For comparison, this figure is 4 times what was the total amount spent on infrastructure in 2003-2004.<sup>4</sup>

In the past, the lack of a reliable management information system has meant that the management of immovable assets in the Department has been hampered. The fact that the buildings of the same school campus were built at different times by different agencies, i.e. the government, community and donors, makes the evaluation and maintenance planning more complicated.<sup>5</sup> At present, the survey data system does not seem to provide the decision-makers with consistent data about actual condition of school infrastructure. As a result, schools have been built in locations where demand was overstated.<sup>6</sup>

The Department has realized the existence of gaps in the infrastructure delivery process as well as in the maintenance planning, and an initiative has been launched to evaluate different approaches to facilities management. A dialogue was successfully established with the Government of United Kingdom, which has produced a 5-year program funded by the UK Government. Cambridge Education Consultants of Cambridge, UK, has been contracted to lead this program. The scope of this program is to analyze the existing management practices at the provincial and district levels, to propose a new management information system, and to provide further technical assistance to its South African counterparts in Limpopo.

An integral part of the new management information system will be a database on all 4,900 provincial schools. This database will provide the decision-makers with regularly updated information on many educational variables, as well as on the physical condition of the school facilities. A preliminary date for implementation of such a system is mid 2005.

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<sup>3</sup> Ibid., p. 64.

<sup>4</sup> Ibid., p. 64.

<sup>5</sup> Ibid., p. 64.

<sup>6</sup> Ibid., p. 65.

## 2.2 Cost-Utility Approach in Capital Project Selection

### 2.2.1 Priority Index

A weighted cost-effectiveness approach, also called cost-utility analysis, can be employed for the capital project selection at the Department of Education. The task is to maximize the overall effectiveness of public expenditure on school infrastructure within a given amount of budget. The efficiency is to be measured a weighted “priority index” (PI) which can be setup to include all the important factors affecting the project selection.

Such an index will take account of the physical condition of the assets of a school, the need for additional class-rooms, the community factors, the development priorities, and other factors. For prioritizing the needs for new school-blocks, the number of backlogs and the learners-to-classroom ratio are the two indicators chosen to reflect the infrastructure adequacy for a particular school area. By weighting these two variables 0.7 and 0.3, respectively, a composite index is compiled. A number of additional factors are incorporated to augment this composite index. This efficiency criterion is a simple and plausible measure of improvement.

A cost-utility evaluation that can be built using the information from the newly designed EMIS for the Department will provide an effective and low-cost solution for the problem. The following advantages of employment of a priority index for the capital selection at the Department of Education are expected:

1. **Simplicity.** The index does not require more additional information than the standard management information system would possess on terms of data on schools and their support infrastructure.
2. **Transparency.** Since the composition of factors making up the PI and the assignment of the weights to each factor are both to be formally defined by the Department of Education, this index is a transparent way of conducting the capital project selection.
3. **Accountability.** This system will also comply with the requirements of the prudent capital project evaluation as stipulated by the new Infrastructure Delivery Toolkit, currently being rolled out by the National Treasury.

4. **Low Administrative Cost.** Once the database of provincial schools is compiled, the management information system can be programmed to compute the priority index for each school as a routine operation. The decision-makers will only have to monitor the content of the factor comprising the index and their relative weights. A periodic adjustment of these two aspects will be needed.

### 2.2.2 Definition of Index

The index itself can include as many factors as the decision-makers need to cover in the allocation of funds across provincial schools in the six districts. The discussion here will focus on the major factors identified during the initial investigation at the Department. It is more convenient to group similar factors into groups that make it easier to understand and to compute an index for a particular school.

**Infrastructure Adequacy.** This is the most crucial set of factors indicating the need for additional school infrastructure. There are two aspects of infrastructure adequacy: class-block backlog and the learner-to-classroom ratio. Both indicators are currently computed for all schools applying for additional buildings.

**(A) Estimated Class-block Backlog.** The class-room backlog is estimated as a number of additional buildings, measured by a standard 4-class block, required at a particular school in order to maintain the maximum acceptable class size. For primary schools, the target class size is 40 learners, and for secondary the size is set at 35 learners per class-room. Thus, if a primary school has 600 learners and only 8 class-rooms are currently available, the backlog is equal to 7 class-rooms ( $= [600 \text{ learners} - (8 \text{ class-rooms} * 40 \text{ learners})] / 40 \text{ learners-per-classroom}$ ), or 1.8 class-blocks.

**(B) Learner-to-Classroom / Target Class Size Ratio.** The overcrowding of classes is measured by the excess of actual class attendance to the maximum target class size, i.e. by the learner-to-classroom / target class size ratio. This ratio is nothing else than the average learner-to-classroom indicator at a particular

school, divide by the target size of class audience. For instance, the same primary school with 600 learners and 8 class-rooms currently available, should have a learner-to-classroom of 75 learners per class-room ( $= 600 \text{ learners} / 8 \text{ class-rooms}$ ). Then, the overcrowding is 1.9 times above the target size of a primary school class ( $= 75 \text{ learners per class-room} / 40 \text{ learners per class-room}$ ).

**Augmenting Factors.** In addition to looking after the infrastructure adequacy, the decision-making process currently considers a host of factors that aid project selection. These factors could be grouped into three categories: type of school, presence of support facilities, location of the school, and development priority factors.

**(1) Type of School.** The primary schools have been given more priority over secondary and other types of schools. Thus, the index should give somewhat more attention to primary schools as compared to other schools.

**(2) Support Facilities.** The availability of the basic support facilities such as toilets, water supply, fences, electricity, library, and laboratories has played a certain role in the allocation of funds for construction of new buildings among the schools in need. It has been stated that schools without any of such basic facilities should be given more priority, keeping all other factors constant.

**(3) School Location.** The vast majority of the provincial schools are located in the rural areas where little private contributions are made to support their budgets, as compared to urban schools. As a result, the prioritization of schools for additional infrastructure funding must reflect this historical disproportion.

**(4) Development Priority Factors.** The population of certain geographical areas may decline over time due to shifting patterns of economic activity or migration. For instance, the duration of mining at a particular site is determined by the availability of natural resources and once the stock is depleted and if no alternative economic activity exists at the site, it is likely that some migration will take place in the future, thus reducing the burden on the local school(s). Another example is the widespread transformation of agriculture farms in the province into game reserves catering for tourists. Game farming requires substantially less labor input and as a result some population outflow could be reasonably expected from such areas. The development priority factors must account for such expectations by reducing the priority of the schools affected by

population outflows. The development priority could potentially incorporate all other factors that may contribute to the demand for schooling in a particular area.

### **2.2.3 Estimation of Priority Index**

The list of the factors outlined above is by no way an exhaustive record of all important considerations. The index could include other relevant factors if needed. Once all factors that should be included in the index are identified and are prioritized relative to each other, then a composite index can be developed. The prioritization can be facilitated by the use of weights to balance the different factors comprising the index.

#### **Relative Weights of Infrastructure Adequacy Factors**

The most important indicator of the need for additional capital funding is the infrastructure adequacy of schools as measured by the number of class-block backlogs and the excess of the learner-to-classroom over the target class size. If both of these two indicators are assumed to add up to unity, then the question is, what is more important: to have enough class-blocks to accommodate learners or to have smaller sizes of the audiences? At present time, the existence of backlogs may suggest that the first aspect of the infrastructure adequacy is somewhat more important than the second. Then, a tentative distribution of weights among the two could be such that the class-block backlogs have a weight of 0.7 and the excess of the learner-to-classroom over the target class size has a weight of 0.3.

Suppose there are two primary school-areas A and B, with a respective population of 600 and 400 learners. If area A currently has 8 class-rooms and area B has 3 class-rooms, then their learner-to-classroom ratios are 75 and 133 learners per class-room. The estimated class-block backlog is, therefore, 1.8 standard blocks for area A and also 1.8 blocks for area B.<sup>7</sup> In other words, if schools A and B both have the same number of additional buildings required, but area A has a higher learner-to-classroom ratio, then

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<sup>7</sup> For school A, the backlog is estimated as 7 class-rooms ( $= [600 \text{ learners} - (8 \text{ class-rooms} * 40 \text{ learners})] / 40 \text{ learners-per-classroom}$ ), or 1.8 class-blocks. For school B, the same procedure yields 7 class-rooms ( $= [400 \text{ learners} - (3 \text{ class-rooms} * 40 \text{ learners})] / 40 \text{ learners-per-classroom}$ ), or 1.8 class-blocks.

this area should be given more priority. The excess ratio of learner-to-classroom over the target class size is 1.9 for area A and 3.3 for area B.<sup>8</sup>

A composite index can be then estimated from these two indicators and relative weights assigned to them. The score of school-area A would be equal to 1.83 ( $= 1.8 \text{ backlogs} * 0.7 + 1.9 \text{ excess ratio} * 0.3$ ). Similarly, the score of school-area B would be estimated as 2.25 ( $= 1.8 \text{ backlogs} * 0.7 + 3.3 \text{ excess ratio} * 0.3$ ). As a result, the priority of school-area B is higher than the priority of school-area A, based on the two infrastructure adequacy factors. Such infrastructure adequacy composite score can be computed for all provincial schools once the database is compiled. A ranking of all schools based on purely infrastructure adequacy would then list the school-areas from the highest to the lowest need for additional infrastructure.

### **Relative Weights of Augmenting Factors**

In addition to purely infrastructure adequacy factors, a number of additional aspects have been traditionally taken into consideration. As mentioned above, these factors could be grouped into the following categories: type of school, presence of support facilities, location of the school, and development priority factors. The idea is to construct an augmenting adjustment index that would range from unity to additional 1.75, expanding the score of the infrastructure adequacy computed earlier.

In other words, all other augmenting factors could introduce an upward shift in the index up to a limit of 0.75 taking the infrastructure adequacy score as the base. Because all schools have different combinations of features, the resulting augmenting adjustment will give more priority to rural primary schools in dire need of new facilities.

The allocation of the augmenting points among the four identified groups of factors could be done a number of ways. The one presented here is a tentative prioritization of these factors, based on the initial investigation. The actual weights could be further re-defined as needed. Table 1 presents a summary of the distribution of points among the four identified groups of factors.

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<sup>8</sup> For school A, the excess of class attendance over the norm is 1.9 times ( $= 75 \text{ learners-per-classroom} / 40 \text{ learners-per-classroom}$ ), while for school B this is 3.3 times ( $= 133 \text{ learners-per-classroom} / 40 \text{ learners-per-classroom}$ ).

**Table 1. Weight Distribution among Augmenting Factors.**

|                                                        |                                       |
|--------------------------------------------------------|---------------------------------------|
| <b>1. Type of School.</b>                              |                                       |
| Primary (P=0.25) or Secondary (S=0)                    | <b>0 or 0.25</b>                      |
| <b>2. Support Facilities.</b>                          |                                       |
| Water (N=0.08) or (Yes=0)                              | <b>Max = 0.25</b><br><b>0 or 0.08</b> |
| Toilets (N=0.08) or (Yes=0)                            | <b>0 or 0.08</b>                      |
| Electricity (N=0.04) or (Yes=0)                        | <b>0 or 0.04</b>                      |
| Fences (N=0.02) or (Yes=0)                             | <b>0 or 0.02</b>                      |
| Library (N=0.01) or (Yes=0)                            | <b>0 or 0.01</b>                      |
| Labs                                                   |                                       |
| Primary (N=0.01) or (Yes=0)                            | <b>0 or 0.01</b>                      |
| Secondary (N=0.02) or (Yes=0)                          | <b>0 or 0.02</b>                      |
| <b>3. Location of School.</b>                          |                                       |
| Rural (R=0.20) or Urban (U=0)                          | <b>0 or 0.20</b>                      |
| <b>4. Development Factors.</b>                         |                                       |
| Expected Population Decline (N=0) or (Yes: -0.40 to 0) | <b>Min = -0.40</b>                    |
| Other Factors (N=0) or (Yes: 0 to 0.05)                | <b>0.00 to 0.05</b>                   |
| <b>Maximum Weight of Augmenting Factors</b>            |                                       |
|                                                        | <b>0.75</b>                           |
| <b>Maximum Possible Augmenting Adjustment</b>          |                                       |
|                                                        | <b>1.75</b>                           |

### **Augmenting Adjustment to Infrastructure Adequacy Score**

The priority index is computed as the infrastructure adequacy score multiplied by the augmenting adjustment factor, which can be anything between 1.00 and 1.75. In other words, if two schools C and D end up with an identical infrastructure adequacy score of let's say 2.49,<sup>9</sup> but school C is a secondary school in urban area with presence of all basic support facilities, and school D is a rural primary school with none of amenities, then the augmenting factors index will give zero additional score to the first school and also award the maximum possible 0.75 additional points to the second school. Table 2 presents the estimation of the priority index for schools C and D.

<sup>9</sup> The infrastructure adequacy scores will be the same for two schools C and D in a situation when their class-block backlogs and excess learners' ratios are identical. For instance, the first is a secondary school with 550 learners and 6 class-rooms, while the second is a primary school with 629 learners and also 6 class-rooms. The learners-to-classroom ratios will be different for each school, 92 for the first and 105 learners per classroom for the second. But because the target class size is 40 learners per class for primary and 35 learners for secondary schools, the number of backlogs is identical for both schools, i.e. 2.4 blocks are needed. At the same time, the excess ratios will also be the same at both schools, equal to 2.6 times the target class size. As a result, the composite infrastructure adequacy scores will be the same for both schools C and D will be equal to 2.49 (= 2.4 backlogs \* 0.7 + 2.6 excess ratio \* 0.3).

**Table 2. Estimation of Priority Index.**

| INFRASTRUCTURE ADEQUACY                       |                   |          |                                  |             |             |
|-----------------------------------------------|-------------------|----------|----------------------------------|-------------|-------------|
|                                               | Weight            | School C | School D                         | School C    | School D    |
| Total Number of Learners                      |                   | 550      | 629                              |             |             |
| Available Classrooms                          |                   | 6        | 6                                |             |             |
| Learner-to-Classroom Ratio                    |                   | 92       | 105                              |             |             |
| <b>Class-blocks Backlog</b>                   | <b>0.70</b>       | 2.4      | 2.4                              | 1.70        | 1.70        |
| <b>Learner-to-Classroom Ratio/Target Size</b> | <b>0.30</b>       | 2.6      | 2.6                              | 0.79        | 0.79        |
| <b>Total Weight of Section</b>                | <b>1.00</b>       |          | <b>Total Section Score:</b>      | <b>2.49</b> | <b>2.49</b> |
| AUGMENTING FACTORS                            |                   |          |                                  |             |             |
| <b>1. Type of School.</b>                     | <b>0.25</b>       |          |                                  |             |             |
| Primary (P) or Secondary (S)                  |                   | S        | P                                | <b>0.00</b> | <b>0.25</b> |
| <b>2. Support Facilities.</b>                 | <b>Max = 0.25</b> |          |                                  |             |             |
| Water                                         | <b>0.08</b>       | Y        | N                                | 0.00        | 0.08        |
| Toilets                                       | <b>0.08</b>       | Y        | N                                | 0.00        | 0.08        |
| Electricity                                   | <b>0.04</b>       | Y        | N                                | 0.00        | 0.04        |
| Fences                                        | <b>0.02</b>       | Y        | N                                | 0.00        | 0.02        |
| Library                                       | <b>0.01</b>       | Y        | N                                | 0.00        | 0.01        |
| Labs                                          |                   | Y        | N                                | 0.00        | 0.01        |
| Primary                                       | <b>0.01</b>       |          |                                  |             |             |
| Secondary                                     | <b>0.02</b>       |          |                                  |             |             |
|                                               |                   |          | <b>Total Section Score:</b>      | <b>0.00</b> | <b>0.24</b> |
| <b>3. Location of School.</b>                 | <b>0.20</b>       |          |                                  |             |             |
| Rural (R) or Urban (U)                        |                   | U        | R                                | <b>0.00</b> | <b>0.20</b> |
| <b>4. Development Factors</b>                 |                   |          |                                  |             |             |
| Expected Population Decline                   | <b>-0.40</b>      | N        | N                                | 0.00        | 0.00        |
| Other Factors                                 | <b>0.05</b>       | N        | N                                | 0.00        | 0.00        |
|                                               |                   |          | <b>Total Section Score:</b>      | <b>0.00</b> | <b>0.00</b> |
| <b>Maximum Weight of Augmenting Factors</b>   | <b>0.75</b>       |          | <b>Total Augmenting Factors:</b> | <b>0.00</b> | <b>0.69</b> |
| <b>Maximum Possible Augmenting</b>            | <b>1.75</b>       |          | <b>Augmenting Adjustment:</b>    | <b>1.00</b> | <b>1.69</b> |
| PRIORITY INDEX AND RANKING                    |                   |          |                                  |             |             |
|                                               |                   |          | <b>Priority Index:</b>           | <b>2.49</b> | <b>4.20</b> |
|                                               |                   |          | <b>Ranking:</b>                  | <b>2</b>    | <b>1</b>    |

The priority index for secondary urban school C will be still equal to its infrastructure adequacy score of 2.49 ( $= 2.49 \text{ infrastructure adequacy score} * [1 + \text{zero additional points}]$ ). Where zero signifies that this school does not earn any additional priority points because it is a secondary school in an urban area with all the basic support facilities such as toilets, water supply, fences, electricity, library, and laboratories. However, the index for school D will be adjusted upward up by additional 0.69 points, so that its priority index becomes 4.20 ( $= 2.49 \text{ infrastructure adequacy score} * [1 + 0.69 \text{ additional points}]$ ).

## 2.3 Priority Index in Allocation of Budget for New Buildings

### 2.3.1 Role of Management Information System

The whole procedure of calculation of priority index and ranking of the schools according to multiple criteria can be well transferred to the management information system (MIS). The MIS will have a common database with reliable statistics on all provincial schools and the computation of the priority index would be a routine task of the system. While the database can potentially store multiple types of data on every school, only several essential characteristics will be needed for estimation of the priority index. An example of priority index estimation, school ranking and budget allocation for 8 schools can be used to illustrate the process that will be built-in to the new MIS.

**General Parameters.** These should include the target size for primary and secondary class, and it is currently 40 and 35 learners per classroom, respectively. The cost of construction of a standard 4-classroom block is R 420,000. Another parameter that needs to be supplied is the total amount of capital budget available for building new class-blocks. Once the total budget and cost of the standard block are given, the system will be able to calculate how many additional blocks can be erected with the available funding. For instance, if the capital budget is set at R 2.1 million, this implies that only five new class-blocks can be financed during this budget period. Thus, only 20 additional class-rooms will be added. Note that the standard school-blocks have four class-rooms and the blocks are not divisible into separate class-rooms.

**School Database.** Suppose that the entire database consists of 8 provincial schools. The following data are kept for each school: number of learners, available classrooms, type of school (primary, secondary or other), location of school, availability of support facilities such as toilets, water, fences, electricity, library, laboratories and other. Table 3 shows the details for each school.

**Table 3. Schools Database.**

| School:                                          | S.1 | S.2   | S.3 | S.4   | S.5 | S.6 | S.7 | S.8 |
|--------------------------------------------------|-----|-------|-----|-------|-----|-----|-----|-----|
| <b>INFRASTRUCTURE</b>                            |     |       |     |       |     |     |     |     |
| Total Number of Learners                         | 280 | 1,000 | 550 | 1,400 | 800 | 450 | 600 | 950 |
| Available Classrooms                             | 3   | 17    | 6   | 21    | 11  | 6   | 8   | 9   |
| Learner-to-Classroom Ratio                       | 93  | 59    | 92  | 67    | 73  | 75  | 75  | 106 |
| <b>A. Class-blocks Backlog</b>                   | 1.0 | 2.0   | 2.4 | 4.8   | 2.3 | 1.7 | 1.8 | 3.7 |
| <b>B. Learner-to-Classroom Ratio/Target Size</b> | 2.3 | 1.5   | 2.6 | 1.9   | 1.8 | 2.1 | 1.9 | 2.6 |
| <b>1. Type of School.</b>                        |     |       |     |       |     |     |     |     |
| Primary (P) or Secondary (S)                     | P   | P     | S   | S     | P   | S   | P   | P   |
| <b>2. Support Facilities.</b>                    |     |       |     |       |     |     |     |     |
| Water                                            | N   | N     | N   | Y     | N   | Y   | N   | Y   |
| Toilets                                          | N   | Y     | N   | Y     | N   | N   | N   | N   |
| Electricity                                      | N   | Y     | N   | Y     | N   | N   | Y   | N   |
| Fences                                           | N   | Y     | N   | Y     | Y   | N   | N   | N   |
| Library                                          | N   | N     | N   | Y     | N   | Y   | N   | N   |
| Labs                                             | N   | Y     | N   | N     | N   | N   | N   | N   |
| <b>3. Location of School.</b>                    |     |       |     |       |     |     |     |     |
| Rural (R) or Urban (U)                           | R   | U     | R   | R     | U   | R   | U   | R   |
| <b>4. Development Factors</b>                    |     |       |     |       |     |     |     |     |
| Expected Population Decline                      | N   | N     | N   | N     | N   | Y   | N   | N   |
| Other Factors                                    | N   | N     | N   | N     | N   | N   | N   | N   |

The learners-to-classroom ratio is found as the total number of learners divided by the number of class-rooms available. The backlog, measured in terms of standardized 4-classroom blocks, is then found as described in Section 2.2.2. The excess ratio, defined as the average number of learners per class-room divided by the target class size, can also be estimated. If we assume that the weights assigned to the different decision factors are the same as in Table 1, then a priority index for each school can be computed. Table 4 presents the procedure and resulting index.

**Table 4. Estimation of Priority Index and Ranking of Schools.**

| INFRASTRUCTURE ADEQUACY                          |             |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
|--------------------------------------------------|-------------|-----|-------|-----|-------|-----|-----|-----|-----|----------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|
|                                                  | Weight      | S.1 | S.2   | S.3 | S.4   | S.5 | S.6 | S.7 | S.8 |                                  | S.1         | S.2         | S.3         | S.4         | S.5         | S.6          | S.7         | S.8         |
| Total Number of Learners                         |             | 280 | 1,000 | 550 | 1,400 | 800 | 450 | 600 | 950 |                                  |             |             |             |             |             |              |             |             |
| Available Classrooms                             |             | 3   | 17    | 6   | 21    | 11  | 6   | 8   | 9   | 81                               |             |             |             |             |             |              |             |             |
| Learner-to-Classroom Ratio                       |             | 93  | 59    | 92  | 67    | 73  | 75  | 75  | 106 |                                  |             |             |             |             |             |              |             |             |
| <b>A. Class-blocks Backlog</b>                   | <b>0.70</b> | 1.0 | 2.0   | 2.4 | 4.8   | 2.3 | 1.7 | 1.8 | 3.7 | Score A:                         | 0.70        | 1.40        | 1.70        | 3.33        | 1.58        | 1.20         | 1.23        | 2.58        |
| <b>B. Learner-to-Classroom Ratio/Target Size</b> | <b>0.30</b> | 2.3 | 1.5   | 2.6 | 1.9   | 1.8 | 2.1 | 1.9 | 2.6 | Score B:                         | 0.70        | 0.44        | 0.79        | 0.57        | 0.55        | 0.64         | 0.56        | 0.79        |
| <b>Total Weight of Section</b>                   | <b>1.00</b> |     |       |     |       |     |     |     |     | <b>Total Section Score:</b>      | <b>1.40</b> | <b>1.84</b> | <b>2.49</b> | <b>3.90</b> | <b>2.12</b> | <b>1.84</b>  | <b>1.79</b> | <b>3.37</b> |
|                                                  |             |     |       |     |       |     |     |     |     | <b>Section Ranking:</b>          | <b>8</b>    | <b>6</b>    | <b>3</b>    | <b>1</b>    | <b>4</b>    | <b>5</b>     | <b>7</b>    | <b>2</b>    |
| AUGMENTING FACTORS                               |             |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
| <b>1. Type of School.</b>                        | <b>0.25</b> |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
| Primary (P) or Secondary (S)                     |             | P   | P     | S   | S     | P   | S   | P   | P   |                                  | 0.25        | 0.25        | 0.00        | 0.00        | 0.25        | 0.00         | 0.25        | 0.25        |
| <b>2. Support Facilities.</b>                    | <b>0.25</b> |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
| Water                                            | 0.08        | N   | N     | N   | Y     | N   | Y   | N   | Y   |                                  | 0.08        | 0.08        | 0.08        | 0.00        | 0.08        | 0.00         | 0.08        | 0.00        |
| Toilets                                          | 0.08        | N   | Y     | N   | Y     | N   | N   | N   | N   |                                  | 0.08        | 0.00        | 0.08        | 0.00        | 0.08        | 0.08         | 0.08        | 0.08        |
| Electricity                                      | 0.04        | N   | Y     | N   | Y     | N   | N   | Y   | N   |                                  | 0.04        | 0.00        | 0.04        | 0.00        | 0.04        | 0.04         | 0.00        | 0.04        |
| Fences                                           | 0.02        | N   | Y     | N   | Y     | Y   | N   | N   | N   |                                  | 0.02        | 0.00        | 0.02        | 0.00        | 0.00        | 0.02         | 0.02        | 0.02        |
| Library                                          | 0.01        | N   | N     | N   | Y     | N   | Y   | N   | N   |                                  | 0.01        | 0.01        | 0.01        | 0.00        | 0.01        | 0.00         | 0.01        | 0.01        |
| Labs                                             |             | N   | Y     | N   | N     | N   | N   | N   | N   |                                  | 0.01        | 0.00        | 0.02        | 0.02        | 0.01        | 0.02         | 0.01        | 0.01        |
| Primary                                          | 0.01        |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
| Secondary                                        | 0.02        |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
|                                                  |             |     |       |     |       |     |     |     |     | <b>Total Section Score:</b>      | <b>0.24</b> | <b>0.09</b> | <b>0.25</b> | <b>0.02</b> | <b>0.22</b> | <b>0.16</b>  | <b>0.20</b> | <b>0.16</b> |
| <b>3. Location of School.</b>                    | <b>0.20</b> |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
| Rural (R) or Urban (U)                           |             | R   | U     | R   | R     | U   | R   | U   | R   |                                  | 0.20        | 0.00        | 0.20        | 0.20        | 0.00        | 0.20         | 0.00        | 0.20        |
| <b>4. Development Factors</b>                    |             |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
| Expected Population Decline                      | -0.40       | N   | N     | N   | N     | N   | Y   | N   | N   |                                  | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | -0.20        | 0.00        | 0.00        |
| Other Factors                                    | 0.05        | N   | N     | N   | N     | N   | N   | N   | N   |                                  | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00         | 0.00        | 0.00        |
|                                                  |             |     |       |     |       |     |     |     |     | <b>Total Section Score:</b>      | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>-0.20</b> | <b>0.00</b> | <b>0.00</b> |
| <b>Maximum Weight of Augmenting Factors</b>      | <b>0.75</b> |     |       |     |       |     |     |     |     | <b>Total Augmenting Factors:</b> | <b>0.69</b> | <b>0.34</b> | <b>0.45</b> | <b>0.22</b> | <b>0.47</b> | <b>0.16</b>  | <b>0.45</b> | <b>0.61</b> |
| <b>Maximum Possible Augmenting Adjustment</b>    | <b>1.75</b> |     |       |     |       |     |     |     |     | <b>Augmenting Adjustment:</b>    | <b>1.69</b> | <b>1.34</b> | <b>1.45</b> | <b>1.22</b> | <b>1.47</b> | <b>1.16</b>  | <b>1.45</b> | <b>1.61</b> |
| PRIORITY INDEX AND RANKING                       |             |     |       |     |       |     |     |     |     |                                  |             |             |             |             |             |              |             |             |
|                                                  |             |     |       |     |       |     |     |     |     | <b>Priority Index:</b>           | <b>2.37</b> | <b>2.47</b> | <b>3.60</b> | <b>4.75</b> | <b>3.12</b> | <b>2.14</b>  | <b>2.59</b> | <b>5.43</b> |
| <b>ALLOCATION OF BLOCK #1</b>                    |             |     |       |     |       |     |     |     |     | <b>Ranking:</b>                  | <b>7</b>    | <b>6</b>    | <b>3</b>    | <b>2</b>    | <b>4</b>    | <b>8</b>     | <b>5</b>    | <b>1</b>    |

### 2.3.2 Example of Priority Index Estimation

The index is composed of two parts: (A) the infrastructure adequacy score, which is in turn built using the backlogs indicator and excess learners-to-classroom ratio, and (B) the augmentation factors, which include the type and location of school, availability of support facilities, and other development priority factors. Once the infrastructure adequacy score is estimated, it is multiplied by an augmentation adjustment factor that ranges from 1.00 to 1.75. The ranking of schools according to the highest priority index identifies schools with the worst situation in terms of need for additional infrastructure.

**Infrastructure Adequacy Score.** This score is estimated as the absolute number of backlogs multiplied by an assigned weight of 0.7, plus the product of the excess learners-to-classroom ratio multiplied by a weight of 0.3. For example, the backlog score for school 1 is equal to 0.70, which is the product of 1.0 class-block times the assigned weight. The excess learners-to-classroom score for the same school is equal to 0.69, which is found as the excess learners-to-classroom ratio of 2.3 multiplied by the weight of 0.3. Therefore, the composite infrastructure adequacy score is the summation of the two weighted scores, equal to 1.39 ( $= 0.70 + 0.69$ ).

**Type of School.** If it is a primary school, then 0.25 points are recorded in the augmenting adjustment factor. However, if this is a secondary school then no additional priority is given to this school. Thus, school 1 is primary and it earns 0.25 points.

**Support Facilities.** This section clarifies whether the school in question possesses the basic support facilities. If the school indeed has some of the facilities, no additional priority is given to these aspects, but if no amenities exist then each of them adds more priority points to the augmentation factor. In regard to laboratories, more priority is given to having labs in secondary schools rather than in primary schools. To continue with the same example of school 1 in Table 4, we witness that because this primary school currently has no water (0.08), no toilets (0.08), no electricity (0.04), no fences (0.01), no library (0.01), and no labs (0.01), the overall section score is at its maximum, 0.24 points.

**Location of School.** It is assumed that a rural school obtains an additional priority augmentation score of 0.20 points.

**Development Priority Factors.** Currently two factors are assigned to this section. If the particular school is located in an area that, by any reason, is likely to be affected by long-term outflow of population then a negative weight of -0.40 will reduce the priority given to this school by other factors. School 1, for example, is not expected to experience any outgoing population migration and no reduction of priority is recorded. As opposite to this, school 6 is located in an area that will suffer some outflow, and the severity of this migration is assigned a score of 0.20 points out of maximum 0.40 possible for this factor. All other development factors are assumed to be identical for all schools and no special priority is given to any of the schools.

**Augmenting Adjustment.** This adjustment is a summation of all augmentation priority points into a factor that ranges from 1.00 to 1.75 in most cases. An unlikely combination of an urban secondary school with all support facilities and located in an area that will face a population outflow, will be assigned an adjustment factor of 0.60 when the population migration score of -0.40 is taken into consideration. An average urban secondary school with all basic support facilities will obtain an augmentation factor close to unity, while a rural primary school with none of the support facilities should score the maximum points. For instance, school 1 earns an augmentation adjustment factor of 1.69, while school 6, which was identified as located in an area to be affected by future population outflow, has only scored an augmentation factor of 1.16. At the same time, a rural secondary school 4 that has all support facilities except laboratories has been given an augmentation factor of 1.22.

**Priority Index.** Finally, the index is computed as a multiplication product of the infrastructure adequacy score and the augmentation adjustment factor. For example, school 1 has an infrastructure adequacy score of 1.40 and the augmentation adjustment factor of 1.69. The priority index is, therefore, estimated as 2.37 ( $= 1.40 * 1.69$ ). At the same time, school 6 had an even higher infrastructure adequacy score of 1.84 initially, but because it failed to gain as many augmenting points as other schools, its final priority index is only 2.14, which is lower than the PI of school 1.

**School Ranking.** Once the PI index is estimated for all schools in the database, the schools will be automatically ranked from the highest value of PI to the lowest. The number one ranking would signify the highest need for additional infrastructure.

### 2.3.3 Budget Allocation

**The Rule.** The question now is how the school priority index and ranking can assist the decision-making for the allocation of funds among the schools. In a situation when the construction costs of a standard 4-classroom block are the same for all schools, the application of cost-utility analysis suggests using Rule 1 discussed in Section 3.2.2, which simply attempts to maximize the effectiveness of budget spending where the overall effectiveness is measured by the alleviation of the priority index. ***Because the priority index reflects a number of objectives, the overall effectiveness of budget spending is maximized when the funds are forwarded to schools with the highest ranking.***

**Illustration of Budget Allocation.** To illustrate the practical application of the allocation rule, let's continue with the same example of 8 schools from the previous section. Since the priority index has been estimated and ranking of schools was done accordingly, we should focus on how a limited budget should be allocated among the schools in the most efficient manner.

In the present situation, the total backlog for all 8 schools is 19.6 standard blocks, or 78.3 class-rooms, as could be computed from the schools' backlog data in Table 4. Suppose that the capital budget for the current period is only R 2.1 million, which translates into 5 new class-blocks, since each costs R 420,000 to construct. The issue is now to decide which school should be given the funding and for how many school-blocks.

***The right approach to the allocation is to award each additional class-block to the school ranking first in terms of the priority index.*** Because each additional building will alter the current priority index and ranking of schools, the ranking is recalculated after each new addition of class-rooms or support facilities, or changes in the type of

school or in the development priority factors. Table 5 illustrates the iterative allocation process that finds an optimal spending pattern for a budget of 5 class-blocks. Because each additional block alters the priority index and ranking, the allocation is done in five steps, each reflecting the increment of one school-block. It is assumed that the augmentation factors remain constant, while in reality this assumption need not to be upheld as it is often the case that new construction may improve some of the backlogs in the support facilities.

What is shown in Table 5 is a multi-stage selection process. Note that during each round only one additional class-block is being awarded to the school that has the highest ranking. For example, the very first class-block is given to school 8 because it has the highest ranking in Table 4, i.e. before the allocation. Then, once this additional block is given to school 8, as shown in Table 5, it means that the priority index of school 8 declines to a level such that now another school takes the lead in ranking. Indeed, after the first class-block is awarded to school 8, it automatically reduces its ranking to the second position, and the second school-block must now be given to school 4, which just came up on the top of the list.

In turn, the second class-block given to school 4 causes its priority index to decline and the top ranking shifts again to school 8. Thus, the third class-block goes to school 8. Once this third block is allocated, the new ranking shows that school 3 has just become the prime favorite of the priority index, and the next block must be given to this school. Therefore, the fourth block goes to school 3, and new readjustment of the priority index entails. This readjustment puts school 4 on the top of the priority list, which implies that the fifth lock should be awarded to school 4.

Thus, the allocation of five new class-blocks among 8 schools results in awarding two blocks to each school 8 and to school 4, and one block to school 3. This pattern is consistent with the initial priority ranking in Table 4, which put school 8 on the first place, school 4 on the second, and school 3 on the third. Hence, the allocation rule has allocated the limited budget funds in the most efficient manner.

**Table 5. Allocation of Funds for Construction of New Class-Blocks subject to Budget Limit.**

| ALLOCATION OF BLOCK #2                 | S.1  | S.2   | S.3 | S.4   | S.5 | S.6 | S.7 | S.8 |     | S.1  | S.2  | S.3  | S.4  | S.5  | S.6  | S.7  | S.8  |
|----------------------------------------|------|-------|-----|-------|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|
|                                        |      |       | 1   | 2     |     |     |     |     |     |      |      |      |      |      |      |      | 2    |
| Total Number of Learners               | 280  | 1,000 | 550 | 1,400 | 800 | 450 | 600 | 950 |     |      |      |      |      |      |      |      |      |
| New Class-Blocks                       | 0    | 0     | 0   | 0     | 0   | 0   | 0   | 1   |     |      |      |      |      |      |      |      |      |
| Available Classrooms                   | 3    | 17    | 6   | 21    | 11  | 6   | 8   | 13  | 85  |      |      |      |      |      |      |      |      |
| Learner-to-Classroom Ratio             | 93   | 59    | 92  | 67    | 73  | 75  | 75  | 73  |     |      |      |      |      |      |      |      |      |
| Resulting Class-blocks Backlog         | 0.70 | 1.0   | 2.0 | 2.4   | 4.8 | 2.3 | 1.7 | 1.8 | 2.7 | 0.70 | 1.40 | 1.70 | 3.33 | 1.58 | 1.20 | 1.23 | 1.88 |
| Learner-to-Classroom Ratio/Target Size | 0.30 | 2.3   | 1.5 | 2.6   | 1.9 | 1.8 | 2.1 | 1.9 | 1.8 | 0.70 | 0.44 | 0.79 | 0.57 | 0.55 | 0.64 | 0.56 | 0.55 |
| Total Section Score:                   |      |       |     |       |     |     |     |     |     | 1.40 | 1.84 | 2.49 | 3.90 | 2.12 | 1.84 | 1.79 | 2.43 |
| Augmenting Adjustment:                 |      |       |     |       |     |     |     |     |     | 1.69 | 1.34 | 1.45 | 1.22 | 1.47 | 1.16 | 1.45 | 1.61 |
| Priority Index:                        |      |       |     |       |     |     |     |     |     | 2.37 | 2.47 | 3.60 | 4.75 | 3.12 | 2.14 | 2.59 | 3.91 |
| Ranking:                               |      |       |     |       |     |     |     |     |     | 7    | 6    | 3    | 1    | 4    | 8    | 5    | 2    |
| ALLOCATION OF BLOCK #3                 | S.1  | S.2   | S.3 | S.4   | S.5 | S.6 | S.7 | S.8 |     | S.1  | S.2  | S.3  | S.4  | S.5  | S.6  | S.7  | S.8  |
| Total Number of Learners               | 280  | 1,000 | 550 | 1,400 | 800 | 450 | 600 | 950 |     |      |      |      |      |      |      |      |      |
| New Class-Blocks                       | 0    | 0     | 0   | 1     | 0   | 0   | 0   | 0   |     |      |      |      |      |      |      |      |      |
| Available Classrooms                   | 3    | 17    | 6   | 25    | 11  | 6   | 8   | 13  | 89  |      |      |      |      |      |      |      |      |
| Learner-to-Classroom Ratio             | 93   | 59    | 92  | 56    | 73  | 75  | 75  | 73  |     |      |      |      |      |      |      |      |      |
| Resulting Class-blocks Backlog         | 0.70 | 1.0   | 2.0 | 2.4   | 3.8 | 2.3 | 1.7 | 1.8 | 2.7 | 0.70 | 1.40 | 1.70 | 2.63 | 1.58 | 1.20 | 1.23 | 1.88 |
| Learner-to-Classroom Ratio/Target Size | 0.30 | 2.3   | 1.5 | 2.6   | 1.6 | 1.8 | 2.1 | 1.9 | 1.8 | 0.70 | 0.44 | 0.79 | 0.48 | 0.55 | 0.64 | 0.56 | 0.55 |
| Total Section Score:                   |      |       |     |       |     |     |     |     |     | 1.40 | 1.84 | 2.49 | 3.11 | 2.12 | 1.84 | 1.79 | 2.43 |
| Augmenting Adjustment:                 |      |       |     |       |     |     |     |     |     | 1.69 | 1.34 | 1.45 | 1.22 | 1.47 | 1.16 | 1.45 | 1.61 |
| Priority Index:                        |      |       |     |       |     |     |     |     |     | 2.37 | 2.47 | 3.60 | 3.79 | 3.12 | 2.14 | 2.59 | 3.91 |
| Ranking:                               |      |       |     |       |     |     |     |     |     | 7    | 6    | 3    | 2    | 4    | 8    | 5    | 1    |

**Table 5. Allocation of Funds for Construction of New Class-Blocks subject to Budget Limit (continued).**

| ALLOCATION OF BLOCK #4                 |  | S.1  | S.2   | S.3 | S.4   | S.5 | S.6 | S.7 | S.8 | S.1  | S.2  | S.3  | S.4  | S.5  | S.6  | S.7  | S.8  |      |
|----------------------------------------|--|------|-------|-----|-------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|
|                                        |  |      |       | 1   | 2     |     |     |     |     |      |      |      |      |      |      |      | 2    |      |
| Total Number of Learners               |  | 280  | 1,000 | 550 | 1,400 | 800 | 450 | 600 | 950 |      |      |      |      |      |      |      |      |      |
| New Class-Blocks                       |  | 0    | 0     | 0   | 0     | 0   | 0   | 0   | 1   |      |      |      |      |      |      |      |      |      |
| Available Classrooms                   |  | 3    | 17    | 6   | 25    | 11  | 6   | 8   | 17  | 93   |      |      |      |      |      |      |      |      |
| Learner-to-Classroom Ratio             |  | 93   | 59    | 92  | 56    | 73  | 75  | 75  | 56  |      |      |      |      |      |      |      |      |      |
| Resulting Class-blocks Backlog         |  | 0.70 | 1.0   | 2.0 | 2.4   | 3.8 | 2.3 | 1.7 | 1.8 | 1.7  | 0.70 | 1.40 | 1.70 | 2.63 | 1.58 | 1.20 | 1.23 | 1.18 |
| Learner-to-Classroom Ratio/Target Size |  | 0.30 | 2.3   | 1.5 | 2.6   | 1.6 | 1.8 | 2.1 | 1.9 | 1.4  | 0.70 | 0.44 | 0.79 | 0.48 | 0.55 | 0.64 | 0.56 | 0.42 |
| Total Section Score:                   |  |      |       |     |       |     |     |     |     | 1.40 | 1.84 | 2.49 | 3.11 | 2.12 | 1.84 | 1.79 | 1.60 |      |
| Augmenting Adjustment:                 |  |      |       |     |       |     |     |     |     | 1.69 | 1.34 | 1.45 | 1.22 | 1.47 | 1.16 | 1.45 | 1.61 |      |
| Priority Index:                        |  |      |       |     |       |     |     |     |     | 2.37 | 2.47 | 3.60 | 3.79 | 3.12 | 2.14 | 2.59 | 2.58 |      |
| Ranking:                               |  |      |       |     |       |     |     |     |     | 7    | 6    | 2    | 1    | 3    | 8    | 4    | 5    |      |

| ALLOCATION OF BLOCK #5                 |  | S.1  | S.2   | S.3 | S.4   | S.5 | S.6 | S.7 | S.8 | S.1  | S.2  | S.3  | S.4  | S.5  | S.6  | S.7  | S.8  |      |
|----------------------------------------|--|------|-------|-----|-------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|
|                                        |  |      |       |     |       |     |     |     |     |      |      |      |      |      |      |      |      |      |
| Total Number of Learners               |  | 280  | 1,000 | 550 | 1,400 | 800 | 450 | 600 | 950 |      |      |      |      |      |      |      |      |      |
| New Class-Blocks                       |  | 0    | 0     | 0   | 1     | 0   | 0   | 0   | 0   |      |      |      |      |      |      |      |      |      |
| Available Classrooms                   |  | 3    | 17    | 6   | 29    | 11  | 6   | 8   | 17  | 97   |      |      |      |      |      |      |      |      |
| Learner-to-Classroom Ratio             |  | 93   | 59    | 92  | 48    | 73  | 75  | 75  | 56  |      |      |      |      |      |      |      |      |      |
| Resulting Class-blocks Backlog         |  | 0.70 | 1.0   | 2.0 | 2.4   | 2.8 | 2.3 | 1.7 | 1.8 | 1.7  | 0.70 | 1.40 | 1.70 | 1.93 | 1.58 | 1.20 | 1.23 | 1.18 |
| Learner-to-Classroom Ratio/Target Size |  | 0.30 | 2.3   | 1.5 | 2.6   | 1.4 | 1.8 | 2.1 | 1.9 | 1.4  | 0.70 | 0.44 | 0.79 | 0.41 | 0.55 | 0.64 | 0.56 | 0.42 |
| Total Section Score:                   |  |      |       |     |       |     |     |     |     | 1.40 | 1.84 | 2.49 | 2.34 | 2.12 | 1.84 | 1.79 | 1.60 |      |
| Augmenting Adjustment:                 |  |      |       |     |       |     |     |     |     | 1.69 | 1.34 | 1.45 | 1.22 | 1.47 | 1.16 | 1.45 | 1.61 |      |
| Priority Index:                        |  |      |       |     |       |     |     |     |     | 2.37 | 2.47 | 3.60 | 2.85 | 3.12 | 2.14 | 2.59 | 2.58 |      |
| Ranking:                               |  |      |       |     |       |     |     |     |     | 7    | 6    | 1    | 3    | 2    | 8    | 4    | 5    |      |

An important feature of this priority index is that it serves to reduce the overall disparity between the different areas. In the example at the beginning of the planning period, the range of the priority index was 5.43 for school 8, which is identified as the school in the most need, to an index of 2.14 for school 6, area with the least need. After the allocation of school-blocks, the range of the priority index is narrowed. After the first school-block is allotted to school 8, the PI range is only from 4.75 (school 4) to 2.14 (school 6). This system of prioritization is such that will ensure that the benefits are maximized from the allocation of capital budget for the construction of new class-blocks. Table 6 summarizes the cumulative allocation of the budget for five class-blocks.

**Table 6. Summary of Funds Allocation for 5 Standard Class-Blocks.**

|                                    | Allocated To: | Max PI Observed | S.1      | S.2      | S.3      | S.4      | S.5      | S.6      | S.7      | S.8      |
|------------------------------------|---------------|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>1<sup>st</sup> Block</b>        | School 8 *    | 5.43            |          |          |          |          |          |          |          | 1        |
| <b>2<sup>nd</sup> Block</b>        | School 4 **   | 4.75            |          |          |          | 1        |          |          |          |          |
| <b>3<sup>rd</sup> Block</b>        | School 8      | 3.91            |          |          |          |          |          |          |          | 1        |
| <b>4<sup>th</sup> Block</b>        | School 4      | 3.79            |          |          |          | 1        |          |          |          |          |
| <b>5<sup>th</sup> Block</b>        | School 3 ***  | 3.60            |          |          | 1        |          |          |          |          |          |
| <b>Total New Blocks Allocated:</b> |               |                 | <b>0</b> | <b>0</b> | <b>1</b> | <b>2</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>2</b> |

Notes: \* Ranked first before allocation.  
 \*\* Ranked second before allocation.  
 \*\*\* Ranked third before allocation.

### **Automation of Project Selection.**

It should be noted that the seemingly lengthy procedure presented here should be levied on a computer-based system, such as the forthcoming MIS for the Department. Once programmed, the computer will be able to calculate the priority index and generate ranking as a part of routine process. The allocation of limited budget funds could also be assisted by the same system.

The user intervention will be necessary in terms of regular updates of the school database records, and for periodic reassessment of the weights assigned to the various factors affecting the capital project selection.

## **Chapter 3. Rehabilitation of Existing Class-Blocks**

In addition to building new school-blocks, the second crucial function of capital project selection in the Department of Education is the rehabilitation of the existing school facilitates in desperate need of repair due to damage due to natural causes or to age of structures. No standard school-blocks were used in the past, and currently schools have buildings erected by different donors with different designs. Some school buildings were built as early as in the 1940s and are still in use. In a situation of severe shortage of budget funds and huge need for rehabilitation, a system of prioritization should be in place to ensure the most efficient allocation of the public funds.

### **3.1 Current Approach**

In contrast to school selection for new school-blocks, where the construction costs for the standard 4-classroom block are fixed, the selection of schools for rehabilitation involves assessment of different costs as the damage is different from site to site. The current approach to allocation of the limited rehabilitation funds is relied on the information supplied from the district offices in regard to the schools identified as having buildings in desperate need of repair. Once the list of schools with badly damaged infrastructure is submitted to the Department, an initial assessment is done to prioritize the listing so that the most critical ones are selected for funding during this period. The schools not selected for rehabilitation will be included in the same process in next budget period.

Once the initial selection is made, the shortened list is referred to the Department of Public Works in order to carry out visual and technical assessment of the rehabilitation works to be done. The Department of Public Works sends an assessment team to prepare a report for each site and a preliminary costing of the works. Once the assessment is done for all schools on the list, the cost estimate reports are forwarded back to the Department of Education. Then, the Department decides which schools are actually selected for rehabilitation.

As the outcomes of rehabilitation activities in each school are known, i.e. number of class-rooms repaired, and the cost of rehabilitation is also reasonably known too, the current selection process tries to maximize the efficiency of spending. The selection procedure seems also to utilize the same set of factors described in Section 2.2.2, in order to prioritize among the schools applying for rehabilitation.

## **3.2 Priority Index in Rehabilitation of Existing Buildings**

### **3.2.1 Nature of Decision-Making Problem**

In the situation of huge backlog for school infrastructure and a limited amount of capital budget available the management has to make hard choices in terms of allocation of funds for rehabilitation. It is well understood that if no repair is given to school buildings in critical condition, these structures will be totally useless in some time. The question is really how to rank all alternative rehabilitation sites so that the budget is spent in the most efficient manner.

The efficiency in the case of rehabilitation is measured in terms of technical cost-effectiveness, i.e. if the repair cost is indeed lower than construction of a new building, and in terms of achievement of the multiple objectives described by the school priority index. In contrast to the ranking of schools for new class-blocks, that each costs the same, the ranking of rehabilitation sites must account for different costs associated with the alternative schools.

The problem is also aggravated by the fact that rehabilitation ranking involves inter-temporal comparison of schools' condition now and in some future year. If no rehabilitation is arranged for a building now, it will depreciate faster and become useless after a few years. The analysis should be able to consistently compare the cost of construction of a new class-room in the future with the current cost of rehabilitation.

### **3.2.2 Building Condition**

The first step in assessment of alternative rehabilitation sites is to compare the current cost of rehabilitation with the future cost of building a new class-room to replace the

existing damage structure. To illustrate the discussion of this process, let's use an illustration with eight provincial schools. Table 7 lists the number and condition of damaged class-rooms in these schools.

**Table 7. Class-rooms in Desperate Need for Rehabilitation.**

| School:                                                    | S.1      | S.2        | S.3       | S.4        | S.5        | S.6      | S.7       | S.8        | Total        |
|------------------------------------------------------------|----------|------------|-----------|------------|------------|----------|-----------|------------|--------------|
| <b>INFRASTRUCTURE</b>                                      |          |            |           |            |            |          |           |            |              |
| Total Number of Learners                                   | 280      | 1,000      | 550       | 1,400      | 800        | 450      | 600       | 950        | <b>81</b>    |
| Available Classrooms                                       | 3        | 17         | 6         | 21         | 11         | 6        | 8         | 9          |              |
| Learner-to-Classroom Ratio                                 | 93       | 59         | 92        | 67         | 73         | 75       | 75        | 106        |              |
| <b>A. Class-blocks Backlog</b>                             | 1.0      | 2.0        | 2.4       | 4.8        | 2.3        | 1.7      | 1.8       | 3.7        |              |
| <b>B. Learner-to-Classroom Ratio/Target Size</b>           | 2.3      | 1.5        | 2.6       | 1.9        | 1.8        | 2.1      | 1.9       | 2.6        |              |
| <b>Classrooms in Urgent Need of Rehabilitation:</b>        |          |            |           |            |            |          |           |            |              |
| Condition of Classroom A                                   |          | 1          | 2         | 1          | 2          |          | 2         | 1          |              |
| Cost of Rehabilitation Classroom A                         |          | 100        | 35        | 100        | 40         |          | 50        | 120        |              |
| Condition of Classroom B                                   |          | 1          |           | 2          | 1          |          |           | 2          |              |
| Cost of Rehabilitation Classroom B                         |          | 80         |           | 45         | 90         |          |           | 45         |              |
| Condition of Classroom C                                   |          | 2          |           | 2          |            |          |           |            |              |
| Cost of Rehabilitation Classroom C                         |          | 40         |           | 60         |            |          |           |            |              |
| Condition of Classroom D                                   |          | 2          |           | 1          |            |          |           |            |              |
| Cost of Rehabilitation Classroom D                         |          | 50         |           | 95         |            |          |           |            |              |
| Condition of Classroom E                                   |          | 1          |           | 1          |            |          |           |            |              |
| Cost of Rehabilitation Classroom E                         |          | 95         |           | 85         |            |          |           |            |              |
| Condition of Classroom F                                   |          |            |           | 1          |            |          |           |            |              |
| Cost of Rehabilitation Classroom F                         |          |            |           | 90         |            |          |           |            |              |
| Condition of Classroom G                                   |          |            |           | 1          |            |          |           |            |              |
| Cost of Rehabilitation Classroom G                         |          |            |           | 110        |            |          |           |            |              |
| Condition of Classroom H                                   |          |            |           |            |            |          |           |            |              |
| Cost of Rehabilitation Classroom H                         |          |            |           |            |            |          |           |            |              |
| Condition of Classroom I                                   |          |            |           |            |            |          |           |            |              |
| Cost of Rehabilitation Classroom I                         |          |            |           |            |            |          |           |            |              |
| Condition of Classroom J                                   |          |            |           |            |            |          |           |            |              |
| Cost of Rehabilitation Classroom J                         |          |            |           |            |            |          |           |            |              |
| <b>Total # Classrooms in Urgent Need of Rehabilitation</b> | <b>0</b> | <b>5</b>   | <b>1</b>  | <b>7</b>   | <b>2</b>   | <b>0</b> | <b>1</b>  | <b>2</b>   | <b>18</b>    |
| <b>Total Rehabilitation Cost (R, '000s)</b>                | <b>0</b> | <b>365</b> | <b>35</b> | <b>585</b> | <b>130</b> | <b>0</b> | <b>50</b> | <b>165</b> | <b>1,330</b> |

Table 7 shows that among the existing class-rooms there are some that need urgent repair in order to stay in service and be useful for educational services. For example, school 5 has a total of 11 class-rooms and two need certain rehabilitation works. One of these class-rooms (5.B) is in a very critical condition as indicated by “1” in the condition field, and the other class-room (5.A) is in a weak condition as indicated by “2” in its condition field.<sup>10</sup> Likewise, school 4 currently has 21 class-rooms and 7 of

<sup>10</sup> The use of condition indicator corresponds to the classification system used in the “Annual Survey for Ordinary Schools (2004)”, Department of Education, Limpopo Provincial Government, Polokwane, South Africa. Thus, “1” refers as very weak condition, not suitable for education; “2” is weak and structure needs attention; “3” needs paint and minor repair; “4” is in good condition; “5” is a new structure; and “6” currently being upgraded.

need rehabilitation. Five of the seven (4.A, 4.D, 4.E, 4.F and 4.G) are in a very critical condition, and two (4.B and 4.C) need repair works.

Note that the listing only contains conditions “1” and “2”, which are characterized as serious according to the school survey. *It is assumed that a building in category “1” will stand, on the average, 1 more year before it becomes completely useless. A building belonging to category “2” is assumed to remain in service, on the average, for 4 more years.*<sup>11</sup> In the future, as the infrastructure backlogs become gradually eliminated, the Department may have more funds available for rehabilitation and can consider including condition “3” into the scope of analysis.

### 3.2.3 Relative Rehabilitation Cost

The estimated costs of rehabilitation for each class-room are stated in Table 7. It is assumed that the initial assessment of repair works has been done and the results are summarized. Thus, class-room 5.A requires an investment of R 40,000 while class-room 5.B needs R 90,000 to keep it in service. Both repair cost estimates are less than the R 105,000 cost of a new class-room (= R 420,000 / 4 rooms), but the question is really whether it is worth spending funds on maintenance or wait until the class-rooms become unusable and then replace these with new buildings.

To calculate the relative cost of rehabilitation to construction of a new class-room, we need to divide the estimated repair cost by the present value (PV) of the construction cost of a new class-room in the future when the existing structure becomes worthless:

$$\text{Relative Rehabilitation Cost} = \frac{\text{Rehabilitation Cost}}{\text{PV of New Class-room Construction}}$$

The current cost of a standard 4-classroom block is R 420,000, which implies a proportional cost of R 105,000 per class-room in 2004 prices. If we assume the current 2004 year as the base year of analysis and also presume that no *real* changes to the construction cost of the standard school-block take place over next few years, then we can estimate the present value of one class-room construction in 1 year, as

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<sup>11</sup> These two assumptions were derived from consultation with the Section of the Department of Public Works responsible for the schools infrastructure. A further research might be needed to refine these expectations of building life duration.

corresponding to condition “1”, and in 4 years, as corresponding to condition “2”.<sup>12</sup> Thus, the PV of the construction cost of a new class-room in 1 year is estimated as R<sub>2004</sub> 94,600; and in 6 years as R<sub>2004</sub> 69,200, both expressed in 2004 prices.<sup>13</sup> *The discount rate is the economic opportunity cost of capital (EOCK), estimated as 11.0% for South Africa.*

Thus, the rehabilitation cost of a particular class-room must be compared with the PV of the construction cost of a new class-room in the future period when it would replace this damaged class-room if no repair is undertaken until that. Table 8 shows the results of estimation of the relative rehabilitation cost for all 18 class-rooms in the sample.

**Table 8. Relative Rehabilitation Cost.**

| School   |           | Condition | Years Remaining | PV of New Class Cost (R <sub>2004</sub> '000s) | Rehab Cost (R <sub>2004</sub> '000s) | Rehab Cost / PV of New Class Cost |
|----------|-----------|-----------|-----------------|------------------------------------------------|--------------------------------------|-----------------------------------|
| School 2 | Class 2.A | 1         | 1 year          | 94.6                                           | 100                                  | 1.06                              |
|          | Class 2.B | 1         | 1 year          | 94.6                                           | 80                                   | 0.85                              |
|          | Class 2.C | 2         | 4 years         | 69.2                                           | 40                                   | 0.58                              |
|          | Class 2.D | 2         | 4 years         | 69.2                                           | 50                                   | 0.72                              |
|          | Class 2.E | 1         | 1 year          | 94.6                                           | 95                                   | 1.00                              |
| School 3 | Class 3.A | 2         | 4 years         | 69.2                                           | 35                                   | 0.51                              |
| School 4 | Class 4.A | 1         | 1 year          | 94.6                                           | 100                                  | 1.06                              |
|          | Class 4.B | 2         | 4 years         | 69.2                                           | 45                                   | 0.65                              |
|          | Class 4.C | 2         | 4 years         | 69.2                                           | 60                                   | 0.87                              |
|          | Class 4.D | 1         | 1 year          | 94.6                                           | 95                                   | 1.00                              |
|          | Class 4.E | 1         | 1 year          | 94.6                                           | 85                                   | 0.90                              |
|          | Class 4.F | 1         | 1 year          | 94.6                                           | 90                                   | 0.95                              |
|          | Class 4.G | 1         | 1 year          | 94.6                                           | 110                                  | 1.16                              |
| School 5 | Class 5.A | 2         | 4 years         | 69.2                                           | 40                                   | 0.58                              |
|          | Class 5.B | 1         | 1 year          | 94.6                                           | 90                                   | 0.95                              |
| School 7 | Class 7.A | 2         | 4 years         | 69.2                                           | 50                                   | 0.72                              |
| School 8 | Class 8.A | 1         | 1 year          | 94.6                                           | 120                                  | 1.27                              |
|          | Class 8.B | 2         | 4 years         | 69.2                                           | 45                                   | 0.65                              |

Hence, the relevant benchmark for the rehabilitation costs of class-room 5.A is the PV of new class-room construction in 4-year time, or R<sub>2004</sub> 69,200. Since the rehabilitation costs of this class-room are only R<sub>2004</sub> 40,000, the relative rehabilitation cost is 0.58 (=R<sub>2004</sub> 40,000 / R<sub>2004</sub> 69,200).

<sup>12</sup> “Real” changes in the price of a good or service exclude inflationary effects, which are the general rise in all prices across economy. Thus, “real” price adjustments are resulting from forces of supply and demand for construction services, rather than from the inflation.

<sup>13</sup> PV in 1 year estimated as R<sub>2004</sub> 94,600 = R<sub>2004</sub> 105,000 / [(1 + 11.0%)<sup>1</sup>]; and in 4 years as R<sub>2004</sub> 69.2 = R<sub>2004</sub> 105,000 / [(1 + 11.0%)<sup>4</sup>].

For class-room 8.A, the relevant benchmark is the PV of new class-room construction in a year time, or  $R_{2004} 94,400$ , and its relative rehabilitation cost is 1.27 ( $=R_{2004} 120,000 / R_{2004} 94,600$ ). In other words, the rehabilitation of class-room 5.A is 0.58 times cheaper now than building a replacement in 6 years; while the rehabilitation of class-room 8.A is 1.27 times more expensive now than building a replacement in 1 year.

### 3.2.4 Discounted School Priority Index

The second step of rehabilitation prioritization is to look at the priority of the schools in terms of the current infrastructure adequacy and other important factors, described in Section 2.2.2. The need for analysis of the priority of the schools arises due to the fact that provincial schools have uneven distribution of physical assets, and some of the schools are in higher need for additional infrastructure. Thus, in a situation when two schools have the same rehabilitation costs, the one with a higher priority index (PI) should be selected first because it is in more need than the other. Since, the priority index for all schools has been estimated; we can use this index for rehabilitation decisions.

However, the priority index computed for ranking the construction of new class-blocks does not include the condition of the class-rooms, on the presumption that having a damaged class-room is better than having no class-room at all. Now, the rehabilitation priority system should fulfill this role as looking at the condition of the school facilities across the districts. Because the rehabilitation decisions involve comparing inter-temporal situations now and in a distant period, the relevant priority index should be first computed for all schools without one class-room, and then should be discounted back to the base year, in this case year 2004. Table 9 illustrates the estimation of a discounted PI index for all 8 schools in the selected sample.

Table 9 is based on school information and parameters of Table 4 in Section 2.3. In that table, the total number of class-rooms that are currently available is 81. Now, let's remove one class-room from each school in order to see what its priority index would be if one class-room becomes completely unsuitable, i.e. a class-room collapses of natural causes such as damage, flood, soil settlement, or its own age. If each school is

deprived of 1 class-room, then the priority index of each school will increase because the same population of learners will have to share smaller infrastructure territory. It is assumed that all other factors, summarized by the augmenting adjustment, remain constant as in Table 4. The resulting priority index due to the removal of one class-room is estimated in the lower panel of Table 9. For example, school 3 currently has 6 class-rooms and a learner-to-classroom ratio of 92, as shown in Table 4, and if one of the structures collapses then the ratio will rise to 110, which will also entail a change in its priority index.

**Table 9. PV of Future School Priority Index without One Class-room.**

|                                                   |             | S.1         | S.2         | S.3         | S.4         | S.5         | S.6         | S.7         | S.8         | Total     |
|---------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|
| Total Number of Learners                          |             | 280         | 1,000       | 550         | 1,400       | 800         | 450         | 600         | 950         |           |
| Currently Available Classrooms                    |             | 3           | 17          | 6           | 21          | 11          | 6           | 8           | 9           | <b>81</b> |
| Removing 1 Classroom                              |             | 1           | 1           | 1           | 1           | 1           | 1           | 1           | 1           |           |
| Available Classrooms                              |             | 2           | 16          | 5           | 20          | 10          | 5           | 7           | 8           | <b>73</b> |
| Learner-to-Classroom Ratio                        |             | 140         | 63          | 110         | 70          | 80          | 90          | 86          | 119         |           |
| <b>A. Class-blocks Backlog</b>                    | <b>0.70</b> | 1.3         | 2.3         | 2.7         | 5.0         | 2.5         | 2.0         | 2.0         | 3.9         |           |
| <b>B. Learner-to-Classroom Ratio/Target Size</b>  | <b>0.30</b> | 3.5         | 1.6         | 3.1         | 2.0         | 2.0         | 2.6         | 2.1         | 3.0         |           |
| <b>Total Weight of Section</b>                    | <b>1.00</b> |             |             |             |             |             |             |             |             |           |
| Score A:                                          |             | 0.88        | 1.58        | 1.88        | 3.50        | 1.75        | 1.38        | 1.40        | 2.76        |           |
| Score B:                                          |             | 1.05        | 0.47        | 0.94        | 0.60        | 0.60        | 0.77        | 0.64        | 0.89        |           |
| <b>Infrastructure Adequacy Score:</b>             |             | <b>1.93</b> | <b>2.04</b> | <b>2.82</b> | <b>4.10</b> | <b>2.35</b> | <b>2.15</b> | <b>2.04</b> | <b>3.65</b> |           |
| <b>Augmenting Adjustment:</b>                     |             | <b>1.69</b> | <b>1.34</b> | <b>1.45</b> | <b>1.22</b> | <b>1.47</b> | <b>1.16</b> | <b>1.45</b> | <b>1.61</b> |           |
| <b>Current Priority Index w/o 1 Class-room:</b>   |             | <b>3.25</b> | <b>2.74</b> | <b>4.09</b> | <b>5.00</b> | <b>3.45</b> | <b>2.49</b> | <b>2.96</b> | <b>5.87</b> |           |
| <b>PV of Future PI w/o 1 Classroom (1 year):</b>  |             | <b>2.93</b> | <b>2.47</b> | <b>3.68</b> | <b>4.51</b> | <b>3.11</b> | <b>2.24</b> | <b>2.67</b> | <b>5.29</b> |           |
| <b>PV of Future PI w/o 1 Classroom (4 years):</b> |             | <b>2.14</b> | <b>1.80</b> | <b>2.69</b> | <b>3.29</b> | <b>2.28</b> | <b>1.64</b> | <b>1.95</b> | <b>3.87</b> |           |

The computation of school priority index simply simulates what would happen to the priority position of a particular school if one of its class-rooms becomes unusable now. However, our rehabilitation priority system is concerned with the buildings in condition “1” and “2”, which imply a horizon of 1 year and 4 years, respectively. This means that the future school priority index without a class-room should be discounted by 1 year and 4 years, respectively, in order to be comparable to the priority index today.

The relevant discount rate is again the economic opportunity cost of capital for South Africa, estimated as 11.0%. Thus, if school 1 suffers the loss of one class-room in a

year time, the present time equivalent of a 3.25 priority index would be only 2.93.<sup>14</sup> The present-day equivalent of the school priority index in a situation when one classroom becomes unusable after 4 years is, therefore, 2.14.<sup>15</sup> In other words, we place lower importance on the value of index in remote periods.

### 3.2.5 Rehabilitation Priority Index and Ranking

Once the school priority indices without a class-room are discounted to the present year, the analyst can match the costs of rehabilitation with the corresponding discounted school priority index to produce a “rehabilitation priority index”. This index is computed for each class-room and is defined as the PV of the school priority index without a class-room divided by the relative cost of rehabilitation of that particular class-room:

$$\text{Rehabilitation Priority Index}_{\text{Classroom X}}^{\text{School Z}} = \frac{\text{PV of School}^{\text{School Z}} \text{ PI w/o 1 Classroom}}{\text{Relative Rehabilitation Cost}_{\text{Classroom X}}^{\text{School Z}}}$$

This rehabilitation priority index is based on the original school priority index in a situation when a school suffers a marginal loss of one class-room. Then the cost of rehabilitation relative to building a new class-room in a future period enters the picture as the denominator of the formula above, indicating that a higher repair cost will lower the rehabilitation index of a class-room. If the necessary repair works cost more than the construction of a new class-room in the future, then the relative rehabilitation cost is more than unity, and as a result, the rehabilitation priority index become lower. However, if the repairs are cheaper than the replacement of this structure in the future, then the relative rehabilitation cost is below unity, and the class-room’s rehabilitation priority index is enlarged. The index effectively matches the cost aspect of rehabilitation and the need of the school for additional infrastructure.

Table 10 presents the estimation of the rehabilitation priority index and ranking for each of the 18 identified damaged class-rooms across 8 schools. This table is built on the basis of the preceding Table 8 and Table 9. The “costs” panel shows the relative

<sup>14</sup> The discounted PI without 1 class-room for school 1, over 1 year, is estimated as  $3.25 / ([1 + 11.0\%]^1) = 2.93$ .

<sup>15</sup> The discounted PI without 1 class-room for school 1, over 6 years, is estimated as  $3.25 / ([1 + 11.0\%]^4) = 2.14$ .

cost of rehabilitation to the present value of future cost of class-room replacement, as computed in Table 8. The “priority” section is taken directly from Table 9, and shows the resulting PV of the school’s priority index without a damaged class-room discounted to the base year 2004. The last “ranking” panel consists of two items: the rehabilitation priority index and class-room ranking. The rehabilitation priority index is obtained as the PV of the school’s priority index without a class-room divided by the relative rehabilitation cost.

**Table 10. Rehabilitation Priority Index and Ranking.**

| LOCATION |           | COSTS     |                                      |                                   | PRIORITY                   |                                 | RANKING              |               |
|----------|-----------|-----------|--------------------------------------|-----------------------------------|----------------------------|---------------------------------|----------------------|---------------|
| School   |           | Condition | Rehab Cost (R <sub>2004</sub> '000s) | Rehab Cost / PV of New Class Cost | Current PI w/o 1 Classroom | PV of Future PI w/o 1 Classroom | Rehab Priority Index | Rehab Ranking |
| School 2 | Class 2.A | 1         | 100                                  | 1.06                              | 2.74                       | 2.47                            | 2.33                 | 18            |
|          | Class 2.B | 1         | 80                                   | 0.85                              | 2.74                       | 2.47                            | 2.92                 | 14            |
|          | Class 2.C | 2         | 40                                   | 0.58                              | 2.74                       | 1.80                            | 3.12                 | 13            |
|          | Class 2.D | 2         | 50                                   | 0.72                              | 2.74                       | 1.80                            | 2.50                 | 16            |
|          | Class 2.E | 1         | 95                                   | 1.00                              | 2.74                       | 2.47                            | 2.46                 | 17            |
| School 3 | Class 3.A | 2         | 35                                   | 0.51                              | 4.09                       | 2.69                            | 5.32                 | 2             |
| School 4 | Class 4.A | 1         | 100                                  | 1.06                              | 5.00                       | 4.51                            | 4.26                 | 7             |
|          | Class 4.B | 2         | 45                                   | 0.65                              | 5.00                       | 3.29                            | 5.06                 | 3             |
|          | Class 4.C | 2         | 60                                   | 0.87                              | 5.00                       | 3.29                            | 3.80                 | 11            |
|          | Class 4.D | 1         | 95                                   | 1.00                              | 5.00                       | 4.51                            | 4.49                 | 6             |
|          | Class 4.E | 1         | 85                                   | 0.90                              | 5.00                       | 4.51                            | 5.01                 | 4             |
|          | Class 4.F | 1         | 90                                   | 0.95                              | 5.00                       | 4.51                            | 4.74                 | 5             |
|          | Class 4.G | 1         | 110                                  | 1.16                              | 5.00                       | 4.51                            | 3.88                 | 10            |
| School 5 | Class 5.A | 2         | 40                                   | 0.58                              | 3.45                       | 2.28                            | 3.93                 | 9             |
|          | Class 5.B | 1         | 90                                   | 0.95                              | 3.45                       | 3.11                            | 3.27                 | 12            |
| School 7 | Class 7.A | 2         | 50                                   | 0.72                              | 2.96                       | 1.95                            | 2.70                 | 15            |
| School 8 | Class 8.A | 1         | 120                                  | 1.27                              | 5.87                       | 5.29                            | 4.17                 | 8             |
|          | Class 8.B | 2         | 45                                   | 0.65                              | 5.87                       | 3.87                            | 5.94                 | 1             |

For example, class-room 2.A is in a critical condition “1” and to remain functional, it requires an immediate expense of R 100,000 otherwise this class-room will become totally useless in 1 year. Thus, because the PV of the replacement in 1 year is only R 94,600, Table 8 suggests that the relative rehabilitation cost of this class-room now is 1.06 times of the PV of its replacement cost in the future. At the same time, if school 2 (to which this class-room belongs) suffers a loss of this or any other class-room then its current priority index would rise to 2.74. However, because this particular class-room without any repair is expected, on the average, to serve additional 1 year, this school PI

should be discounted back to reflect its lower importance in the future. Thus, Table 9 shows that the 2.74 school priority index in a year time will be equivalent to only 2.47 in its present-day value. Then, the rehabilitation priority index for class-room 2.A is now estimated as the PV of the future school PI without a class-room divided by the relative rehabilitation cost:

$$\text{Rehabilitation Priority Index}_{\text{Classroom A}}^{\text{School 2}} = \frac{2.47}{1.06} = 2.33$$

The resulting index is then ranked from the highest to the lowest value. The class-rooms ranking at the top indicate the highest need relative to cost of repair. Hence, class-block 2.A is ranked 18<sup>th</sup> due to its relatively high cost of rehabilitation and relatively modest school priority, as described by its school's PI value. Class-rooms with low rehabilitation costs and located in high priority schools are ranked at the top of the listing. Particularly, class-room 8.B is ranked first due to its location in a school lacking infrastructure.

### 3.3 Budget Allocation using Rehabilitation Priority Index

The rehabilitation index and ranking of sites gives the decision-makers ability to allocate the rehabilitation budget in the most efficient manner. The top positions of the rehabilitation ranking are occupied by class-rooms that are both relatively cheaper to repair and being located in schools with the highest need for additional infrastructure. ***The allocation rule is to start funding the schools at the top of the rehabilitation ranking ladder and then to continue spending as long as the budget size allows.***

Assume that the total rehabilitation budget available for the current year is R 350,000 and the schools having damaged class-rooms are limited to the eight schools in our example. Then, the allocation rule would spend the funds in the order of the rehabilitation ranking up to a point when the budget is exhausted. Table 11 illustrates this process. With a fixed budget of R 300,000, school 8 should be financed to have its class-room 8.B to be rehabilitated at cost of R 45,000. Then, School 4 will have three of its class-rooms (4.B, 4.E and 4.F) repaired at a total cost of R 220,000. Finally school 3 should be given funding for repair of class-room 3.A with a cost of R 35,000. This

combination exhausts the budget available and maximizes the efficiency of rehabilitation spending.

**Table 10. Allocation of Rehabilitation Budget Funds.**

| <b>Rank</b>                 | <b>Location</b> | <b>Rehab Cost<br/>(R '000s)</b> | <b>School<br/>2</b> | <b>School<br/>3</b> | <b>School<br/>4</b> | <b>School<br/>5</b> | <b>School<br/>7</b> | <b>School<br/>8</b> | <b>Cumulative<br/>Cost<br/>(R '000s)</b> |
|-----------------------------|-----------------|---------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------------------------------------|
| 1                           | Class 8.B       | 45                              | -                   | -                   | -                   | -                   | -                   | 45                  | 45                                       |
| 2                           | Class 3.A       | 35                              | -                   | 35                  | -                   | -                   | -                   | -                   | 80                                       |
| 3                           | Class 4.B       | 45                              | -                   | -                   | 45                  | -                   | -                   | -                   | 125                                      |
| 4                           | Class 4.E       | 85                              | -                   | -                   | 85                  | -                   | -                   | -                   | 210                                      |
| 5                           | Class 4.F       | 90                              | -                   | -                   | 90                  | -                   | -                   | -                   | 300                                      |
| 6                           | Class 4.D       | 95                              | -                   | -                   | 95                  | -                   | -                   | -                   | 395                                      |
| 7                           | Class 4.A       | 100                             | -                   | -                   | 100                 | -                   | -                   | -                   | 495                                      |
| 8                           | Class 8.A       | 120                             | -                   | -                   | -                   | -                   | -                   | 120                 | 615                                      |
| 9                           | Class 5.A       | 40                              | -                   | -                   | -                   | 40                  | -                   | -                   | 655                                      |
| 10                          | Class 4.G       | 110                             | -                   | -                   | 110                 | -                   | -                   | -                   | 765                                      |
| 11                          | Class 4.C       | 60                              | -                   | -                   | 60                  | -                   | -                   | -                   | 825                                      |
| 12                          | Class 5.B       | 90                              | -                   | -                   | -                   | 90                  | -                   | -                   | 915                                      |
| 13                          | Class 2.C       | 40                              | 40                  | -                   | -                   | -                   | -                   | -                   | 955                                      |
| 14                          | Class 2.B       | 80                              | 80                  | -                   | -                   | -                   | -                   | -                   | 1,035                                    |
| 15                          | Class 7.A       | 50                              | -                   | -                   | -                   | -                   | 50                  | -                   | 1,085                                    |
| 16                          | Class 2.D       | 50                              | 50                  | -                   | -                   | -                   | -                   | -                   | 1,135                                    |
| 17                          | Class 2.E       | 95                              | 95                  | -                   | -                   | -                   | -                   | -                   | 1,230                                    |
| 18                          | Class 2.A       | 100                             | 100                 | -                   | -                   | -                   | -                   | -                   | 1,330                                    |
| <b>Total Cost (R '000s)</b> |                 | <b>1,330</b>                    | <b>365</b>          | <b>35</b>           | <b>585</b>          | <b>130</b>          | <b>50</b>           | <b>165</b>          |                                          |

In a situation when more funds become available for rehabilitation, the allocation rule would work in exactly the same way, by financing the top ranking rehabilitation in first place. In fact, if there were enough funds to finance all damaged buildings, the maximum budget would be R 1.33 million. That would cover all rehabilitation needs for 18 identified damaged class-rooms across 8 schools in the sample.

## Chapter 4. Conclusion

The existing system for identification of the demand for additional school infrastructure and renovation is not functioning properly. ***It is important to re-assess the existing management practices at the provincial and district levels, in order to devise a new management information system.***

***An integral part of the new management information system should be a computerized database on all 4,900 provincial schools.*** This database should provide the decision-makers with regularly updated information on many educational aspects, as well as on the physical condition of the school facilities.

A weighted cost-effectiveness approach, also called cost-utility analysis, can be employed for the capital project selection at the Department of Education. ***The task is to maximize the overall effectiveness of public expenditure on school infrastructure within a given amount of budget.*** The efficiency is to be measured a weighted “priority index” (PI) which can be setup to include all the important factors affecting the project selection.

***The index can include as many factors as the decision-makers need to cover in the allocation of funds across provincial schools in the six districts.*** Infrastructure adequacy is the most crucial set of factors indicating the need for additional school infrastructure. There are two aspects of infrastructure adequacy: class-block backlog and the learner-to-classroom ratio. In addition to looking after the infrastructure adequacy, the decision-making process currently considers a host of factors that aid the project selection. These factors could be grouped into three categories: type of school, presence of support facilities, location of the school, and development priority factors.

***The right approach is to the allocation is to award each additional class-block to the school ranking first in terms of the priority index.*** Then the overall effectiveness of budget spending is maximized when the funds are forwarded to schools with the highest ranking. Because each additional building will alter the current priority index and ranking of schools, the ranking must be recalculated after each new addition of

class-rooms or support facilities, or changes in the type of school or in the development priority factors.

In a situation of severe shortage of budget funds and huge need for rehabilitation, a system of prioritization should be in place to ensure the most efficient allocation of the public funds. The rehabilitation index and ranking of sites gives the decision-makers ability to allocate the rehabilitation budget in the most efficient manner. The top positions of the rehabilitation ranking are occupied by class-rooms that are both relatively cheaper to repair and being located in schools with the highest need for additional infrastructure. ***The allocation rule is to start funding the schools at the top of the rehabilitation ranking ladder and then to continue spending as long as the budget size allows.***

The methodology outlined in this Handbook together with a reliable information system, which the Department is currently developing, can be used to ensure that the funds are allocated to the provincial schools, new and old, in an economically and socially efficient manner.

## **Annex A. Analytical Framework**

### **A.1 The Approach**

Capital expenditure evaluation is often presented only in the framework of cost-benefit analysis where all benefits and costs are expressed in terms of monetary values. However, many projects undertaken by the government's departments have a common feature: the monetary value of the benefits are unknown to the project analyst. This happens mainly because the benefits are difficult to quantify and monetize, for example, the enhancement of school education, or improvement in healthcare.

At the same time, for many budget expenditures in such as national defense, healthcare, education, security and justice administration, road and infrastructure maintenance, it may not be feasible to carry out a full cost-benefit analysis for each individual project. A quicker and more efficient method is often employed to avoid the quantification and monetizing of all economic benefits. Cost-effectiveness analysis (CEA) is frequently employed in such situations. CEA is much simpler but still capable of capturing the most important benefits and is a reasonable basis for making effective decisions.

The task of allocation of a department's budget among various activities is another use of the CEA. Once the spending priorities are defined, the scarce budget funds can be allocated among projects based on the CEA technique. Projects with a lower priority and smaller positive outcome are effectively shifted to the next budget period, where another comparative evaluation will take place.

### **A.2 Cost-Effectiveness Analysis vs. Cost-Utility Analysis**

A pure cost-effectiveness analysis looks at a single quantified, but not monetized, effectiveness measure of the cost per unit. For example, the cost in Rand of building a standard class-block that will alleviate some of the backlog for a particular rural school. An investment into a school with a higher level of need, as measured by the number of learners per class-room, is more preferable to building the same class-block where the

school can still manage with the existing infrastructure. In this example, the CEA only cares about the reduction of the learner-to-classroom ratio, excluding all other factors.

Cost-utility analysis (CUA) also measures costs per benefit effectiveness but the benefit measure is a composite index made up of two or more categories, including quantity and quality. For example, the cost-utility analysis in the case of capital project selection for education would not only consider the learner-to-classroom ratio but also the physical condition of the existing facilities, community factors, priorities and so on. While it would be impractical to employ a full-scale cost-benefit analysis for construction of additional class-rooms in a rural school, the CUA could still incorporate the important factors. Hence, cost-utility analysis is a step closer to the cost-benefit analysis than is cost-effectiveness analysis. CUA, in fact, attempts to include several of the benefits excluded from cost effectiveness analysis.

#### **A.2.1 Estimation of Effectiveness-to-Cost Ratio**

The cost-effectiveness analysis first computes cost-effectiveness ratios of different alternatives, and then compares the resulting ratios so that the most efficient option is chosen. In a sense, CEA ensures technical efficiency when achieving the desired outcome. The ratios measure only one aspect of benefit(s) resulting from a project, and the whole host of social impacts is not included in the evaluation.

##### **Effectiveness-to-Cost Ratio**

The approach most suitable for prioritization of the allocation of school-blocks among alternative areas is to measure the effectiveness ( $E_i$ ) in terms of its cost ( $C_i$ ). This EC ratio could be thought of as the average effectiveness per unit of cost:

$$EC_i = \frac{E_i}{C_i}$$

Once the benefits and costs are defined, the procedure of ranking alternative projects would simply choose the alternatives with the highest ratios. For example, the allocation of additional class-blocks to the schools, as the class-block is standardized with a fixed construction cost ( $C_i$ ). Hence, the capital budget effectiveness would be increased if the spending is channeled to schools with the highest value of ( $E_i$ ). In the context of this handbook, ( $E_i$ ) is the priority index calculated for every school. The

index itself is a composite measure of effectiveness in terms of achieving multiple objectives in provision of school infrastructure. This index is, in fact, a utility indicator discussed in Section A.3.

### **Costs Assessment**

The preceding sections have focused on the computation of ratios. While computing cost-effectiveness ratio for a particular project, an attention should be paid to the treatment of costs, which may include not only financial but also social costs.<sup>16</sup> In the education sector, the enhancement of primary schooling is sometimes viewed in terms of the additional number of class-blocks and improvement of their physical condition. But any large-scale program aiming at the development of school systems must take into account not only the infrastructure costs but also the cost of additional teaching personnel to staff the schools, teaching materials, as well as regular maintenance costs.

Generally, different types of projects often have some of the costs in non-monetary terms, such as waiting time, coping costs, enforcement costs, regulatory costs, compliance costs, etc. The economic cost-effectiveness analysis carried out for such projects must account for all costs, and should also be based on the economic instead of financial prices of goods and services.

### **Discounting**

Many capital projects have large investment costs at the beginning and then their benefits are spread over many years. Hence, the benefits in distant years have to be discounted back to the present time in order to make an evaluation of alternatives. Because cost-effectiveness analysis does not place a monetary value on the benefits, the project analyst has to discount the quantity of the effectiveness measure itself. In other words, both the costs and units of effectiveness should be discounted by the same rate.<sup>17</sup> The only addition to what has been discussed in previous sections is that the costs and effectiveness are now being discounted:

$$CE_i = \frac{PV \text{ of Costs}_i}{PV \text{ of Effectiveness}_i}$$

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<sup>16</sup> Boardman, A.E., Greenberg, D.H, Vining, A.R., and Weimer, D.L., *Cost-Benefit Analysis: Concepts and Practice*, 2nd Ed., Prentice Hall, (2001), p. 439.

<sup>17</sup> Ibid., p. 404.

The question of what is the appropriate discount rate to use is often raised. For example, proponents of health and education projects have argued for low rate of discount to be used when comparing alternative projects.<sup>18</sup> However, there is no sound economic reason to use any discount rate other than the economic opportunity cost of funds, which in the case of South Africa is a real rate of 11.0 percent.<sup>19</sup>

### A.3 Cost-Utility Analysis

The estimation of benefit in CEA, as has been illustrated, is limited to a single measure of effectiveness. Often, this simplification is not acceptable and, instead, a cost utility analysis is employed. In principle, CUA could be used with multiple outcomes but as the number of dimensions grows, the complexity of analysis also increases. This approach is practically employed in the allocation of new school-blocks as there are a number of different factors that are taken into consideration during the selection process.

Cost-utility analysis forces the analyst to compile a composite index of outcomes, i.e., utility level as a measure of benefits. Each type of benefit ( $B_j$ ) would be assigned its relative importance, or weight ( $w_j$ ), in the utility:

$$CU_i = \frac{C_i}{\left( \sum_{j=1}^n (B_j * w_j) \right)_i}$$

In the construction of a weighted effectiveness index, the most delicate task is the assignment of relative weights, indicating the importance of a particular outcome compared to all other benefits in the utility. If a particular case that analyst is dealing with seems to have controversial interpretations, then the analyst should refer to opinions of experts, policymakers' preferences, and community views. These

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<sup>18</sup> The theoretical arguments have been developed by Harberger, A.C., "On Measuring the Social Opportunity Cost of Public Funds", in *Project Evaluation – Collected Papers*, (Chicago: the University of Chicago, 1972); Sandmo, H. and Dreze, J.H., "Discount Rates for Public Investment in Closed and Open Economies", *Economica*, (November 1971); and Sjaastad, L.A. and Wisecarver, D.L., "The Social Cost of Public Fund", *Journal of Political Economy*, (June 1977).

<sup>19</sup> "Integrated Investment Appraisal: Concepts and Practice", *Appendix A: The Economic Cost of Capital for South Africa*, pp. 457-470.

subjective opinions are still a better indicator of what is the relative importance is for each of the outcomes from a project.

Note that the significance of weights is to rank the different outcomes relative to each other, using the same scale of measurement. It is not even necessary that the sum of all weights is equal to one  $\left( \sum_{j=1}^n w_j \right)$ , as long as the scale used across the different types of benefits is identical. Once the metric is chosen and outcomes are ranked relative to each other, then the cost utility analysis becomes very similar to cost effectiveness analysis. Likewise, the analyst can use both cost-utility ratios, utility-to-cost ratios as well as marginal ratios.

Cost utility analysis is a frequently employed by policymakers in health, education, defense, security, and many other sectors. A typical case when CUA is a necessity is when a set of alternative policy actions must be evaluated, each resulting in multiple outcomes.

### **A.3.1 CUA in Improvement of School Learning**

An application of cost utility analysis in education could be presented with the help of following example.<sup>20</sup> Suppose, there are two alternative methods of improving students learning: better-qualified teachers (A) and smaller class sizes (B). Both methods lead to improvement in mathematical skills, reading and world knowledge, as measured by percentile score achievements in each field. But the effectiveness of the two alternative methods is not the same across the three fields, and there is a consensus that for the target group of pupils, improvement of reading skills is more important than mathematics, and world knowledge. At the same time, mathematical skills are more important than world knowledge. If ranked on the same scale of maximum 10 points, these preferences could be expressed by weights of 9, 7, and 6 for reading, mathematics and world knowledge, respectively.

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<sup>20</sup> The following example is adopted from Belli, P., Anderson, J.R., Barnum, H.N., Dixon, J.A., and Tan, J.P., "Economic Analysis of Investment Operations: Analytical Tools and Practical Applications", The World Bank, Washington D.C., (2001), p. 79.

Table A-1 shows the expected test scores by subject under each alternative method of improvement. The weighted score represents the utility index, and it is computed as a sum of scores by subject times their respective weights.<sup>21</sup> If the per pupil costs of method A and method B are R 95 and R 105 per year, then it is possible to find utility-cost ratios and cost-to-utility ratios.

Obviously, method B is a better policy to improve student learning, because it results in lower cost per unit of utility, or higher test scores per Rand. Note that the choice of project may change if the ranking of outcomes is altered, which will immediately entail a corresponding adjustment in the utility indices.

**Table A-1. CUA in Improvement of School Learning.**

|                | Test Scores by Subject |          |                 | Weighted Score       | Cost (Rand per Pupil) | UC Ratio            | CU Ratio | Ranking |
|----------------|------------------------|----------|-----------------|----------------------|-----------------------|---------------------|----------|---------|
|                | Mathematics            | Reading  | World Knowledge |                      |                       |                     |          |         |
| <b>Weights</b> | <b>7</b>               | <b>9</b> | <b>6</b>        |                      |                       |                     |          |         |
| Method A       | 75                     | 40       | 55              | 1,215 <sup>(a)</sup> | 95                    | 12.8 <sup>(c)</sup> | 0.078    | 2       |
| Method B       | 60                     | 65       | 65              | 1,395 <sup>(b)</sup> | 105                   | 13.3 <sup>(d)</sup> | 0.075    | 1       |

Notes: (a) Computed as:  $7*75 + 9*40 + 6*55 = 1,215$

(b)  $7*60 + 9*65 + 6*65 = 1,395$

(c)  $1,215 / 95 = 12.8$

(d)  $1,395 / 105 = 13.3$

### A.3.2 Alternatives with Subjective Outcomes

Sometimes the analyst may come across a case when no quantitative estimates of the relationship between the policy intervention and resulting benefits exist. It is obvious that alternative policies will do some good but no quantitative data is available. Using the previous example focused on improvement of student learning in mathematics, reading and world knowledge, let's now presume that no test score data is available to the policy makers. What is available now is subjective opinion(s) of the education experts in regard to probability of raising the test score in each subject by a grade point. Table A-2 states the summary of the experts' opinions expressed in probability terms.

<sup>21</sup> For instance, the weighted score of method A is calculated as  $(\sum \text{score}_i * \text{weight}_i) = 75*7 + 40*9 + 55*6 = 1,215$ .

For instance, the probability the better-qualified teachers (A) will result in one-point increase in test scores in mathematics is 45%, in reading is 50%, and in world knowledge is 55%. The fixed cost of method A is expected to be R 95 per pupil. At the same time, the probability that smaller class sizes (B) will raise test scores by a point is 30% in mathematics, is 65% in reading, and 45% in world knowledge. Both methods contribute to the learning process, but which is more effective?

**Table A-2. CUA in Improvement of School Learning with Subjective Outcomes.**

|                | Test Scores by Subject |          |                 | Weighted Score       | Cost (Rand per Pupil) | UC Ratio            | CU Ratio | Ranking |
|----------------|------------------------|----------|-----------------|----------------------|-----------------------|---------------------|----------|---------|
|                | Mathematics            | Reading  | World Knowledge |                      |                       |                     |          |         |
| <b>Weights</b> | <b>7</b>               | <b>9</b> | <b>6</b>        |                      |                       |                     |          |         |
| Method A       | 45%                    | 50%      | 55%             | 10.95 <sup>(a)</sup> | 95                    | 0.12 <sup>(c)</sup> | 8.676    | 1       |
| Method B       | 30%                    | 65%      | 45%             | 10.65 <sup>(b)</sup> | 105                   | 0.10 <sup>(d)</sup> | 9.859    | 2       |

Notes: (a) Computed as:  $7*45\% + 9*50\% + 6*55\% = 10.95$

(b)  $7*30\% + 9*65\% + 6*45\% = 10.65$

(c)  $10.95 / 95 = 0.12$

(d)  $10.65 / 105 = 0.10$

If the policy preferences have not changed, then the weights will be the same as in the previous example: reading skills are ranked 9 out of 10, mathematical skills are graded 7 out of 10, and world knowledge is assigned a weight of 6 out of 10. Using the weights, method A appears to generate more units of utility, as measured by weighted score of 10.95 versus 10.65 resulting from method B.<sup>22</sup> Given the costs of each intervention, utility-cost and cost-utility ratios are computed. Method A is more cost-effective because it contributes more to the overall scores per Rand of spending.

## A.4 Applicability of the Method

In a situation when only quantitative data on project outcomes is available and it is neither possible nor feasible to translate the quantitative data into monetary values, cost-effectiveness and cost-utility analysis represent a practical way of carrying out the assessment. When, in addition to that, only one aspect of project benefits matters, cost-

effectiveness analysis offers a handy tool for selection of alternatives. CEA does not include any subjective judgments and it measures technical efficiency.

Cost-utility analysis is used when multiple benefits have to be included into assessment. The main advantage of CUA is that it can deal with evaluation of a whole host of benefits without requiring actual data. Both cost-effectiveness and cost-utility analysis offer very practical methods of selection among alternatives.

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<sup>22</sup> The weighted score of method A is computed as  $45\%*7+50\%*9+55\%*6 = 10.95$ .

## **Annex B. Application of Priority Index to Prioritarization of Selected Schools in Limpopo Province**

### **B.1 Introduction**

This annex contains a practical application of the prioritization model developed for the allocation of new class-blocks and rehabilitation decisions for the existing stock of class-rooms. Sections from B.2 through B.5 are devoted to estimation of the school priority index for some 40 selected provincial schools in order to rank them in terms of their needs for additional infrastructure. Section B.6 continues with the same sample of 40 schools and estimates the rehabilitation index and ranking of damaged class-rooms located in some schools.

The text of this annex is accompanied by a CD-ROM containing the spreadsheet actual computations. The spreadsheet is built on the dataset of the education management information system currently used by the Department of Education.<sup>23</sup> *The purpose of this annex and the spreadsheet is not to develop an additional stand-alone system for the Department but to illustrate the concept of the priority index and show in detail how it can be estimated and used for budget allocation.* It is believed that the Department should have a single MIS system in the future that would combine both the existing database functionality and a built-in module to estimate a priority index and school ranking for infrastructure allocation decisions.

### **B.2 Parameters and Data**

#### **B.2.1 Available Information**

Table B-1 presents an extract from the current EMIS database used by the Department and compiled from the School Annual Survey 2004 filed by the schools' principals. The survey goes into substantial degree of detail of many educational aspects using a

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<sup>23</sup> Chapter 15 of the EMIS database contains all relevant infrastructure information.

set of quantitative and qualitative norms and standards defined by the National Department of Education. A specific section is devoted to the school infrastructure. Schools are identified by a unique EMIS number, and their names (field 11) and location in terms of district (field 111) and regional (field 110) placement are stated in general information section of the EMIS. The total enrollment at school is summarized in field 123. Section 15 contains all infrastructure-related information.

**Number of Class-rooms (field 15231).** The survey differentiates between three types of class-rooms: permanent; prefabs (which also include mobile classes); and all other (located outside of school premises).

**Condition of Infrastructure Facilities.** The condition of the following facilities are reported: fences (field 154); class-rooms (field 15121); staff rooms (field 15122); offices (field 15123); laboratory (field 15124); library (field 15125); and toilets (field 156). The scale of condition is such that “1” corresponds to critical “unsuitable for education” condition; “2” refers to “weak, requiring attention” state; “3” means that “painting and minor repair” is needed; “4” is good condition; “5” is a new structure; and “6” is currently being renovated. It should be noted that the condition reporting is not done for each building/structure but rather as a general characteristics of the facilities in question. Thus, it would be wrong to assume that a school reporting the condition of its classrooms as “1” would necessarily have all class-rooms being in that critical condition. For instance, Malegale Primary School (#925660495) has 26 class-rooms and reports in field 15121 a condition of “1”. This, most probably, means that the most severely damaged building(s) in this school has/have the rating of “1”, while other damaged buildings might be in a better condition.

**Electricity Supply.** Field 1513 tells about the status of power supply at a school. Value of “1” means that the school is “wired and supplied by ESKOM”; “2” implies that power is “self-generated using generators”; “3” refers to “solar panels”; and “4” corresponds to no power supply.

**Table B-1. Infrastructure Conditions for 40 Selected Provincial Schools.**

| Emis Number          | School Name Field11         | Regions Field110 | Districts Field111 | Urban / Rural | Primary / Secondary | Enrolment Field123 | Perm Classrooms Field15231 | Prefabs Field15231 | Other Rooms Field15231 | Fence Condition Field154 | Classrooms Condition Field15121 | Staffrooms Condition Field15122 | Offices Condition Field15123 | Laboratory Condition Field15124 | Library Condition Field15125 | Toilets Condition Field15126 | Store Room Condition Field15127 | Electricity Field1513 | Water Field1514 | Sanitation-Flush Field15151 | Sanitation-Septic Tank Field15152 | Sanitation-Ventilated Pit Field15153 | Sanitation-Pit Field15154 | Sanitation-Bucket Field15155 | Sanitation-None Field15156 |
|----------------------|-----------------------------|------------------|--------------------|---------------|---------------------|--------------------|----------------------------|--------------------|------------------------|--------------------------|---------------------------------|---------------------------------|------------------------------|---------------------------------|------------------------------|------------------------------|---------------------------------|-----------------------|-----------------|-----------------------------|-----------------------------------|--------------------------------------|---------------------------|------------------------------|----------------------------|
| 901340425            | Motsheudi Sec.              | Northern         | Sekgoses           | R             | S                   | 1,013              | 12                         | 0                  | 1                      | 2                        | 2                               | 5                               | 0                            | 0                               | 0                            | 5                            | 0                               | 1                     | 2               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 0                          |
| 901420031            | Bollanto Pri.               | North Eastern    | Phalaborwa         | R             | P                   | 361                | 12                         | 0                  | 1                      | 1                        | 3                               | 3                               | 3                            | 0                               | 0                            | 3                            | 3                               | 1                     | 3               | 0                           | 1                                 | 0                                    | 1                         | 0                            | 0                          |
| 904220101            | Capricorn High              | Central          | Polokwane          | R             | P                   | 921                | 26                         | 0                  | 14                     | 1                        | 4                               | 4                               | 4                            | 4                               | 4                            | 4                            | 4                               | 1                     | 1               | 1                           | 2                                 | 2                                    | 2                         | 2                            | 2                          |
| 904220415            | Laerskool Pietersburg Noord | Central          | Polokwane          | U             | S                   | 689                | 25                         | 2                  | 2                      | 2                        | 2                               | 2                               | 2                            | 2                               | 2                            | 1                            | 1                               | 1                     | 1               | 1                           | 1                                 | 0                                    | 0                         | 0                            | 0                          |
| 904221326            | Pietersburg E M Pri.        | Central          | Polokwane          | U             | S                   | 1,039              | 24                         | 5                  | 4                      | 1                        | 4                               | 4                               | 4                            | 4                               | 4                            | 4                            | 4                               | 1                     | 1               | 1                           | 2                                 | 2                                    | 2                         | 2                            | 2                          |
| 907130642            | Lekkerbreek Pri.            | Western          | Warmbaths          | U             | P                   | 409                | 4                          | 0                  | 0                      | 0                        | 3                               | 0                               | 3                            | 0                               | 0                            | 1                            | 0                               | 4                     | 6               | 0                           | 0                                 | 0                                    | 0                         | 0                            | 0                          |
| 911360252            | Matiyani Pri.               | Northern         | Malamulele         | R             | P                   | 940                | 10                         | 0                  | 0                      | 1                        | 2                               | 4                               | 1                            | 0                               | 0                            | 2                            | 1                               | 1                     | 1               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 914450056            | Bhejani Pri.                | Bushbuckridge    | Mkhuhlu            | R             | S                   | 1,355              | 18                         | 0                  | 0                      | 2                        | 2                               | 2                               | 1                            | 0                               | 0                            | 1                            | 1                               | 4                     | 2               | 2                           | 2                                 | 1                                    | 1                         | 2                            | 2                          |
| 915530341            | Vasasele Sec.               | Eastern          | Ritavi             | R             | S                   | 967                | 15                         | 0                  | 0                      | 1                        | 4                               | 0                               | 0                            | 0                               | 0                            | 3                            | 0                               | 0                     | 2               | 1                           | 0                                 | 0                                    | 0                         | 0                            | 0                          |
| 917420703            | Shiphamele Pri.             | North Eastern    | Phalaborwa         | R             | S                   | 1,155              | 17                         | 0                  | 0                      | 2                        | 3                               | 3                               | 3                            | 0                               | 0                            | 3                            | 3                               | 1                     | 6               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 918510651            | Modubatse Sec.              | Eastern          | Bolobedu           | R             | P                   | 1,482              | 18                         | 0                  | 0                      | 2                        | 4                               | 0                               | 0                            | 0                               | 0                            | 3                            | 0                               | 1                     | 2               | 1                           | 2                                 | 2                                    | 2                         | 2                            | 2                          |
| 918510699            | Mokope Senior Sec.          | Eastern          | Bolobedu           | U             | P                   | 789                | 11                         | 0                  | 0                      | 1                        | 4                               | 4                               | 4                            | 0                               | 0                            | 2                            | 4                               | 1                     | 2               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 918511029            | Metsi A- Phepha Pri.        | Eastern          | Bolobedu           | U             | S                   | 375                | 3                          | 0                  | 0                      | 2                        | 2                               | 2                               | 2                            | 0                               | 2                            | 2                            | 0                               | 1                     | 2               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 918511463            | Tlhapedi Pri.               | Eastern          | Bolobedu           | R             | P                   | 991                | 11                         | 0                  | 0                      | 1                        | 5                               | 0                               | 1                            | 0                               | 0                            | 4                            | 0                               | 1                     | 6               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 920211725            | Selaelo Pri.                | Central          | Bochum             | R             | P                   | 248                | 3                          | 0                  | 0                      | 1                        | 5                               | 0                               | 0                            | 0                               | 0                            | 0                            | 0                               | 4                     | 2               | 0                           | 0                                 | 1                                    | 0                         | 0                            | 0                          |
| 922220873            | Mmanare Sec.                | Central          | Polokwane          | R             | S                   | 727                | 12                         | 0                  | 3                      | 1                        | 2                               | 2                               | 2                            | 2                               | 2                            | 1                            | 0                               | 1                     | 0               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 922221135            | Napo Pri.                   | Central          | Polokwane          | R             | P                   | 509                | 5                          | 0                  | 0                      | 1                        | 5                               | 0                               | 0                            | 0                               | 0                            | 5                            | 0                               | 1                     | 6               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 923240419            | Makgalapane Pri.            | Central          | Mankweng           | R             | S                   | 251                | 4                          | 0                  | 0                      | 2                        | 1                               | 1                               | 1                            | 0                               | 0                            | 2                            | 1                               | 3                     | 4               | 2                           | 2                                 | 2                                    | 2                         | 2                            | 2                          |
| 923241054            | Mountainview Sernior Sec.   | Central          | Mankweng           | R             | P                   | 996                | 12                         | 3                  | 0                      | 2                        | 3                               | 0                               | 0                            | 0                               | 0                            | 2                            | 0                               | 1                     | 2               | 1                           | 0                                 | 0                                    | 0                         | 0                            | 0                          |
| 923260628            | Mamaolo Pri.                | Central          | Mogodumo           | R             | S                   | 1,050              | 18                         | 0                  | 0                      | 0                        | 5                               | 1                               | 1                            | 0                               | 0                            | 5                            | 3                               | 1                     | 2               | 0                           | 0                                 | 0                                    | 0                         | 0                            | 0                          |
| 924650115            | Mamphokgo Pri.              | Southern         | Dennilton          | R             | P                   | 1,084              | 13                         | 0                  | 0                      | 2                        | 4                               | 0                               | 0                            | 0                               | 0                            | 1                            | 0                               | 0                     | 1               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 924651262            | Phokanoka High              | Southern         | Dennilton          | R             | P                   | 952                | 15                         | 2                  | 0                      | 3                        | 2                               | 3                               | 3                            | 0                               | 0                            | 1                            | 0                               | 0                     | 7               | 2                           | 2                                 | 2                                    | 2                         | 2                            | 2                          |
| 924661528            | Ngwanamatlang Sec.          | Southern         | Sekhukhune         | R             | S                   | 805                | 7                          | 0                  | 1                      | 1                        | 4                               | 4                               | 0                            | 0                               | 0                            | 0                            | 1                               | 1                     | 1               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 925630685            | Tshililo Sec.               | Southern         | Magakala           | R             | P                   | 347                | 3                          | 0                  | 0                      | 2                        | 1                               | 0                               | 0                            | 0                               | 0                            | 1                            | 0                               | 4                     | 4               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 925660495            | Malegale Pri.               | Southern         | Sekhukhune         | R             | S                   | 1,542              | 26                         | 0                  | 0                      | 1                        | 1                               | 0                               | 0                            | 0                               | 0                            | 4                            | 0                               | 4                     | 4               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 1                          |
| 925661160            | Sebase Sec.                 | Southern         | Sekhukhune         | R             | P                   | 458                | 8                          | 0                  | 1                      | 2                        | 1                               | 5                               | 5                            | 5                               | 5                            | 1                            | 1                               | 1                     | 6               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 1                          |
| 925661245            | Serageng Pri.               | Southern         | Sekhukhune         | R             | P                   | 309                | 3                          | 0                  | 0                      | 1                        | 2                               | 0                               | 0                            | 0                               | 0                            | 1                            | 0                               | 3                     | 3               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 1                          |
| 926540379            | Rakgolokwana Sec.           | Eastern          | Thabina            | R             | P                   | 1,136              | 16                         | 0                  | 0                      | 1                        | 2                               | 5                               | 5                            | 5                               | 5                            | 2                            | 5                               | 1                     | 2               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 926540683            | Lorraine Banareng Pri.      | Eastern          | Thabina            | R             | S                   | 1,224              | 12                         | 0                  | 0                      | 2                        | 1                               | 0                               | 1                            | 0                               | 0                            | 2                            | 1                               | 1                     | 2               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 927430229            | Hloala Chiloane Pri.        | Bushbuckridge    | Acornhoek          | R             | P                   | 604                | 6                          | 0                  | 0                      | 3                        | 1                               | 1                               | 1                            | 1                               | 1                            | 1                            | 1                               | 4                     | 6               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 927451004            | Tamajane Senior Sec.        | Bushbuckridge    | Mkhuhlu            | R             | S                   | 619                | 7                          | 0                  | 0                      | 0                        | 3                               | 3                               | 3                            | 1                               | 1                            | 5                            | 1                               | 1                     | 6               | 2                           | 2                                 | 1                                    | 1                         | 2                            | 2                          |
| 928330206            | Mutuwaethu Pri.             | Northern         | Soutpansberg       | R             | P                   | 831                | 8                          | 0                  | 0                      | 2                        | 3                               | 2                               | 2                            | 0                               | 0                            | 2                            | 2                               | 1                     | 2               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 928330756            | Makumbwi Pri.               | Northern         | Soutpansberg       | R             | P                   | 449                | 7                          | 0                  | 0                      | 3                        | 2                               | 0                               | 0                            | 0                               | 0                            | 2                            | 0                               | 1                     | 1               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 928330923            | Patrick Ramaano Sec.        | Northern         | Soutpansberg       | R             | S                   | 1,656              | 36                         | 0                  | 3                      | 1                        | 3                               | 3                               | 3                            | 1                               | 4                            | 2                            | 0                               | 1                     | 2               | 1                           | 1                                 | 0                                    | 1                         | 2                            | 0                          |
| 930320100            | Manamani Pri.               | Northern         | Vuwani             | R             | P                   | 638                | 5                          | 0                  | 1                      | 2                        | 2                               | 0                               | 0                            | 0                               | 0                            | 2                            | 0                               | 1                     | 0               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 930351531            | Tshivhase Sec.              | Northern         | Thohoyandou        | R             | S                   | 1,690              | 30                         | 0                  | 4                      | 2                        | 3                               | 3                               | 3                            | 3                               | 3                            | 3                            | 3                               | 1                     | 2               | 2                           | 1                                 | 2                                    | 1                         | 2                            | 2                          |
| 930360955            | Mpandeli Sec.               | Northern         | Malamulele         | R             | S                   | 1,229              | 20                         | 0                  | 0                      | 2                        | 3                               | 3                               | 3                            | 0                               | 0                            | 3                            | 0                               | 1                     | 2               | 0                           | 0                                 | 0                                    | 1                         | 0                            | 0                          |
| 930361125            | Mmbofheni Pri.              | Northern         | Malamulele         | R             | P                   | 415                | 4                          | 0                  | 0                      | 2                        | 2                               | 0                               | 0                            | 0                               | 0                            | 2                            | 0                               | 1                     | 2               | 2                           | 2                                 | 2                                    | 1                         | 2                            | 2                          |
| 931331186            | Djunane Pri.                | Northern         | Soutpansberg       | R             | P                   | 1,195              | 16                         | 0                  | 0                      | 1                        | 3                               | 3                               | 3                            | 0                               | 3                            | 2                            | 3                               | 1                     | 1               | 1                           | 2                                 | 2                                    | 2                         | 2                            | 2                          |
| 991102100            | Kgatelopele Pri.            | Western          | Mahwelereng        | R             | P                   | 1,035              | 8                          | 0                  | 0                      | 1                        | 5                               | 0                               | 0                            | 0                               | 0                            | 1                            | 0                               | 4                     | 2               | 1                           | 0                                 | 0                                    | 0                         | 0                            | 1                          |
| <b>Total: 34,485</b> |                             |                  |                    |               |                     |                    | <b>510</b>                 | <b>12</b>          | <b>35</b>              |                          |                                 |                                 |                              |                                 |                              |                              |                                 |                       |                 |                             |                                   |                                      |                           |                              |                            |

**Drinking Water Supply.** Field 1514 records the availability of drinking water in school. Thus, value of “1” means that water is “indoors (piped)””; “2” implies that water is “onsite (piped not indoors)””; “3” refers to “onsite (delivered)””; and “4” corresponds to “communal tap”; “5” means that a water source is within a “walking distance” from school; “6” means no water supply, and “7” is reserved for “other” supply options.

**Sanitation Situation.** The availability of the following sanitation facilities are reported: flush system to main sewer (field 15151); flush system to septic tank (field 15152); ventilated improved pit (field 15153); pit latrine (field 15154); bucket system (field 15155); and no sanitation facilities (field 15153). For each of these fields, “1” means “yes” and “2” stands for “no” answer.

## B.2.2 Sample Characteristics

Table B-1 contains two data fields that are not directly specified in the EMIS database. The first is the **location of school** within an urban or rural area. If a school is placed in an urban area then “U” is assigned while for a rural school “R” is stated. Secondly, the **type of a school** as being defined either primary or secondary. A primary school is marked as “P” while a secondary is recorded as “S”. Table A-1 showed that there are 6 urban and 34 rural schools in the sample. In terms of type, there are 23 primary schools and the remaining 17 are secondary. Table A-2 summarizes the sample content both by location and type of school.

**Table B-2. Sample Characteristics.**

|                  | <b>Urban</b> | <b>Rural</b> |             |
|------------------|--------------|--------------|-------------|
| <b>Primary</b>   | 3 (8%)       | 20 (50%)     | <b>58%</b>  |
| <b>Secondary</b> | 3 (8%)       | 14 (35%)     | <b>43%</b>  |
|                  | <b>15%</b>   | <b>85%</b>   | <b>100%</b> |

## B.2.3 Parameters

The spreadsheet accompanying this annex has a “parameter panel” where all model parameters are grouped together for the convenience of adjusting any of the variables, if needed. This section describes these parameters.

**Class Size.** The national norm for a primary class is 40 learners per class, while secondary level classes should target an audience of 35 learners. A substantial excess of learners over a prolonged period often results in reduction of the quality of lectures.

**Construction Costs.** The construction of school buildings has been standardized and its smallest block is a 4-classroom structure that currently costs R 420,000. Due to the tendering mechanism of construction, the actual cost may be slightly lower than the budgeted amount, and the local practice has been to spend any remainder of the R 420,000 on the improvement of other infrastructure facilities, typically toilets and fences of the school where a new class-block is being erected. It is expected that the cost of the standardized class-block will be adjusted upward by the end of year 2004 but it should not exceed R 420,000. For the purposes of analysis, we can take year 2004 as the base year and assume that the real construction costs will not change over the time of analysis and will remain at the same level of R 420,000. If the total cost of a standard block is evenly spread over its 4 rooms, then the construction costs of a single class-room should be R 105,000. This figure will serve as a benchmark for rehabilitation decisions.

**Condition of Class-Rooms.** The condition of the class-rooms follows the same system as used in the Annual School Survey, and only the first two conditions are considered for rehabilitation decisions.<sup>24</sup> It is expected that a building in condition “1” will serve, on the average, 1 additional year, while a building in condition “2” will be useful, on the average, for 4 additional years.<sup>25</sup>

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<sup>24</sup> The use of condition indicator corresponds to the classification system used in the “Annual Survey for Ordinary Schools (2004)”, Department of Education, Limpopo Provincial Government, Polokwane, South Africa. Thus, “1” refers as very weak condition, not suitable for education; “2” is weak and structure needs attention; “3” needs paint and minor repair; “4” is in good condition; “5” is a new structure; and “6” currently being upgraded.

<sup>25</sup> These two assumptions were derived from consultation with the Section of the Department of Public Works responsible for the schools infrastructure. A further research might be needed to refine these expectations of building life duration.

**Discount Rate.** The relevant discount rate is the economic opportunity cost of capital (EOCK) for South Africa, estimated as **11.0%**.<sup>26</sup>

**PV of Future Construction Costs.** The present value (PV) of construction costs in the future is obviously lower than the construction costs today.<sup>27</sup> Therefore, an effort should be made to discount the future construction costs to their current equivalent. The relevant timeframe for discounting is the time when a replacement for the existing damaged building will be needed. Since we assumed that the real construction costs remain constant, a damaged building in condition “1” will stand one more year after which a replacement will be needed at a cost of R 420,000, measured in real terms. An equivalent of the future cost is its present value discounted by the EOCK, which will be **R 378,400** ( $=R\ 420,000 / [(1+11.0\%)^1 \text{ year}]$ ). The equivalent of the replacement cost in 4 years, corresponding to condition “2”, is the value of **R 276,700** ( $=R\ 420,000 / [(1+11.0\%)^4 \text{ years}]$ ).

Often, the damaged areas of schools buildings comprise not the whole buildings but rather separate class-rooms. To facilitate the rehabilitation selection taking into account class-rooms, rather than whole class-blocks, a benchmark value is needed to compare the current rehabilitation costs of a single class-room with its future replacement cost. Since, there are 4 rooms in each standard class-block, the present value of a class-room replacement cost in 1 year is **R 94,600** ( $=R\ 378,400 / 4 \text{ rooms}$ ), and in 4 years is equal to **R 69,200** ( $=R\ 276,700 / 4 \text{ rooms}$ ).

#### **B.2.4 Priorities and Weights**

A number of factors have been identified in Section 2.2.2 of this handbook as being important for infrastructure decisions. Following the same method explained in Chapter

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<sup>26</sup> The theoretical arguments have been developed by Harberger, A.C., “On Measuring the Social Opportunity Cost of Public Funds”, in *Project Evaluation – Collected Papers*, (Chicago: the University of Chicago, 1972); Sandmo, H. and Dreze, J.H., “Discount Rates for Public Investment in Closed and Open Economies”, *Economica*, (November 1971); and Sjaastad, L.A. and Wisecarver, D.L., “The Social Cost of Public Fund”, *Journal of Political Economy*, (June 1977).

<sup>27</sup> Since an amount of 1 rand now will, if invested, grow to  $(1+r)$  a year hence, it follows that an amount B next year will have a present value of  $B/(1+r)$ . Similarly, since an investment of 1 rand now will grow to  $(1+r)^n$  in n years, it follows that an amount B to be received in n years in the future will have a present value of  $B/(1+r)^n$ . The greater the rate of discount, r, used and the further in the future the date when an amount is to be realized, the smaller is its present value. Thus, R100 received 50 years from now has a value of only R0.85 today at a discount rate of 10%.

2, a system of weights has been devised to compare the different characteristics of schools applying for additional infrastructure funding. The most important indicators for additional infrastructure are the class-blocks backlog and the excess of learners in class-room over the national normative size. Following the discussion of these indicators in Section 2.2.3, a weight of 0.70 is assigned to the identified class-blocks backlog, and weight of 0.3 is given to the reported excess of learners in class-room over the national normative size.

Table B-3 summarizes the weights assigned to the other important factors according to their discussion in Section 2.2.3. A secondary school located in an urban area with all basic facilities present and with no infrastructure backlog will be ranked as having the lowest need. An “augmenting score” of such school will be close to zero, and the resulting “augmenting adjustment” factor will approach the value of 1.00. An unlikely combination of an urban secondary school with all support facilities and located in an area that will face a population outflow, will be assigned an “adjustment factor” of 0.60 when the population migration score of -0.40 is taken into consideration.

**Table B-3. Priority Weights.**

|                                                        |             |              |
|--------------------------------------------------------|-------------|--------------|
| <b>1. Type of School.</b>                              |             |              |
| Primary (P=0.25) or Secondary (S=0)                    |             | <b>0.25</b>  |
| <b>2. Support Facilities.</b>                          | <b>Max:</b> | <b>0.25</b>  |
| Water (N=0.08) or (Yes=0)                              |             | 0.08         |
| Toilets (N=0.08) or (Yes=0)                            |             | 0.08         |
| Electricity (N=0.04) or (Yes=0)                        |             | 0.04         |
| Fences (N=0.02) or (Yes=0)                             |             | 0.02         |
| Library (N=0.01) or (Yes=0)                            |             | 0.01         |
| Labs                                                   |             |              |
| Primary (N=0.01) or (Yes=0)                            |             | 0.01         |
| Secondary (N=0.02) or (Yes=0)                          |             | 0.02         |
| <b>3. Location of School.</b>                          |             |              |
| Rural (R=0.20) or Urban (U=0)                          |             | <b>0.20</b>  |
| <b>4. Development Factors.</b>                         |             |              |
| Expected Population Decline (N=0) or (Yes: -0.40 to 0) | <b>Min:</b> | <b>-0.40</b> |
| Other Factors (N=0) or (Yes: 0 to 0.05)                | <b>Max:</b> | <b>0.05</b>  |
| <b>Maximum Weight of Augmenting Factors</b>            |             | <b>0.75</b>  |
| <b>Maximum Possible Augmenting Adjustment</b>          |             | <b>1.75</b>  |

A rural primary school with currently overcrowded classes, large class-room backlog and without any basic facilities, will score the maximum points both in terms of its

“infrastructure adequacy” and “augmenting factors”. The “augmenting score” will be close to its maximum of 0.75, and the resulting “augmenting adjustment” factor will approach the value of 1.75.

### **B.3 Estimation of School Priority Index and Ranking**

#### **B.3.1 Infrastructure Adequacy**

Table B-4 presents the estimation of the infrastructure adequacy score for the selected 40 provincial schools. As discussed in Section 2.2.2, the score is based on two verifiable factors: the class-blocks backlog and the excess of learners in class-room over the national normative size.

**Learner-to-Classroom Ratio.** This ratio is computed as a ratio of the school enrollment (field 123) divided by a sum of all available class-rooms (field 15231): permanent; prefabs (which also include mobile classes); and all other (located outside of school premises). For example, Motsheudi Secondary School (#901340425) has, on the average, a ratio of 77.9 learners per class-room ( $= 1,013 \text{ learners} / [12 \text{ Perm Classrooms} + 0 \text{ Prefabs} + 1 \text{ Other Rooms}]$ ).

**Class-blocks Backlog.** The backlog is estimated as a number of additional buildings, measured by a standard 4-class block, required at a particular school in order to maintain the maximum acceptable class size. For primary schools, the target class size is 40 learners, and for secondary the size is set at 35 learners per class-room. Thus, if Motsheudi Secondary School has 1,013 learners and only 13 class-rooms are currently available, the backlog is equal to 16 class-rooms ( $= [1,013 \text{ learners} - (13 \text{ class-rooms} * 40 \text{ learners})] / 40 \text{ learners-per-classroom}$ ), or 4.0 class-blocks. Schools with the average occupancy below the national norms appear as having zero backlogs, indicating that no additional infrastructure is currently required. The management of the Department may alternatively consider removing such schools from the priority list at this stage because such sites will get lowest ranking consequently.

**Table B-4. Estimation of Infrastructure Adequacy Scores.**

| EMIS#     | School                      | Learner-to-Classroom Ratio | A. Class-blocks Backlog (weight=0.7) | B. Learner-to-Classroom Ratio/Target Size (weight=0.3) | Score A: | Score B: | Total Infrastructure Adequacy Score (A + B): | Infrastructure Adequacy Ranking: |
|-----------|-----------------------------|----------------------------|--------------------------------------|--------------------------------------------------------|----------|----------|----------------------------------------------|----------------------------------|
| 901340425 | Motsheudi Sec.              | 77.9                       | 4.0                                  | 2.2                                                    | 2.79     | 0.67     | <b>3.46</b>                                  | <b>7</b>                         |
| 901420031 | Bollanto Pri.               | 27.8                       | 0.0                                  | 0.7                                                    | 0.00     | 0.21     | <b>0.21</b>                                  | <b>38</b>                        |
| 904220101 | Capricorn High              | 23.0                       | 0.0                                  | 0.6                                                    | 0.00     | 0.17     | <b>0.17</b>                                  | <b>40</b>                        |
| 904220415 | Laerskool Pietersburg Noord | 23.8                       | 0.0                                  | 0.7                                                    | 0.00     | 0.20     | <b>0.20</b>                                  | <b>39</b>                        |
| 904221326 | Pietersburg E M Pri.        | 31.5                       | 0.0                                  | 0.9                                                    | 0.00     | 0.27     | <b>0.27</b>                                  | <b>37</b>                        |
| 907130642 | Lekkerbreek Pri.            | 102.3                      | 1.6                                  | 2.6                                                    | 1.09     | 0.77     | <b>1.86</b>                                  | <b>28</b>                        |
| 911360252 | Matiyani Pri.               | 94.0                       | 3.4                                  | 2.4                                                    | 2.36     | 0.71     | <b>3.07</b>                                  | <b>12</b>                        |
| 914450056 | Bhejani Pri.                | 75.3                       | 5.2                                  | 2.2                                                    | 3.63     | 0.65     | <b>4.27</b>                                  | <b>2</b>                         |
| 915530341 | Vasasele Sec.               | 64.5                       | 3.2                                  | 1.8                                                    | 2.21     | 0.55     | <b>2.76</b>                                  | <b>16</b>                        |
| 917420703 | Shiphamele Pri.             | 67.9                       | 4.0                                  | 1.9                                                    | 2.80     | 0.58     | <b>3.38</b>                                  | <b>8</b>                         |
| 918510651 | Modubatse Sec.              | 82.3                       | 4.8                                  | 2.1                                                    | 3.33     | 0.62     | <b>3.95</b>                                  | <b>4</b>                         |
| 918510699 | Mokope Senior Sec.          | 71.7                       | 2.2                                  | 1.8                                                    | 1.53     | 0.54     | <b>2.06</b>                                  | <b>25</b>                        |
| 918511029 | Metsi A- Phepha Pri.        | 125.0                      | 1.9                                  | 3.6                                                    | 1.35     | 1.07     | <b>2.42</b>                                  | <b>21</b>                        |
| 918511463 | Tlhapedi Pri.               | 90.1                       | 3.4                                  | 2.3                                                    | 2.41     | 0.68     | <b>3.09</b>                                  | <b>11</b>                        |
| 920211725 | Selaelo Pri.                | 82.7                       | 0.8                                  | 2.1                                                    | 0.56     | 0.62     | <b>1.18</b>                                  | <b>34</b>                        |
| 922220873 | Mmanare Sec.                | 48.5                       | 1.4                                  | 1.4                                                    | 1.01     | 0.42     | <b>1.43</b>                                  | <b>32</b>                        |
| 922221135 | Napo Pri.                   | 101.8                      | 1.9                                  | 2.5                                                    | 1.35     | 0.76     | <b>2.12</b>                                  | <b>24</b>                        |
| 923240419 | Makgalapane Pri.            | 62.8                       | 0.8                                  | 1.8                                                    | 0.56     | 0.54     | <b>1.09</b>                                  | <b>35</b>                        |
| 923241054 | Mountainveiw Sernior Sec.   | 66.4                       | 2.5                                  | 1.7                                                    | 1.73     | 0.50     | <b>2.23</b>                                  | <b>23</b>                        |
| 923260628 | Mamaolo Pri.                | 58.3                       | 3.0                                  | 1.7                                                    | 2.10     | 0.50     | <b>2.60</b>                                  | <b>19</b>                        |
| 924650115 | Mamphokgo Pri.              | 83.4                       | 3.5                                  | 2.1                                                    | 2.47     | 0.63     | <b>3.09</b>                                  | <b>10</b>                        |
| 924651262 | Phokanoka High              | 56.0                       | 1.7                                  | 1.4                                                    | 1.19     | 0.42     | <b>1.61</b>                                  | <b>30</b>                        |
| 924661528 | Ngwanamatlang Sec.          | 100.6                      | 3.8                                  | 2.9                                                    | 2.63     | 0.86     | <b>3.49</b>                                  | <b>6</b>                         |
| 925630685 | Tshililo Sec.               | 115.7                      | 1.4                                  | 2.9                                                    | 0.99     | 0.87     | <b>1.86</b>                                  | <b>27</b>                        |
| 925660495 | Malegale Pri.               | 59.3                       | 4.5                                  | 1.7                                                    | 3.16     | 0.51     | <b>3.67</b>                                  | <b>5</b>                         |
| 925661160 | Sebase Sec.                 | 50.9                       | 0.6                                  | 1.3                                                    | 0.43     | 0.38     | <b>0.81</b>                                  | <b>36</b>                        |
| 925661245 | Serageng Pri.               | 103.0                      | 1.2                                  | 2.6                                                    | 0.83     | 0.77     | <b>1.60</b>                                  | <b>31</b>                        |
| 926540379 | Rakgolokwana Sec.           | 71.0                       | 3.1                                  | 1.8                                                    | 2.17     | 0.53     | <b>2.70</b>                                  | <b>17</b>                        |
| 926540683 | Lorraine Banareng Pri.      | 102.0                      | 5.7                                  | 2.9                                                    | 4.02     | 0.87     | <b>4.89</b>                                  | <b>1</b>                         |
| 927430229 | Hloala Chiloane Pri.        | 100.7                      | 2.3                                  | 2.5                                                    | 1.59     | 0.76     | <b>2.35</b>                                  | <b>22</b>                        |
| 927451004 | Tamajane Senior Sec.        | 88.4                       | 2.7                                  | 2.5                                                    | 1.87     | 0.76     | <b>2.63</b>                                  | <b>18</b>                        |
| 928330206 | Mutuwaafhethu Pri.          | 103.9                      | 3.2                                  | 2.6                                                    | 2.24     | 0.78     | <b>3.01</b>                                  | <b>13</b>                        |
| 928330756 | Makumbwi Pri.               | 64.1                       | 1.1                                  | 1.6                                                    | 0.74     | 0.48     | <b>1.22</b>                                  | <b>33</b>                        |
| 928330923 | Patrick Ramaano Sec.        | 42.5                       | 2.1                                  | 1.2                                                    | 1.46     | 0.36     | <b>1.82</b>                                  | <b>29</b>                        |
| 930320100 | Manamani Pri.               | 106.3                      | 2.5                                  | 2.7                                                    | 1.74     | 0.80     | <b>2.54</b>                                  | <b>20</b>                        |
| 930351531 | Tshivhase Sec.              | 49.7                       | 3.6                                  | 1.4                                                    | 2.50     | 0.43     | <b>2.93</b>                                  | <b>15</b>                        |
| 930360955 | Mpandeli Sec.               | 61.5                       | 3.8                                  | 1.8                                                    | 2.65     | 0.53     | <b>3.17</b>                                  | <b>9</b>                         |
| 930361125 | Mmbofheni Pri.              | 103.8                      | 1.6                                  | 2.6                                                    | 1.12     | 0.78     | <b>1.89</b>                                  | <b>26</b>                        |
| 931331186 | Djunane Pri.                | 74.7                       | 3.5                                  | 1.9                                                    | 2.43     | 0.56     | <b>2.99</b>                                  | <b>14</b>                        |
| 991102100 | Kgatelopele Pri.            | 129.4                      | 4.5                                  | 3.2                                                    | 3.13     | 0.97     | <b>4.10</b>                                  | <b>3</b>                         |
|           |                             |                            | <b>Total: 100.2</b>                  | <b>Average: 2.00</b>                                   |          |          |                                              |                                  |

**Learner-to-Classroom / Target Class Size Ratio.** This ratio is computed as the average learner-to-classroom indicator at a particular school being divided by the target size of the class audience for this type of school. For instance, the same Motsheudi Secondary School with 1,013 learners and 13 class-rooms currently available is 2.2 times above the target size of for secondary schools ( $= 77.9 \text{ learners per class-room} / 40 \text{ learners per class-room}$ ).

**Infrastructure Adequacy Score.** This score is estimated as the absolute number of backlogs multiplied by an assigned weight of 0.7 (Score A), plus the product of the excess learners-to-classroom ratio multiplied by a weight of 0.3 (Score B). For example, the backlog score for Motsheudi Secondary School is equal to 2.79, which is the product of 4.0 class-block times the assigned weight. The excess learners-to-classroom score for the same school is equal to 0.67, which is found as the excess learners-to-classroom ratio of 2.2 multiplied by the weight of 0.3. Therefore, the composite infrastructure adequacy score is the summation of the two weighted scores, equal to 3.46 ( $= 2.79 + 0.67$ ).

**Infrastructure Adequacy Ranking.** The highest infrastructure adequacy score of 4.89 is recorded for Lorraine Banareng Primary School (#926540683). This school has the largest backlog of additional class-blocks of 5.7. While the excess ratio of Lorraine Banareng Primary School (2.9) is not as high as in Metsi A-Phepha Primary School (#918511029) having an excess ratio of 3.6, the highest in the sample, the Lorraine Banareng Primary School has much larger enrollment and higher backlog. Table B-1 confirms these observations. Hence, Lorraine Banareng Primary School ranks first, Bhejani Primary School (#914450056) ranks second, and Kgatelopele Primary School (#991102100) ranks third.

The lowest infrastructure adequacy score of 0.17 is recorded for Capricorn High School (#904220101), which does not have any backlog and has the lowest learner-to-classroom ratio in the sample. This school is ranked at the very bottom of the list. There are three more schools that have no backlogs and their learner-to-classroom ratios are lower than the national requirement. Thus, Laerskool Pietersburg Noord School (#904220415) ranks 39<sup>th</sup>, Bollanto Primary School (#901420031) ranks 38<sup>th</sup>, and

Pietersburg E M Primary School (#904221326) ranks 37<sup>th</sup>. While their score A is equal to zero, the difference between actual learner-to-classroom ratios places them on different steps of rank listing.

### **B.3.2 Augmenting Factors**

Section 2.2.2 described that in addition to looking after the infrastructure adequacy, the decision-making process also takes into consideration a set of factors deemed to be important. These factors have been grouped into three categories: type of school, presence of support facilities, location of the school, and development priority factors. Each of the factors has been assigned an augmenting weight that will enhance the infrastructure adequacy score if a certain condition is satisfied. Table B-5 presents the estimation of the augmenting score and augmenting adjustment factors for the selected 40 provincial schools.

**Type of School.** According to school information in Table B-1 and to the statement of priority weights in Table B-3, any primary school gets a score of 0.25 while all secondary schools receive zero additional points.

**Basic Facilities.** The availability of the basic support facilities such as toilets, water supply, fences, electricity, library, and laboratories at each school has been stated in Table B-1 and the weights assigned to these factors are presented in Table B-3. In cases when basic facilities are currently unavailable, the school receives additional for each facility missing. In cases when some or all basic facilities are already in place, the school does not score additional points.

**Water.** In terms of water supply, the augmenting score is linked to field 1514 of the EMIS database. As already mentioned, this field may contain an integer value from 1 to 7. Only first three are considered as acceptable level of water supply in school: “1” means that water is “indoors (piped)”; “2” implies that water is “onsite (piped not indoors)”; “3” refers to “onsite (delivered)”.

**Table B-5. Estimation of Augmenting Adjustment Factors.**

| EMIS#     | School                      | Type of School              | Basic Facilities |         |             |        |         |      | Location              | Development Factors         |               | Augmenting Score: | Augmenting Adjustment: |
|-----------|-----------------------------|-----------------------------|------------------|---------|-------------|--------|---------|------|-----------------------|-----------------------------|---------------|-------------------|------------------------|
|           |                             | Primary (P) / Secondary (S) | Water            | Toilets | Electricity | Fences | Library | Labs | Rural (R) / Urban (U) | Expected Population Decline | Other Factors |                   |                        |
| 901340425 | Motsheudi Sec.              | 0.00                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.33              | 1.33                   |
| 901420031 | Bollanto Pri.               | 0.25                        | 0.00             | 0.00    | 0.00        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.47              | 1.47                   |
| 904220101 | Capricorn High              | 0.25                        | 0.00             | 0.00    | 0.00        | 0.00   | 0.00    | 0.00 | 0.00                  | 0.00                        | 0.00          | 0.25              | 1.25                   |
| 904220415 | Laerskool Pietersburg Noord | 0.00                        | 0.00             | 0.00    | 0.00        | 0.02   | 0.00    | 0.00 | 0.00                  | 0.00                        | 0.00          | 0.02              | 1.02                   |
| 904221326 | Pietersburg E M Pri.        | 0.00                        | 0.00             | 0.00    | 0.00        | 0.00   | 0.00    | 0.00 | 0.00                  | 0.00                        | 0.00          | 0.00              | 1.00                   |
| 907130642 | Lekkerbreek Pri.            | 0.25                        | 0.08             | 0.08    | 0.04        | 0.02   | 0.01    | 0.01 | 0.00                  | 0.00                        | 0.00          | 0.49              | 1.49                   |
| 911360252 | Matiyani Pri.               | 0.25                        | 0.00             | 0.08    | 0.00        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.55              | 1.55                   |
| 914450056 | Bhejani Pri.                | 0.00                        | 0.00             | 0.00    | 0.04        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.29              | 1.29                   |
| 915530341 | Vasasele Sec.               | 0.00                        | 0.00             | 0.00    | 0.04        | 0.00   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.27              | 1.27                   |
| 917420703 | Shiphamele Pri.             | 0.00                        | 0.08             | 0.08    | 0.00        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.41              | 1.41                   |
| 918510651 | Modubatse Sec.              | 0.25                        | 0.00             | 0.00    | 0.00        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.49              | 1.49                   |
| 918510699 | Mokope Senior Sec.          | 0.25                        | 0.00             | 0.08    | 0.00        | 0.00   | 0.01    | 0.01 | 0.00                  | 0.00                        | 0.00          | 0.35              | 1.35                   |
| 918511029 | Metsi A- Phepha Pri.        | 0.00                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.00    | 0.02 | 0.00                  | 0.00                        | 0.00          | 0.12              | 1.12                   |
| 918511463 | Tlhapedi Pri.               | 0.25                        | 0.08             | 0.08    | 0.00        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.63              | 1.63                   |
| 920211725 | Selaelo Pri.                | 0.25                        | 0.00             | 0.00    | 0.04        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.51              | 1.51                   |
| 922220873 | Mmanare Sec.                | 0.00                        | 0.08             | 0.08    | 0.00        | 0.00   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.36              | 1.36                   |
| 922221135 | Napo Pri.                   | 0.25                        | 0.08             | 0.08    | 0.00        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.63              | 1.63                   |
| 923240419 | Makgalapane Pri.            | 0.00                        | 0.08             | 0.08    | 0.00        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.41              | 1.41                   |
| 923241054 | Mountainveiw Sernior Sec.   | 0.25                        | 0.00             | 0.00    | 0.00        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.49              | 1.49                   |
| 923260628 | Mamaolo Pri.                | 0.00                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.33              | 1.33                   |
| 924650115 | Mamphokgo Pri.              | 0.25                        | 0.00             | 0.08    | 0.04        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.61              | 1.61                   |
| 924651262 | Phokanoka High              | 0.25                        | 0.08             | 0.08    | 0.04        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.69              | 1.69                   |
| 924661528 | Ngwanamatlang Sec.          | 0.00                        | 0.00             | 0.08    | 0.00        | 0.00   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.31              | 1.31                   |
| 925630685 | Tshililo Sec.               | 0.25                        | 0.08             | 0.08    | 0.04        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.69              | 1.69                   |
| 925660495 | Malegale Pri.               | 0.00                        | 0.08             | 0.08    | 0.04        | 0.00   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.43              | 1.43                   |
| 925661160 | Sebase Sec.                 | 0.25                        | 0.08             | 0.08    | 0.00        | 0.02   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.63              | 1.63                   |
| 925661245 | Serageng Pri.               | 0.25                        | 0.00             | 0.08    | 0.00        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.55              | 1.55                   |
| 926540379 | Rakgolokwana Sec.           | 0.25                        | 0.00             | 0.08    | 0.00        | 0.00   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.53              | 1.53                   |
| 926540683 | Lorraine Banareng Pri.      | 0.00                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.33              | 1.33                   |
| 927430229 | Hloala Chiloane Pri.        | 0.25                        | 0.08             | 0.08    | 0.04        | 0.02   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.67              | 1.67                   |
| 927451004 | Tamajane Senior Sec.        | 0.00                        | 0.08             | 0.00    | 0.00        | 0.02   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.30              | 1.30                   |
| 928330206 | Mutuwafhethu Pri.           | 0.25                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.57              | 1.57                   |
| 928330756 | Makumbwi Pri.               | 0.25                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.57              | 1.57                   |
| 928330923 | Patrick Ramaano Sec.        | 0.00                        | 0.00             | 0.00    | 0.00        | 0.00   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.20              | 1.20                   |
| 930320100 | Manamani Pri.               | 0.25                        | 0.08             | 0.08    | 0.00        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.65              | 1.65                   |
| 930351531 | Tshivhase Sec.              | 0.00                        | 0.00             | 0.00    | 0.00        | 0.02   | 0.00    | 0.00 | 0.20                  | 0.00                        | 0.00          | 0.22              | 1.22                   |
| 930360955 | Mpandeli Sec.               | 0.00                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.02 | 0.20                  | 0.00                        | 0.00          | 0.33              | 1.33                   |
| 930361125 | Mmbofheni Pri.              | 0.25                        | 0.00             | 0.08    | 0.00        | 0.02   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.57              | 1.57                   |
| 931331186 | Djunane Pri.                | 0.25                        | 0.00             | 0.00    | 0.00        | 0.00   | 0.00    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.46              | 1.46                   |
| 991102100 | Kgatelopele Pri.            | 0.25                        | 0.00             | 0.00    | 0.04        | 0.00   | 0.01    | 0.01 | 0.20                  | 0.00                        | 0.00          | 0.51              | 1.51                   |

Hence, if school has one of these three supply systems, the school **does not receive** additional augmenting points. A school **receives** additional 0.08 points in case that it has either: “4” corresponds to “communal tap”; or “5” means that a water source is within a “walking distance” from school; or “6” means no water supply, or “7” meaning “other” supply options.

***Toilets.*** Augmenting score for toilets is linked to fields 15151-15156 of the EMIS database. These fields may contain either “1” or “2” corresponding to “yes” or “no” answer to the presence of a particular type of sanitation system. Only first three are sanitation systems are considered as acceptable level of sanitation: sanitation-flush (field 15151), sanitation-septic tank (field 15152), sanitation-improved ventilated pit (field 15153). Hence, if school has one of these three sanitation systems, the school **does not receive** additional augmenting points. A school **receives** additional 0.08 points in case that it has either: pit latrine (field 15154); or bucket system (field 15155); or no sanitation facilities (field 15153)..

***Electricity.*** In terms of water supply, the augmenting score is linked to field 1513 of the EMIS database. This field may contain an integer value from 1 to 4. Only first three are considered as acceptable level of electricity supply in school: “1” means that the school is “wired and supplied by ESKOM”; “2” implies that power is “self-generated using generators”; and “3” refers to “solar panels”. Hence, if school has one of these three supply systems, the school **does not receive** additional augmenting points. A school **receives** additional 0.04 points in case that it has no power supply as indicated by value “4” in the database.

***Fences.*** The augmenting score is linked to field 154 of the EMIS database. This field may contain an integer value from 1 to 3. Only first one is considered as acceptable fence for a school: “1” means is in a “good condition”, and if school has such a fence, this school **does not receive** additional augmenting points. A school **receives** additional 0.02 points in case that it has: “2” bad condition of the fence; or “3” no fence.

**Library.** Library's augmenting score is linked to field 15125 of the EMIS database. This field may contain an integer value from 1 to 6. If school has a library in any condition this school **does not receive** additional augmenting points. A school **receives** additional 0.01 points only in case it does not have a library, i.e. the data value is "0" or missing.

**Laboratory.** It is more important for secondary schools to have a functional laboratory than for primary schools. The augmenting score is linked to field 15124 of the EMIS database. This field may contain an integer value from 1 to 6. If school has a laboratory in any condition this school **does not receive** additional augmenting points. In case that a school does not have a laboratory, i.e. the data value is "0" or missing, the school **receives** additional either 0.01 points if it is primary type, or 0.02 points if it is secondary school.

**School Location.** A rural school **receives** an additional 0.20 points while an urban school **does not receive** any extra points. Since the Department has opted to focus its infrastructure delivery on rural regions, and past two budgets were almost entirely spent on rural schools, an alternative way could be to temporarily exclude all urban schools from priority list. Once funds become available, urban schools can be included in the common pool of new infrastructure applications.

**Development Factors.** There are two factors placed in this category: expected population decline and other factors. Obviously, both require some intelligent interference in order to assign any value. For the expected population decline, the score could take any value between -0.40 to 0, depending on the magnitude of expected migration. Other unforeseen now factors can be also brought into the infrastructure selection process and a provision is made for an additional score of 0.05. If the importance of new factors deems to be very high, this weight could be raised to a reasonable degree.

### **B.3.3 Augmenting Score and Adjustment factor**

Once all factors for a school are accounted for, the resulting total score can be derived as a summation of scores obtained. For example, Motsheudi Secondary School (#901340425), located in a rural area, currently has fences, water and electricity supply

but does not have toilets, library and labs. No development factors are identified. Therefore, its augmenting score will be calculated as:

|                                             |                      |
|---------------------------------------------|----------------------|
| <b>1. Type of School: Secondary</b>         | <b>= 0</b>           |
| <b>2. Support Facilities:</b>               |                      |
| Water                                       | = 0                  |
| Toilets                                     | = 0.08               |
| Electricity                                 | = 0                  |
| Fences                                      | = 0.02               |
| Library                                     | = 0.01               |
| Labs, Secondary                             | = 0.02               |
| <b>3. Location of School: Rural</b>         | <b>= 0.20</b>        |
| <b>4. Development Factors.</b>              |                      |
| Expected Population Decline                 | = 0                  |
| Other Factors                               | = 0                  |
| <b>Total Augmenting Score:</b>              | <b>= 0.33</b>        |
| <b><u>Augmenting Adjustment Factor:</u></b> | <b><u>= 1.33</u></b> |

The augmenting adjustment factor is equal to one plus the computed augmenting score. This factor will be multiplied by the infrastructure adequacy score, estimated in Section B.3.2, to derive the school priority index.

#### **B.3.4 School Priority Index and Ranking**

Finally, the PI index can be estimated for every school using the infrastructure adequacy scores in Table B-4 and corresponding augmenting adjustment factors from Table B-5. The priority index is computed as a product of the two, and the resulting PI values for the selected 40 schools is shown in Table B-6.

As anticipated, the existence of augmenting factors has shifted some of the schools in terms of priority ranking. The top ranking still remains unchallenged as Lorraine Banareng Primary School (#926540683) has the highest PI of 6.51, largely explained by its high infrastructure adequacy score. The second top ranking has changed hands from Bhejani Primary School (#914450056) to Kgatelopele Primary School (#991102100), which was initially ranked third. Consequently, other rural primary schools with low level of basic facilities have also advanced in terms of their priority for new infrastructure.

**Table B-6. Estimation of Priority Index and School Ranking.**

| EMIS#     | School                      | Total<br>Infrastructure<br>Adequacy Score: | Infrastructure<br>Adequacy<br>Ranking: | Augmenting<br>Adjustment: | Priority<br>Index: | Ranking: |
|-----------|-----------------------------|--------------------------------------------|----------------------------------------|---------------------------|--------------------|----------|
| 901340425 | Motsheudi Sec.              | 3.46                                       | 7                                      | 1.33                      | 4.60               | 11       |
| 901420031 | Bollanto Pri.               | 0.21                                       | 38                                     | 1.47                      | 0.31               | 37       |
| 904220101 | Capricorn High              | 0.17                                       | 40                                     | 1.25                      | 0.22               | 39       |
| 904220415 | Laerskool Pietersburg Noord | 0.20                                       | 39                                     | 1.02                      | 0.21               | 40       |
| 904221326 | Pietersburg E M Pri.        | 0.27                                       | 37                                     | 1.00                      | 0.27               | 38       |
| 907130642 | Lekkerbreek Pri.            | 1.86                                       | 28                                     | 1.49                      | 2.77               | 27       |
| 911360252 | Matiyani Pri.               | 3.07                                       | 12                                     | 1.55                      | 4.75               | 9        |
| 914450056 | Bhejani Pri.                | 4.27                                       | 2                                      | 1.29                      | 5.51               | 4        |
| 915530341 | Vasasele Sec.               | 2.76                                       | 16                                     | 1.27                      | 3.51               | 19       |
| 917420703 | Shiphamele Pri.             | 3.38                                       | 8                                      | 1.41                      | 4.77               | 8        |
| 918510651 | Modubatse Sec.              | 3.95                                       | 4                                      | 1.49                      | 5.89               | 3        |
| 918510699 | Mokope Senior Sec.          | 2.06                                       | 25                                     | 1.35                      | 2.79               | 26       |
| 918511029 | Metsi A- Phepha Pri.        | 2.42                                       | 21                                     | 1.12                      | 2.71               | 29       |
| 918511463 | Tlhapedi Pri.               | 3.09                                       | 11                                     | 1.63                      | 5.03               | 6        |
| 920211725 | Selaelo Pri.                | 1.18                                       | 34                                     | 1.51                      | 1.78               | 34       |
| 922220873 | Mmanare Sec.                | 1.43                                       | 32                                     | 1.36                      | 1.94               | 32       |
| 922221135 | Napo Pri.                   | 2.12                                       | 24                                     | 1.63                      | 3.45               | 21       |
| 923240419 | Makgalapane Pri.            | 1.09                                       | 35                                     | 1.41                      | 1.54               | 35       |
| 923241054 | Mountainveiw Sernior Sec.   | 2.23                                       | 23                                     | 1.49                      | 3.32               | 23       |
| 923260628 | Mamaolo Pri.                | 2.60                                       | 19                                     | 1.33                      | 3.46               | 20       |
| 924650115 | Mamphokgo Pri.              | 3.09                                       | 10                                     | 1.61                      | 4.98               | 7        |
| 924651262 | Phokanoka High              | 1.61                                       | 30                                     | 1.69                      | 2.72               | 28       |
| 924661528 | Ngwanamatlang Sec.          | 3.49                                       | 6                                      | 1.31                      | 4.57               | 12       |
| 925630685 | Tshililo Sec.               | 1.86                                       | 27                                     | 1.69                      | 3.14               | 24       |
| 925660495 | Malegale Pri.               | 3.67                                       | 5                                      | 1.43                      | 5.25               | 5        |
| 925661160 | Sebase Sec.                 | 0.81                                       | 36                                     | 1.63                      | 1.32               | 36       |
| 925661245 | Serageng Pri.               | 1.60                                       | 31                                     | 1.55                      | 2.48               | 30       |
| 926540379 | Rakgolokwana Sec.           | 2.70                                       | 17                                     | 1.53                      | 4.13               | 16       |
| 926540683 | Lorraine Banareng Pri.      | 4.89                                       | 1                                      | 1.33                      | 6.51               | 1        |
| 927430229 | Hloala Chiloane Pri.        | 2.35                                       | 22                                     | 1.67                      | 3.92               | 17       |
| 927451004 | Tamajane Senior Sec.        | 2.63                                       | 18                                     | 1.30                      | 3.42               | 22       |
| 928330206 | Mutuwaflhethu Pri.          | 3.01                                       | 13                                     | 1.57                      | 4.73               | 10       |
| 928330756 | Makumbwi Pri.               | 1.22                                       | 33                                     | 1.57                      | 1.92               | 33       |
| 928330923 | Patrick Ramaano Sec.        | 1.82                                       | 29                                     | 1.20                      | 2.18               | 31       |
| 930320100 | Manamani Pri.               | 2.54                                       | 20                                     | 1.65                      | 4.19               | 15       |
| 930351531 | Tshivhase Sec.              | 2.93                                       | 15                                     | 1.22                      | 3.57               | 18       |
| 930360955 | Mpandeli Sec.               | 3.17                                       | 9                                      | 1.33                      | 4.22               | 14       |
| 930361125 | Mmbofheni Pri.              | 1.89                                       | 26                                     | 1.57                      | 2.97               | 25       |
| 931331186 | Djunane Pri.                | 2.99                                       | 14                                     | 1.46                      | 4.36               | 13       |
| 991102100 | Kgatelopele Pri.            | 4.10                                       | 3                                      | 1.51                      | 6.19               | 2        |

The lowest PI index of 0.21 is recorded for Laerskool Pietersburg Noord School (#904220415), which was initially at the 39<sup>th</sup> place. Note that Capricorn High School (#904220101) now occupies that rank. Also, Pietersburg E M Primary School (#904221326) now ranks 38<sup>th</sup>, and Bollanto Primary School (#901420031) ranks 37<sup>th</sup>.

## **B.4 Allocation of Budget for New Class-rooms**

### **B.4.1 The Mechanism**

As discussed in Section 2.3, the overall effectiveness of budget spending is maximized when the funds are forwarded to schools with the highest ranking. Let's continue with the sample of 40 provincial schools and illustrate how a limited budget in a particular year should be allocated among the schools in the most efficient manner. In the present situation, the total backlog for all 40 schools is 100.2 standard blocks, or 401 additional class-rooms, as could be seen from the schools' backlog data in Table B-4. Suppose that the capital budget for the current period is only R 8.4 million, which translates into 20 new class-blocks, since each costs R 420,000 to construct. The issue is now to decide which school should be given the funding and for how many new blocks at each selected location.

The right approach to the allocation is to award each additional class-block to the school ranking first in terms of the priority index. Because each additional building will alter the current priority index and ranking of schools, the ranking must be recalculated after each new addition of class-rooms or support facilities, or changes in the type of school or in the development priority factors. Table B-7 illustrates this iterative allocation process for 10 blocks.

Recently, there has been a lot of priority placed on upholding the minimum sanitation norms in provincial schools, and it is assumed that each newly constructed building has the appropriate toilets. Thus, if a school initially didn't have any sanitation facilities, the first constructed class-block brings about an improvement in respect to sanitation too. All other augmentation factors are assumed to remain constant, while in reality this need not to be true as new construction may improve some of the backlogs in the other support facilities.

**Table B-7. Allocation of Budget Funds for Construction of New Class-Blocks, Blocks #1 and #2.**

| EMIS#      School |                             | Allocation of Block #1 |          | Allocation of Block #2 |                      |                            |                                |                                        |                                |                        |                 |          |
|-------------------|-----------------------------|------------------------|----------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|
|                   |                             | Priority Index:        | Ranking: | School-Block #1        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: |
| 901340425         | Motsheudi Sec.              | 4.60                   | 11       | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 11       |
| 901420031         | Bollanto Pri.               | 0.31                   | 37       | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       |
| 904220101         | Capricorn High              | 0.22                   | 39       | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       |
| 904220415         | Laerskool Pietersburg Noord | 0.21                   | 40       | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       |
| 904221326         | Pietersburg E M Pri.        | 0.27                   | 38       | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       |
| 907130642         | Lekkerbreek Pri.            | 2.77                   | 27       | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       |
| 911360252         | Matiyani Pri.               | 4.75                   | 9        | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 9        |
| 914450056         | Bhejani Pri.                | 5.51                   | 4        | 0                      | 18                   | 75.3                       | 5.18                           | 2.15                                   | 4.27                           | 1.29                   | 5.51            | 3        |
| 915530341         | Vasasele Sec.               | 3.51                   | 19       | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 19       |
| 917420703         | Shiphamele Pri.             | 4.77                   | 8        | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 8        |
| 918510651         | Modubatse Sec.              | 5.89                   | 3        | 0                      | 18                   | 82.3                       | 4.76                           | 2.06                                   | 3.95                           | 1.49                   | 5.89            | 2        |
| 918510699         | Mokope Senior Sec.          | 2.79                   | 26       | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       |
| 918511029         | Metsi A- Phepha Pri.        | 2.71                   | 29       | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       |
| 918511463         | Tlhapedi Pri.               | 5.03                   | 6        | 0                      | 11                   | 90.1                       | 3.44                           | 2.25                                   | 3.09                           | 1.63                   | 5.03            | 5        |
| 920211725         | Selaelo Pri.                | 1.78                   | 34       | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       |
| 922220873         | Mmanare Sec.                | 1.94                   | 32       | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       |
| 922221135         | Napo Pri.                   | 3.45                   | 21       | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 21       |
| 923240419         | Makgalapane Pri.            | 1.54                   | 35       | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       |
| 923241054         | Mountainveiw Sernior Sec.   | 3.32                   | 23       | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       |
| 923260628         | Mamaolo Pri.                | 3.46                   | 20       | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 20       |
| 924650115         | Mamphokgo Pri.              | 4.98                   | 7        | 0                      | 13                   | 83.4                       | 3.53                           | 2.08                                   | 3.09                           | 1.61                   | 4.98            | 6        |
| 924651262         | Phokanoka High              | 2.72                   | 28       | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       |
| 924661528         | Ngwanamatlang Sec.          | 4.57                   | 12       | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 12       |
| 925630685         | Tshililo Sec.               | 3.14                   | 24       | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       |
| 925660495         | Malegale Pri.               | 5.25                   | 5        | 0                      | 26                   | 59.3                       | 4.51                           | 1.69                                   | 3.67                           | 1.43                   | 5.25            | 4        |
| 925661160         | Sebase Sec.                 | 1.32                   | 36       | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       |
| 925661245         | Serageng Pri.               | 2.48                   | 30       | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       |
| 926540379         | Rakgolokwana Sec.           | 4.13                   | 16       | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 16       |
| 926540683         | Lorraine Banareng Pri.      | 6.51                   | 1        | 1                      | 16                   | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 7        |
| 927430229         | Hloala Chiloane Pri.        | 3.92                   | 17       | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 17       |
| 927451004         | Tamajane Senior Sec.        | 3.42                   | 22       | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.30                   | 3.42            | 22       |
| 928330206         | Mutuwafethu Pri.            | 4.73                   | 10       | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 10       |
| 928330756         | Makumbwi Pri.               | 1.92                   | 33       | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       |
| 928330923         | Patrick Ramaano Sec.        | 2.18                   | 31       | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.20                   | 2.18            | 31       |
| 930320100         | Manamani Pri.               | 4.19                   | 15       | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 15       |
| 930351531         | Tshivhase Sec.              | 3.57                   | 18       | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 18       |
| 930360955         | Mpandeli Sec.               | 4.22                   | 14       | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 14       |
| 930361125         | Mmbofheni Pri.              | 2.97                   | 25       | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       |
| 931331186         | Djunane Pri.                | 4.36                   | 13       | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 13       |
| 991102100         | Kgatelopele Pri.            | 6.19                   | 2        | 0                      | 8                    | 129.4                      | 4.47                           | 3.23                                   | 4.10                           | 1.51                   | 6.19            | 1        |
| Total: 99.2       |                             |                        |          |                        |                      |                            | Average: 1.99                  |                                        |                                |                        |                 |          |

**Table B-7. Allocation of Budget Funds for Construction of New Class-Blocks (Blocks #3 and #4).**

| EMIS#     | Allocation of Block #3 |                      |                            |                                |                                        |                                |                        |                 |          | Allocation of Block #4 |                      |                            |                                |                                        |                                |                        |                 |          |  |
|-----------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|--|
|           | School-Block #2        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: | School-Block #3        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: |  |
| 901340425 | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 11       | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 11       |  |
| 901420031 | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       |  |
| 904220101 | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       |  |
| 904220415 | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       |  |
| 904221326 | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       |  |
| 907130642 | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       |  |
| 911360252 | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 8        | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 7        |  |
| 914450056 | 0                      | 18                   | 75.3                       | 5.18                           | 2.15                                   | 4.27                           | 1.29                   | 5.51            | 2        | 0                      | 18                   | 75.3                       | 5.18                           | 2.15                                   | 4.27                           | 1.29                   | 5.51            | 1        |  |
| 915530341 | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 19       | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 19       |  |
| 917420703 | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 7        | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 6        |  |
| 918510651 | 0                      | 18                   | 82.3                       | 4.76                           | 2.06                                   | 3.95                           | 1.49                   | 5.89            | 1        | 1                      | 22                   | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 9        |  |
| 918510699 | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       |  |
| 918511029 | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       |  |
| 918511463 | 0                      | 11                   | 90.1                       | 3.44                           | 2.25                                   | 3.09                           | 1.63                   | 5.03            | 4        | 0                      | 11                   | 90.1                       | 3.44                           | 2.25                                   | 3.09                           | 1.63                   | 5.03            | 3        |  |
| 920211725 | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       |  |
| 922220873 | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       |  |
| 922221135 | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 21       | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 21       |  |
| 923240419 | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       |  |
| 923241054 | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       |  |
| 923260628 | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 20       | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 20       |  |
| 924650115 | 0                      | 13                   | 83.4                       | 3.53                           | 2.08                                   | 3.09                           | 1.61                   | 4.98            | 5        | 0                      | 13                   | 83.4                       | 3.53                           | 2.08                                   | 3.09                           | 1.61                   | 4.98            | 4        |  |
| 924651262 | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       |  |
| 924661528 | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 12       | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 12       |  |
| 925630685 | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       |  |
| 925660495 | 0                      | 26                   | 59.3                       | 4.51                           | 1.69                                   | 3.67                           | 1.43                   | 5.25            | 3        | 0                      | 26                   | 59.3                       | 4.51                           | 1.69                                   | 3.67                           | 1.43                   | 5.25            | 2        |  |
| 925661160 | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       |  |
| 925661245 | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       |  |
| 926540379 | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 16       | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 16       |  |
| 926540683 | 0                      | 16                   | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 6        | 0                      | 16                   | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 5        |  |
| 927430229 | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 17       | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 17       |  |
| 927451004 | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       |  |
| 928330206 | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 9        | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 8        |  |
| 928330756 | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       |  |
| 928330923 | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       |  |
| 930320100 | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 15       | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 15       |  |
| 930351531 | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 18       | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 18       |  |
| 930360955 | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 14       | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 14       |  |
| 930361125 | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       |  |
| 931331186 | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 13       | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 13       |  |
| 991102100 | 1                      | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 10       | 0                      | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 10       |  |
|           |                        |                      |                            | Total: 98.2                    | Average: 1.96                          |                                |                        |                 |          |                        |                      |                            |                                |                                        | Total: 97.2                    | Average: 1.95          |                 |          |  |

**Table B-7. Allocation of Budget Funds for Construction of New Class-Blocks (Blocks #5 and #6).**

| EMIS#     | Allocation of Block #5 |                      |                            |                                |                                        |                                |                        |                 |          |                 | Allocation of Block #6 |                            |                                |                                        |                                |                        |                 |          |  |  |  |
|-----------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|-----------------|------------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|--|--|--|
|           | School-Block #4        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: | School-Block #5 | Available Classrooms   | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: |  |  |  |
| 901340425 | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 10       | 0               | 13                     | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 9        |  |  |  |
| 901420031 | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       | 0               | 13                     | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       |  |  |  |
| 904220101 | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       | 0               | 40                     | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       |  |  |  |
| 904220415 | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       | 0               | 29                     | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       |  |  |  |
| 904221326 | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       | 0               | 33                     | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       |  |  |  |
| 907130642 | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       | 0               | 4                      | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       |  |  |  |
| 911360252 | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 6        | 0               | 10                     | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 5        |  |  |  |
| 914450056 | 1                      | 22                   | 61.6                       | 4.18                           | 1.76                                   | 3.45                           | 1.29                   | 4.45            | 12       | 0               | 22                     | 61.6                       | 4.18                           | 1.76                                   | 3.45                           | 1.29                   | 4.45            | 11       |  |  |  |
| 915530341 | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 19       | 0               | 15                     | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 19       |  |  |  |
| 917420703 | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 5        | 0               | 17                     | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 4        |  |  |  |
| 918510651 | 0                      | 22                   | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 8        | 0               | 22                     | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 7        |  |  |  |
| 918510699 | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       | 0               | 11                     | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       |  |  |  |
| 918511029 | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       | 0               | 3                      | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       |  |  |  |
| 918511463 | 0                      | 11                   | 90.1                       | 3.44                           | 2.25                                   | 3.09                           | 1.63                   | 5.03            | 2        | 0               | 11                     | 90.1                       | 3.44                           | 2.25                                   | 3.09                           | 1.63                   | 5.03            | 1        |  |  |  |
| 920211725 | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       | 0               | 3                      | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       |  |  |  |
| 922220873 | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       | 0               | 15                     | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       |  |  |  |
| 922221135 | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 21       | 0               | 5                      | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 21       |  |  |  |
| 923240419 | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       | 0               | 4                      | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       |  |  |  |
| 923241054 | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       | 0               | 15                     | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       |  |  |  |
| 923260628 | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 20       | 0               | 18                     | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 20       |  |  |  |
| 924650115 | 0                      | 13                   | 83.4                       | 3.53                           | 2.08                                   | 3.09                           | 1.61                   | 4.98            | 3        | 0               | 13                     | 83.4                       | 3.53                           | 2.08                                   | 3.09                           | 1.61                   | 4.98            | 2        |  |  |  |
| 924651262 | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       | 0               | 17                     | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       |  |  |  |
| 924661528 | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 11       | 0               | 8                      | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 10       |  |  |  |
| 925630685 | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       | 0               | 3                      | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       |  |  |  |
| 925660495 | 0                      | 26                   | 59.3                       | 4.51                           | 1.69                                   | 3.67                           | 1.43                   | 5.25            | 1        | 1               | 30                     | 51.4                       | 3.51                           | 1.47                                   | 2.90                           | 1.35                   | 3.92            | 17       |  |  |  |
| 925661160 | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       | 0               | 9                      | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       |  |  |  |
| 925661245 | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       | 0               | 3                      | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       |  |  |  |
| 926540379 | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 16       | 0               | 16                     | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 15       |  |  |  |
| 926540683 | 0                      | 16                   | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 4        | 0               | 16                     | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 3        |  |  |  |
| 927430229 | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 17       | 0               | 6                      | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 16       |  |  |  |
| 927451004 | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       | 0               | 7                      | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       |  |  |  |
| 928330206 | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 7        | 0               | 8                      | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 6        |  |  |  |
| 928330756 | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       | 0               | 7                      | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       |  |  |  |
| 928330923 | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       | 0               | 39                     | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       |  |  |  |
| 930320100 | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 15       | 0               | 6                      | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 14       |  |  |  |
| 930351531 | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 18       | 0               | 34                     | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 18       |  |  |  |
| 930360955 | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 14       | 0               | 20                     | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 13       |  |  |  |
| 930361125 | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       | 0               | 4                      | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       |  |  |  |
| 931331186 | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 13       | 0               | 16                     | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 12       |  |  |  |
| 991102100 | 0                      | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 9        | 0               | 12                     | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 8        |  |  |  |
|           |                        |                      |                            |                                | Total: 96.2                            | Average: 1.94                  |                        |                 |          |                 |                        |                            |                                |                                        |                                | Total: 95.2            | Average: 1.93   |          |  |  |  |

**Table B-7. Allocation of Budget Funds for Construction of New Class-Blocks (Blocks #7 and #8).**

| EMIS#     | Allocation of Block #7 |                      |                            |                                |                                        |                                |                        |                 |          | Allocation of Block #8 |                      |                            |                                |                                        |                                |                        |                 |          |  |
|-----------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|--|
|           | School-Block #6        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: | School-Block #7        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: |  |
| 901340425 | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 8        | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 7        |  |
| 901420031 | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       |  |
| 904220101 | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       |  |
| 904220415 | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       |  |
| 904221326 | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       |  |
| 907130642 | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       |  |
| 911360252 | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 4        | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 3        |  |
| 914450056 | 0                      | 22                   | 61.6                       | 4.18                           | 1.76                                   | 3.45                           | 1.29                   | 4.45            | 10       | 0                      | 22                   | 61.6                       | 4.18                           | 1.76                                   | 3.45                           | 1.29                   | 4.45            | 9        |  |
| 915530341 | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 18       | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 17       |  |
| 917420703 | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 3        | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 2        |  |
| 918510651 | 0                      | 22                   | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 6        | 0                      | 22                   | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 5        |  |
| 918510699 | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       |  |
| 918511029 | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       |  |
| 918511463 | 1                      | 15                   | 66.1                       | 2.44                           | 1.65                                   | 2.21                           | 1.55                   | 3.42            | 21       | 0                      | 15                   | 66.1                       | 2.44                           | 1.65                                   | 2.21                           | 1.55                   | 3.42            | 21       |  |
| 920211725 | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       |  |
| 922220873 | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       |  |
| 922221135 | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 20       | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 19       |  |
| 923240419 | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       |  |
| 923241054 | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       |  |
| 923260628 | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 19       | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 18       |  |
| 924650115 | 0                      | 13                   | 83.4                       | 3.53                           | 2.08                                   | 3.09                           | 1.61                   | 4.98            | 1        | 1                      | 17                   | 63.8                       | 2.53                           | 1.59                                   | 2.25                           | 1.53                   | 3.44            | 20       |  |
| 924651262 | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       |  |
| 924661528 | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 9        | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 8        |  |
| 925630685 | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       |  |
| 925660495 | 0                      | 30                   | 51.4                       | 3.51                           | 1.47                                   | 2.90                           | 1.35                   | 3.92            | 16       | 0                      | 30                   | 51.4                       | 3.51                           | 1.47                                   | 2.90                           | 1.35                   | 3.92            | 15       |  |
| 925661160 | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       |  |
| 925661245 | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       |  |
| 926540379 | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 14       | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 13       |  |
| 926540683 | 0                      | 16                   | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 2        | 0                      | 16                   | 76.5                       | 4.74                           | 2.19                                   | 3.98                           | 1.25                   | 4.97            | 1        |  |
| 927430229 | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 15       | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 14       |  |
| 927451004 | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       |  |
| 928330206 | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 5        | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 4        |  |
| 928330756 | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       |  |
| 928330923 | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       |  |
| 930320100 | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 13       | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 12       |  |
| 930351531 | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 17       | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 16       |  |
| 930360955 | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 12       | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 11       |  |
| 930361125 | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       |  |
| 931331186 | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 11       | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 10       |  |
| 991102100 | 0                      | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 7        | 0                      | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 6        |  |
|           |                        |                      |                            | Total: 94.2                    | Average: 1.92                          |                                |                        |                 |          |                        |                      |                            |                                | Total: 93.2                            | Average: 1.91                  |                        |                 |          |  |

**Table B-7. Allocation of Budget Funds for Construction of New Class-Blocks (Blocks #9 and #10).**

| EMIS#       | Allocation of Block #9 |                      |                            |                                |                                        |                                |                        |                 |          | Allocation of Block #10 |                      |                            |                                |                                        |                                |                        |                 |          |  |
|-------------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|-------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|-----------------|----------|--|
|             | School-Block #8        | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: | School-Block #9         | Available Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | Priority Index: | Ranking: |  |
| 901340425   | 0                      | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 6        | 0                       | 13                   | 77.9                       | 3.99                           | 2.23                                   | 3.46                           | 1.33                   | 4.60            | 5        |  |
| 901420031   | 0                      | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       | 0                       | 13                   | 27.8                       | 0.00                           | 0.69                                   | 0.21                           | 1.47                   | 0.31            | 37       |  |
| 904220101   | 0                      | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       | 0                       | 40                   | 23.0                       | 0.00                           | 0.58                                   | 0.17                           | 1.25                   | 0.22            | 39       |  |
| 904220415   | 0                      | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       | 0                       | 29                   | 23.8                       | 0.00                           | 0.68                                   | 0.20                           | 1.02                   | 0.21            | 40       |  |
| 904221326   | 0                      | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       | 0                       | 33                   | 31.5                       | 0.00                           | 0.90                                   | 0.27                           | 1.00                   | 0.27            | 38       |  |
| 907130642   | 0                      | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       | 0                       | 4                    | 102.3                      | 1.56                           | 2.56                                   | 1.86                           | 1.49                   | 2.77            | 27       |  |
| 911360252   | 0                      | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 2        | 0                       | 10                   | 94.0                       | 3.38                           | 2.35                                   | 3.07                           | 1.55                   | 4.75            | 1        |  |
| 914450056   | 0                      | 22                   | 61.6                       | 4.18                           | 1.76                                   | 3.45                           | 1.29                   | 4.45            | 8        | 0                       | 22                   | 61.6                       | 4.18                           | 1.76                                   | 3.45                           | 1.29                   | 4.45            | 7        |  |
| 915530341   | 0                      | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 17       | 0                       | 15                   | 64.5                       | 3.16                           | 1.84                                   | 2.76                           | 1.27                   | 3.51            | 16       |  |
| 917420703   | 0                      | 17                   | 67.9                       | 4.00                           | 1.94                                   | 3.38                           | 1.41                   | 4.77            | 1        | 1                       | 21                   | 55.0                       | 3.00                           | 1.57                                   | 2.57                           | 1.33                   | 3.42            | 20       |  |
| 918510651   | 0                      | 22                   | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 4        | 0                       | 22                   | 67.4                       | 3.76                           | 1.68                                   | 3.14                           | 1.49                   | 4.68            | 3        |  |
| 918510699   | 0                      | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       | 0                       | 11                   | 71.7                       | 2.18                           | 1.79                                   | 2.06                           | 1.35                   | 2.79            | 26       |  |
| 918511029   | 0                      | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       | 0                       | 3                    | 125.0                      | 1.93                           | 3.57                                   | 2.42                           | 1.12                   | 2.71            | 29       |  |
| 918511463   | 0                      | 15                   | 66.1                       | 2.44                           | 1.65                                   | 2.21                           | 1.55                   | 3.42            | 21       | 0                       | 15                   | 66.1                       | 2.44                           | 1.65                                   | 2.21                           | 1.55                   | 3.42            | 21       |  |
| 920211725   | 0                      | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       | 0                       | 3                    | 82.7                       | 0.80                           | 2.07                                   | 1.18                           | 1.51                   | 1.78            | 34       |  |
| 922220873   | 0                      | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       | 0                       | 15                   | 48.5                       | 1.44                           | 1.38                                   | 1.43                           | 1.36                   | 1.94            | 32       |  |
| 922221135   | 0                      | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 19       | 0                       | 5                    | 101.8                      | 1.93                           | 2.55                                   | 2.12                           | 1.63                   | 3.45            | 18       |  |
| 923240419   | 0                      | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       | 0                       | 4                    | 62.8                       | 0.79                           | 1.79                                   | 1.09                           | 1.41                   | 1.54            | 35       |  |
| 923241054   | 0                      | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       | 0                       | 15                   | 66.4                       | 2.48                           | 1.66                                   | 2.23                           | 1.49                   | 3.32            | 23       |  |
| 923260628   | 0                      | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 18       | 0                       | 18                   | 58.3                       | 3.00                           | 1.67                                   | 2.60                           | 1.33                   | 3.46            | 17       |  |
| 924650115   | 0                      | 17                   | 63.8                       | 2.53                           | 1.59                                   | 2.25                           | 1.53                   | 3.44            | 20       | 0                       | 17                   | 63.8                       | 2.53                           | 1.59                                   | 2.25                           | 1.53                   | 3.44            | 19       |  |
| 924651262   | 0                      | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       | 0                       | 17                   | 56.0                       | 1.70                           | 1.40                                   | 1.61                           | 1.69                   | 2.72            | 28       |  |
| 924661528   | 0                      | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 7        | 0                       | 8                    | 100.6                      | 3.75                           | 2.88                                   | 3.49                           | 1.31                   | 4.57            | 6        |  |
| 925630685   | 0                      | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       | 0                       | 3                    | 115.7                      | 1.42                           | 2.89                                   | 1.86                           | 1.69                   | 3.14            | 24       |  |
| 925660495   | 0                      | 30                   | 51.4                       | 3.51                           | 1.47                                   | 2.90                           | 1.35                   | 3.92            | 15       | 0                       | 30                   | 51.4                       | 3.51                           | 1.47                                   | 2.90                           | 1.35                   | 3.92            | 14       |  |
| 925661160   | 0                      | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       | 0                       | 9                    | 50.9                       | 0.61                           | 1.27                                   | 0.81                           | 1.63                   | 1.32            | 36       |  |
| 925661245   | 0                      | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       | 0                       | 3                    | 103.0                      | 1.18                           | 2.58                                   | 1.60                           | 1.55                   | 2.48            | 30       |  |
| 926540379   | 0                      | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 12       | 0                       | 16                   | 71.0                       | 3.10                           | 1.78                                   | 2.70                           | 1.53                   | 4.13            | 11       |  |
| 926540683   | 1                      | 20                   | 61.2                       | 3.74                           | 1.75                                   | 3.14                           | 1.25                   | 3.93            | 13       | 0                       | 20                   | 61.2                       | 3.74                           | 1.75                                   | 3.14                           | 1.25                   | 3.93            | 12       |  |
| 927430229   | 0                      | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 14       | 0                       | 6                    | 100.7                      | 2.28                           | 2.52                                   | 2.35                           | 1.67                   | 3.92            | 13       |  |
| 927451004   | 0                      | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       | 0                       | 7                    | 88.4                       | 2.67                           | 2.53                                   | 2.63                           | 1.3                    | 3.42            | 22       |  |
| 928330206   | 0                      | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 3        | 0                       | 8                    | 103.9                      | 3.19                           | 2.60                                   | 3.01                           | 1.57                   | 4.73            | 2        |  |
| 928330756   | 0                      | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       | 0                       | 7                    | 64.1                       | 1.06                           | 1.60                                   | 1.22                           | 1.57                   | 1.92            | 33       |  |
| 928330923   | 0                      | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       | 0                       | 39                   | 42.5                       | 2.08                           | 1.21                                   | 1.82                           | 1.2                    | 2.18            | 31       |  |
| 930320100   | 0                      | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 11       | 0                       | 6                    | 106.3                      | 2.49                           | 2.66                                   | 2.54                           | 1.65                   | 4.19            | 10       |  |
| 930351531   | 0                      | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 16       | 0                       | 34                   | 49.7                       | 3.57                           | 1.42                                   | 2.93                           | 1.22                   | 3.57            | 15       |  |
| 930360955   | 0                      | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 10       | 0                       | 20                   | 61.5                       | 3.78                           | 1.76                                   | 3.17                           | 1.33                   | 4.22            | 9        |  |
| 930361125   | 0                      | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       | 0                       | 4                    | 103.8                      | 1.59                           | 2.59                                   | 1.89                           | 1.57                   | 2.97            | 25       |  |
| 931331186   | 0                      | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 9        | 0                       | 16                   | 74.7                       | 3.47                           | 1.87                                   | 2.99                           | 1.46                   | 4.36            | 8        |  |
| 991102100   | 0                      | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 5        | 0                       | 12                   | 86.3                       | 3.47                           | 2.16                                   | 3.08                           | 1.51                   | 4.64            | 4        |  |
| Total: 92.2 |                        |                      |                            |                                | Average: 1.90                          |                                |                        |                 |          | Total: 91.2             |                      |                            |                                |                                        | Average: 1.89                  |                        |                 |          |  |

What is shown in Table B-7 is a multi-stage selection process. Each round only one additional class-block is being awarded to the school that has the highest ranking. For example, the very first class-block is given to Lorraine Banareng Primary School (#926540683) because it has the highest ranking of 6.51 in Table B-6, i.e. before the allocation. Then, once the first block is given to Lorraine Banareng Primary School, as shown in Table B-7, it means that the priority index of Lorraine Banareng Primary School declines to a level such that now another school takes the lead in ranking. Indeed, the second school-block must now be given to Kgatelopele Primary School (#991102100), which now has the highest PI of 6.19 and is on the top of the ranking list.

In turn, the second class-block given to Kgatelopele Primary School causes its priority index to decline and the top ranking shifts to Modubatse Secondary School (#918510651), which has the highest ranking with an index of 5.89. Thus, the third class-block goes to Modubatse Secondary School. The process is iteratively repeated until the whole available budget is allocated and all 20 class-blocks are assigned.

#### **B.4.2 Distribution of Funds**

The iterative allocation mechanism places each available class-block in a location that has the highest need for additional infrastructure. Table B-8 summarizes the allocation of 20 blocks that can be built with the current budget funds available. The distribution process follows the procedure in Table B-7.

**Table B-8. Distribution of 20 New Class-Blocks among Schools.**

| EMIS#     | Block being Allocated:<br>Max PI Observed: | #1<br>6.51 | #2<br>6.19 | #3<br>5.89 | #4<br>5.51 | #5<br>5.25 | #6<br>5.03 | #7<br>4.98 | #8<br>4.97 | #9<br>4.77 | #10<br>4.75 | #11<br>4.73 | #12<br>4.68 | #13<br>4.64 | #14<br>4.60 | #15<br>4.57 | #16<br>4.45 | #17<br>4.36 | #18<br>4.22 | #19<br>4.19 | #20<br>4.13 | Total | Initial PI<br>Ranking |
|-----------|--------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------|-----------------------|
| 901340425 | Motsheudi Sec.                             |            |            |            |            |            |            |            |            |            |             |             |             |             | 1           |             |             |             |             |             |             | 1     | 11                    |
| 901420031 | Bollanto Pri.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 37                    |
| 904220101 | Capricorn High                             |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 39                    |
| 904220415 | Laerskool Pietersburg Noord                |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 40                    |
| 904221326 | Pietersburg E M Pri.                       |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 38                    |
| 907130642 | Lekkerbreek Pri.                           |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 27                    |
| 911360252 | Matiyani Pri.                              |            |            |            |            |            |            |            |            |            | 1           |             |             |             |             |             |             |             |             |             |             | 1     | 9                     |
| 914450056 | Bhejani Pri.                               |            |            |            | 1          |            |            |            |            |            |             |             |             |             |             |             | 1           |             |             |             |             | 2     | 4                     |
| 915530341 | Vasasele Sec.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 19                    |
| 917420703 | Shiphamele Pri.                            |            |            |            |            |            |            |            |            | 1          |             |             |             |             |             |             |             |             |             |             |             | 1     | 8                     |
| 918510651 | Modubatse Sec.                             |            |            | 1          |            |            |            |            |            |            |             |             | 1           |             |             |             |             |             |             |             |             | 2     | 3                     |
| 918510699 | Mokope Senior Sec.                         |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 26                    |
| 918511029 | Metsi A- Phepha Pri.                       |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 29                    |
| 918511463 | Tlhapedi Pri.                              |            |            |            |            |            | 1          |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 1     | 6                     |
| 920211725 | Selaelo Pri.                               |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 34                    |
| 922220873 | Mmanare Sec.                               |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 32                    |
| 922221135 | Napo Pri.                                  |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 21                    |
| 923240419 | Makgalapane Pri.                           |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 35                    |
| 923241054 | Mountainveiw Sernior Sec.                  |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 23                    |
| 923260628 | Mamaolo Pri.                               |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 20                    |
| 924650115 | Mamphokgo Pri.                             |            |            |            |            |            |            | 1          |            |            |             |             |             |             |             |             |             |             |             |             |             | 1     | 7                     |
| 924651262 | Phokanoka High                             |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 28                    |
| 924661528 | Ngwanamatlang Sec.                         |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             | 1           |             |             |             |             | 1     | 12                    |
| 925630685 | Tshililo Sec.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 24                    |
| 925660495 | Malegale Pri.                              |            |            |            |            | 1          |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 1     | 5                     |
| 925661160 | Sebase Sec.                                |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 36                    |
| 925661245 | Serageng Pri.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 30                    |
| 926540379 | Rakgolokwana Sec.                          |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             | 1           | 1     | 16                    |
| 926540683 | Lorraine Banareng Pri.                     | 1          |            |            |            |            |            |            | 1          |            |             |             |             |             |             |             |             |             |             |             |             | 2     | 1                     |
| 927430229 | Hloala Chiloane Pri.                       |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 17                    |
| 927451004 | Tamajane Senior Sec.                       |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 22                    |
| 928330206 | Mutuwaafhethu Pri.                         |            |            |            |            |            |            |            |            |            |             | 1           |             |             |             |             |             |             |             |             |             | 1     | 10                    |
| 928330756 | Makumbwi Pri.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 33                    |
| 928330923 | Patrick Ramaano Sec.                       |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 31                    |
| 930320100 | Manamani Pri.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             | 1           |             | 1     | 15                    |
| 930351531 | Tshivhase Sec.                             |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 18                    |
| 930360955 | Mpandeli Sec.                              |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             | 1           |             |             | 1     | 14                    |
| 930361125 | Mmbofheni Pri.                             |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 0     | 25                    |
| 931331186 | Djunane Pri.                               |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             | 1           |             |             |             | 1     | 13                    |
| 991102100 | Kgatelopele Pri.                           |            | 1          |            |            |            |            |            |            |            |             |             |             | 1           |             |             |             |             |             |             |             | 2     | 2                     |
|           |                                            |            |            |            |            |            |            |            |            |            |             |             |             |             |             |             |             |             |             |             |             | 20    |                       |

In order to see the achievements clearly, Table B-8 should be sorted out in accordance with the initial ranking before the allocation. Thus, Table B-9 is derived, which shows the distribution of 20 new class-blocks according to the initial priority ranking.

**Table B-9. Allocation of 20 New Class-Blocks According to Priority Index.**

| EMIS#                    | School                         | Total     | Initial PI Ranking |
|--------------------------|--------------------------------|-----------|--------------------|
| 926540683                | Lorraine Banareng Primary      | 2         | 1                  |
| 991102100                | Kgatelopele Primary            | 2         | 2                  |
| 918510651                | Modubatse Secondary            | 2         | 3                  |
| 914450056                | Bhejani Primary                | 2         | 4                  |
| 925660495                | Malegale Primary               | 1         | 5                  |
| 918511463                | Tlhapedi Primary               | 1         | 6                  |
| 924650115                | Mamphokgo Primary              | 1         | 7                  |
| 917420703                | Shiphamele Primary             | 1         | 8                  |
| 911360252                | Matiyani Primary               | 1         | 9                  |
| 928330206                | Mutuwafhethu Primary           | 1         | 10                 |
| 901340425                | Motsheudi Secondary            | 1         | 11                 |
| 924661528                | Ngwanamatlang Secondary        | 1         | 12                 |
| 931331186                | Djunane Primary                | 1         | 13                 |
| 930360955                | Mpandeli Secondary             | 1         | 14                 |
| 930320100                | Manamani Primary               | 1         | 15                 |
| 926540379                | Rakgolokwana Secondary         | 1         | 16                 |
| 927430229                | Hloala Chiloane Primary        | 0         | 17                 |
| 930351531                | Tshivhase Secondary            | 0         | 18                 |
| 915530341                | Vasasele Secondary             | 0         | 19                 |
| 923260628                | Mamaolo Primary                | 0         | 20                 |
| 922221135                | Napo Primary                   | 0         | 21                 |
| 927451004                | Tamajane Senior Secondary      | 0         | 22                 |
| 923241054                | Mountainveiw Sernior Secondary | 0         | 23                 |
| 925630685                | Tshililo Secondary             | 0         | 24                 |
| 930361125                | Mmbofheni Primary              | 0         | 25                 |
| 918510699                | Mokope Senior Secondary        | 0         | 26                 |
| 907130642                | Lekkerbreek Primary            | 0         | 27                 |
| 924651262                | Phokanoka High                 | 0         | 28                 |
| 918511029                | Metsi A- Phepha Primary        | 0         | 29                 |
| 925661245                | Serageng Primary               | 0         | 30                 |
| 928330923                | Patrick Ramaano Secondary      | 0         | 31                 |
| 922220873                | Mmanare Secondary              | 0         | 32                 |
| 928330756                | Makumbwi Primary               | 0         | 33                 |
| 920211725                | Selaelo Primary                | 0         | 34                 |
| 923240419                | Makgalapane Primary            | 0         | 35                 |
| 925661160                | Sebase Secondary               | 0         | 36                 |
| 901420031                | Bollanto Primary               | 0         | 37                 |
| 904221326                | Pietersburg E M Primary        | 0         | 38                 |
| 904220101                | Capricorn High                 | 0         | 39                 |
| 904220415                | Laerskool Pietersburg Noord    | 0         | 40                 |
| <b>Total New Blocks:</b> |                                | <b>20</b> |                    |

Hence, the optimal allocation of 20 class-blocks that maximizes the impact on the identified infrastructure needs is such that the first four schools on the initial priority ranking list should receive two new blocks each. The remaining 12 blocks should be given to schools ranking from place five to place sixteen on the initial priority list. This allocation exhausts the funds available for this budget period. For the next period, the computation of school priority index must be repeated based on regularly updated information on schools' infrastructure and enrollment.

## **B.5 Rehabilitation Priority Index**

### **B.5.1 Data Requirements**

To facilitate the selection process of identified rehabilitation sites, the Department management should have a clear idea about the condition of identified damaged buildings and their estimated rehabilitation costs. In fact, such information is routinely received from the Department of Public Works on the request of the Department of Education. The existing system is such that the Department of Education collects data from schools and district offices and every year a list of damaged buildings is compiled for each provincial district. The list is then forwarded to the Department of Public Works in order to carry out physical assessment and to establish a cost estimate for each identified site. Once the assessment teams send their reports back to the Department of Education, the management selects the sites for rehabilitation subject to the amount of available budget funds.

The information received from assessment teams could be presented in a form that shown in Table B-10. This table shows the condition and estimated repair costs for each identified damaged class-room in a school. In fact, some school may have several damaged buildings and these should be treated separately because their rehabilitation costs are likely to be different. The building condition of class-rooms in Table B-10 is linked to the condition of class-rooms (field 15121) of the EMIS database. Due to data constraint, the number of damaged class-rooms in schools and their repair costs estimates are assumed.

**Table B-10. Damaged Class-rooms and Estimated Rehabilitation Costs.**

| Emis Number   | SchoolName                  | Class A            |                   | Class B            |                   | Class C            |                   | Class D            |                   | Class E            |                   | Class F            |                   | Class G            |                   | Total           |                  |
|---------------|-----------------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|-----------------|------------------|
|               |                             | Rehab Cost Class A | Condition Class A | Rehab Cost Class B | Condition Class B | Rehab Cost Class C | Condition Class C | Rehab Cost Class D | Condition Class D | Rehab Cost Class E | Condition Class E | Rehab Cost Class F | Condition Class F | Rehab Cost Class G | Condition Class G | # of Classrooms | Total Rehab Cost |
| 901340425     | Motsheudi Sec.              | 60                 | 2                 | 70                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 2               | 130              |
| 901420031     | Bollanto Pri.               |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 904220101     | Capricorn High              |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 904220415     | Laerskool Pietersburg Noord | 50                 | 2                 | 75                 | 2                 | 65                 | 2                 | 70                 | 2                 | 55                 | 2                 |                    |                   |                    |                   | 5               | 315              |
| 904221326     | Pietersburg E M Pri.        |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 907130642     | Lekkerbreek Pri.            |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 911360252     | Matiyani Pri.               | 70                 | 2                 | 65                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 2               | 135              |
| 914450056     | Bhejani Pri.                | 60                 | 2                 | 55                 | 2                 | 70                 | 2                 | 50                 | 2                 |                    |                   |                    |                   |                    |                   | 4               | 235              |
| 915530341     | Vasasele Sec.               |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 917420703     | Shiphamele Pri.             |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 918510651     | Modubatse Sec.              |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 918510699     | Mokope Senior Sec.          |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 918511029     | Metsi A- Phepha Pri.        | 70                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 70               |
| 918511463     | Tlhapedi Pri.               |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 920211725     | Selaelo Pri.                |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 922220873     | Mmanare Sec.                | 45                 | 2                 | 55                 | 2                 | 70                 | 2                 | 60                 | 2                 |                    |                   |                    |                   |                    |                   | 4               | 230              |
| 922221135     | Napo Pri.                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 923240419     | Makgalapane Pri.            | 95                 | 1                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 95               |
| 923241054     | Mountainveiw Sernior Sec.   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 923260628     | Mamaolo Pri.                |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 924650115     | Mamphokgo Pri.              |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 924651262     | Phokanoka High              | 60                 | 2                 | 50                 | 2                 | 45                 | 2                 | 75                 | 2                 |                    |                   |                    |                   |                    |                   | 4               | 230              |
| 924661528     | Ngwanamatlang Sec.          |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 925630685     | Tshililo Sec.               | 90                 | 1                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 90               |
| 925660495     | Malegale Pri.               | 80                 | 1                 | 90                 | 1                 | 100                | 1                 | 95                 | 1                 | 85                 | 1                 | 105                | 1                 |                    |                   | 6               | 555              |
| 925661160     | Sebase Sec.                 | 85                 | 1                 | 100                | 1                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 2               | 185              |
| 925661245     | Serageng Pri.               | 75                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 75               |
| 926540379     | Rakgolokwana Sec.           | 40                 | 2                 | 55                 | 2                 | 60                 | 2                 | 50                 | 2                 |                    |                   |                    |                   |                    |                   | 4               | 205              |
| 926540683     | Lorraine Banareng Pri.      | 80                 | 1                 | 75                 | 1                 | 90                 | 1                 |                    |                   |                    |                   |                    |                   |                    |                   | 3               | 245              |
| 927430229     | Hloala Chiloane Pri.        | 85                 | 1                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 85               |
| 927451004     | Tamajane Senior Sec.        |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 928330206     | Mutuwaafhethu Pri.          |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 928330756     | Makumbwi Pri.               | 50                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 50               |
| 928330923     | Patrick Ramaano Sec.        |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 930320100     | Manamani Pri.               | 45                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 45               |
| 930351531     | Tshivhase Sec.              |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 930360955     | Mpandeli Sec.               |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 930361125     | Mmbofheni Pri.              | 55                 | 2                 |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 1               | 55               |
| 931331186     | Djunane Pri.                |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| 991102100     | Kgatelopele Pri.            |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | 0               | 0                |
| <b>Total:</b> |                             |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   |                    |                   | <b>44</b>       | <b>3,030</b>     |

Thus, this table suggests that Motsheudi Secondary School (#901340425) has two damaged class-rooms, both are in condition “2”, but one costs R 60,000 to rehabilitate, and the second is R 70,000. Obviously, some schools may have a large number of damaged buildings while others will not have any in condition “1” or “2”. The total number of damaged of class-rooms is 44, or 11 class-blocks. The total budget required to finance all repair works is R 3.03 million.

### **B.5.2 Relative Rehabilitation Costs**

Following the classification of damaged class-rooms in Table B-10, the class-room information is presented in Table B-11 where their relative rehabilitation costs are estimated. The present value of future replacement cost depends on the current condition of the class-room. As discussed in Section 3.2.3, if a class-room is in condition “1” then its present-day equivalent of replacement cost in 1 year is R 69,200, while condition “2” will require a replacement in 4 years which worth today R 94,600.

These two benchmarks are used to estimate the relative cost of rehabilitation, which is simply a ratio of the estimated repair cost over the relevant PV of future replacement cost. If the resulting ratio is above one then it means that the rehabilitation is more expensive than building a new class-room in the future, while a ratio lower than one means that the required repair works cost less than building a new room.

For example, class A of Motsheudi Secondary School (#901340425) is currently in condition “2” and its estimated rehabilitation costs are R 60,000. The PV of its future replacement cost is R 69,200, and therefore the relative rehabilitation cost is 0.87. Class B at the same school has a relative cost of 1.01 because its estimated rehabilitation cost is R 70,000. The most expensive relative cost of 1.11 is associated with class F in Malegale Primary School (#925660495). The cheapest relative cost of 0.58 is observed for class A of Rakgolokwana Secondary School (#926540379).

However, the relative cost alone does not really allow us to prioritize among schools. The limited size of rehabilitation budget forces the management to make hard choices in selection of rehabilitation sites. Obviously, the rehabilitation selection procedure

should be somehow linked not only to costs but also to the school overall priority for additional infrastructure. Next section deals with this issue.

**Table B-11. Estimation of Relative Rehabilitation Cost.**

| School    | Class-room        | Condition | Rehab Cost<br>(R '000s) | PV of Replacement<br>(R '000s) | Rehab Cost / PV<br>of Replacement |
|-----------|-------------------|-----------|-------------------------|--------------------------------|-----------------------------------|
| 901340425 | 901340425.Class A | 2         | 60.0                    | 69.2                           | <b>0.87</b>                       |
| 901340425 | 901340425.Class B | 2         | 70.0                    | 69.2                           | <b>1.01</b>                       |
| 904220415 | 904220415.Class A | 2         | 50.0                    | 69.2                           | <b>0.72</b>                       |
| 904220415 | 904220415.Class B | 2         | 75.0                    | 69.2                           | <b>1.08</b>                       |
| 904220415 | 904220415.Class C | 2         | 65.0                    | 69.2                           | <b>0.94</b>                       |
| 904220415 | 904220415.Class D | 2         | 70.0                    | 69.2                           | <b>1.01</b>                       |
| 904220415 | 904220415.Class E | 2         | 55.0                    | 69.2                           | <b>0.80</b>                       |
| 911360252 | 911360252.Class A | 2         | 70.0                    | 69.2                           | <b>1.01</b>                       |
| 911360252 | 911360252.Class B | 2         | 65.0                    | 69.2                           | <b>0.94</b>                       |
| 914450056 | 914450056.Class A | 2         | 60.0                    | 69.2                           | <b>0.87</b>                       |
| 914450056 | 914450056.Class B | 2         | 55.0                    | 69.2                           | <b>0.80</b>                       |
| 914450056 | 914450056.Class C | 2         | 70.0                    | 69.2                           | <b>1.01</b>                       |
| 914450056 | 914450056.Class D | 2         | 50.0                    | 69.2                           | <b>0.72</b>                       |
| 918511029 | 918511029.Class A | 2         | 70.0                    | 69.2                           | <b>1.01</b>                       |
| 922220873 | 922220873.Class A | 2         | 45.0                    | 69.2                           | <b>0.65</b>                       |
| 922220873 | 922220873.Class B | 2         | 55.0                    | 69.2                           | <b>0.80</b>                       |
| 922220873 | 922220873.Class C | 2         | 70.0                    | 69.2                           | <b>1.01</b>                       |
| 922220873 | 922220873.Class D | 2         | 60.0                    | 69.2                           | <b>0.87</b>                       |
| 923240419 | 923240419.Class A | 1         | 95.0                    | 94.6                           | <b>1.00</b>                       |
| 924651262 | 924651262.Class A | 2         | 60.0                    | 69.2                           | <b>0.87</b>                       |
| 924651262 | 924651262.Class B | 2         | 50.0                    | 69.2                           | <b>0.72</b>                       |
| 924651262 | 924651262.Class C | 2         | 45.0                    | 69.2                           | <b>0.65</b>                       |
| 924651262 | 924651262.Class D | 2         | 75.0                    | 69.2                           | <b>1.08</b>                       |
| 925630685 | 925630685.Class A | 1         | 90.0                    | 94.6                           | <b>0.95</b>                       |
| 925660495 | 925660495.Class A | 1         | 80.0                    | 94.6                           | <b>0.85</b>                       |
| 925660495 | 925660495.Class B | 1         | 90.0                    | 94.6                           | <b>0.95</b>                       |
| 925660495 | 925660495.Class C | 1         | 100.0                   | 94.6                           | <b>1.06</b>                       |
| 925660495 | 925660495.Class D | 1         | 95.0                    | 94.6                           | <b>1.00</b>                       |
| 925660495 | 925660495.Class E | 1         | 85.0                    | 94.6                           | <b>0.90</b>                       |
| 925660495 | 925660495.Class F | 1         | 105.0                   | 94.6                           | <b>1.11</b>                       |
| 925661160 | 925661160.Class A | 1         | 85.0                    | 94.6                           | <b>0.90</b>                       |
| 925661160 | 925661160.Class B | 1         | 100.0                   | 94.6                           | <b>1.06</b>                       |
| 925661245 | 925661245.Class A | 2         | 75.0                    | 69.2                           | <b>1.08</b>                       |
| 926540379 | 926540379.Class A | 2         | 40.0                    | 69.2                           | <b>0.58</b>                       |
| 926540379 | 926540379.Class B | 2         | 55.0                    | 69.2                           | <b>0.80</b>                       |
| 926540379 | 926540379.Class C | 2         | 60.0                    | 69.2                           | <b>0.87</b>                       |
| 926540379 | 926540379.Class D | 2         | 50.0                    | 69.2                           | <b>0.72</b>                       |
| 926540683 | 926540683.Class A | 1         | 80.0                    | 94.6                           | <b>0.85</b>                       |
| 926540683 | 926540683.Class B | 1         | 75.0                    | 94.6                           | <b>0.79</b>                       |
| 926540683 | 926540683.Class C | 1         | 90.0                    | 94.6                           | <b>0.95</b>                       |
| 927430229 | 927430229.Class A | 1         | 85.0                    | 94.6                           | <b>0.90</b>                       |
| 928330756 | 928330756.Class A | 2         | 50.0                    | 69.2                           | <b>0.72</b>                       |
| 930320100 | 930320100.Class A | 2         | 45.0                    | 69.2                           | <b>0.65</b>                       |
| 930361125 | 930361125.Class A | 2         | 55.0                    | 69.2                           | <b>0.80</b>                       |

### **B.5.3 Impact of Loss of a Damaged Building on School Priority**

In order to rank schools requiring rehabilitation according to priority index, we need to compare the priority index for alternative schools in a simulated situation when a damaged building is lost. The school priority index in its present form is not relevant

for such comparison, because it does not account for a loss of damaged building. Table B-12 shows a simulation in which one class-room is deducted from each school and resulting school priority index is estimated. Clearly, schools with high enrollment and small number of buildings are affected the worst.

**Table B-12. Impact of Loss of a Damaged Class-room on School Priority Index.**

| Emis Number | SchoolName                  | Currently Available Classrooms | Removing One Classroom | Remaining Classrooms | Learner-to-Classroom Ratio | Resulting Class-blocks Backlog | Learner-to-Classroom Ratio/Target Size | Infrastructure Adequacy Score: | Augmenting Adjustment: | School Priority Index: |
|-------------|-----------------------------|--------------------------------|------------------------|----------------------|----------------------------|--------------------------------|----------------------------------------|--------------------------------|------------------------|------------------------|
| 901340425   | Motsheudi Sec.              | 13                             | 1                      | 12                   | 84.4                       | 4.2                            | 2.41                                   | 3.69                           | 1.33                   | 4.91                   |
| 901420031   | Bollanto Pri.               | 13                             | 1                      | 12                   | 30.1                       | 0.0                            | 0.75                                   | 0.23                           | 1.47                   | 0.33                   |
| 904220101   | Capricorn High              | 40                             | 1                      | 39                   | 23.6                       | 0.0                            | 0.59                                   | 0.18                           | 1.25                   | 0.22                   |
| 904220415   | Laerskool Pietersburg Noord | 29                             | 1                      | 28                   | 24.6                       | 0.0                            | 0.70                                   | 0.21                           | 1.02                   | 0.22                   |
| 904221326   | Pietersburg E M Pri.        | 33                             | 1                      | 32                   | 32.5                       | 0.0                            | 0.93                                   | 0.28                           | 1.00                   | 0.28                   |
| 907130642   | Lekkerbreek Pri.            | 4                              | 1                      | 3                    | 136.3                      | 1.8                            | 3.41                                   | 2.29                           | 1.49                   | 3.41                   |
| 911360252   | Matiyani Pri.               | 10                             | 1                      | 9                    | 104.4                      | 3.6                            | 2.61                                   | 3.32                           | 1.55                   | 5.15                   |
| 914450056   | Bhejani Pri.                | 18                             | 1                      | 17                   | 79.7                       | 5.4                            | 2.28                                   | 4.48                           | 1.29                   | 5.78                   |
| 915530341   | Vasasele Sec.               | 15                             | 1                      | 14                   | 69.1                       | 3.4                            | 1.97                                   | 2.98                           | 1.27                   | 3.78                   |
| 917420703   | Shiphamele Pri.             | 17                             | 1                      | 16                   | 72.2                       | 4.3                            | 2.06                                   | 3.59                           | 1.41                   | 5.07                   |
| 918510651   | Modubatse Sec.              | 18                             | 1                      | 17                   | 87.2                       | 5.0                            | 2.18                                   | 4.16                           | 1.49                   | 6.20                   |
| 918510699   | Mokope Senior Sec.          | 11                             | 1                      | 10                   | 78.9                       | 2.4                            | 1.97                                   | 2.29                           | 1.35                   | 3.10                   |
| 918511029   | Metsi A- Phepha Pri.        | 3                              | 1                      | 2                    | 187.5                      | 2.2                            | 5.36                                   | 3.13                           | 1.12                   | 3.51                   |
| 918511463   | Tlhapedi Pri.               | 11                             | 1                      | 10                   | 99.1                       | 3.7                            | 2.48                                   | 3.33                           | 1.63                   | 5.43                   |
| 920211725   | Selaelo Pri.                | 3                              | 1                      | 2                    | 124.0                      | 1.1                            | 3.10                                   | 1.67                           | 1.51                   | 2.51                   |
| 922220873   | Mmanare Sec.                | 15                             | 1                      | 14                   | 51.9                       | 1.7                            | 1.48                                   | 1.63                           | 1.36                   | 2.22                   |
| 922221135   | Napo Pri.                   | 5                              | 1                      | 4                    | 127.3                      | 2.2                            | 3.18                                   | 2.48                           | 1.63                   | 4.04                   |
| 923240419   | Makgalapane Pri.            | 4                              | 1                      | 3                    | 83.7                       | 1.0                            | 2.39                                   | 1.45                           | 1.41                   | 2.04                   |
| 923241054   | Mountainveiw Senior Sec.    | 15                             | 1                      | 14                   | 71.1                       | 2.7                            | 1.78                                   | 2.44                           | 1.49                   | 3.64                   |
| 923260628   | Mamaolo Pri.                | 18                             | 1                      | 17                   | 61.8                       | 3.3                            | 1.76                                   | 2.80                           | 1.33                   | 3.73                   |
| 924650115   | Mamphoko Pri.               | 13                             | 1                      | 12                   | 90.3                       | 3.8                            | 2.26                                   | 3.32                           | 1.61                   | 5.35                   |
| 924651262   | Phokanoka High              | 17                             | 1                      | 16                   | 59.5                       | 2.0                            | 1.49                                   | 1.81                           | 1.69                   | 3.06                   |
| 924661528   | Ngwanamatlang Sec.          | 8                              | 1                      | 7                    | 115.0                      | 4.0                            | 3.29                                   | 3.79                           | 1.31                   | 4.96                   |
| 925630685   | Tshililo Sec.               | 3                              | 1                      | 2                    | 173.5                      | 1.7                            | 4.34                                   | 2.47                           | 1.69                   | 4.17                   |
| 925660495   | Malegale Pri.               | 26                             | 1                      | 25                   | 61.7                       | 4.8                            | 1.76                                   | 3.86                           | 1.43                   | 5.53                   |
| 925661160   | Sebase Sec.                 | 9                              | 1                      | 8                    | 57.3                       | 0.9                            | 1.43                                   | 1.03                           | 1.63                   | 1.68                   |
| 925661245   | Serageng Pri.               | 3                              | 1                      | 2                    | 154.5                      | 1.4                            | 3.86                                   | 2.16                           | 1.55                   | 3.35                   |
| 926540379   | Rakgolokwana Sec.           | 16                             | 1                      | 15                   | 75.7                       | 3.4                            | 1.89                                   | 2.91                           | 1.53                   | 4.46                   |
| 926540683   | Lorraine Banareng Pri.      | 12                             | 1                      | 11                   | 111.3                      | 6.0                            | 3.18                                   | 5.15                           | 1.33                   | 6.85                   |
| 927430229   | Hloala Chiloane Pri.        | 6                              | 1                      | 5                    | 120.8                      | 2.5                            | 3.02                                   | 2.67                           | 1.67                   | 4.46                   |
| 927451004   | Tamajane Senior Sec.        | 7                              | 1                      | 6                    | 103.2                      | 2.9                            | 2.95                                   | 2.93                           | 1.30                   | 3.81                   |
| 928330206   | Mutuwaefhethu Pri.          | 8                              | 1                      | 7                    | 118.7                      | 3.4                            | 2.97                                   | 3.30                           | 1.57                   | 5.18                   |
| 928330756   | Makumbwi Pri.               | 7                              | 1                      | 6                    | 74.8                       | 1.3                            | 1.87                                   | 1.48                           | 1.57                   | 2.32                   |
| 928330923   | Patrick Ramaano Sec.        | 39                             | 1                      | 38                   | 43.6                       | 2.3                            | 1.25                                   | 2.00                           | 1.20                   | 2.40                   |
| 930320100   | Manamani Pri.               | 6                              | 1                      | 5                    | 127.6                      | 2.7                            | 3.19                                   | 2.87                           | 1.65                   | 4.74                   |
| 930351531   | Tshivhase Sec.              | 34                             | 1                      | 33                   | 51.2                       | 3.8                            | 1.46                                   | 3.11                           | 1.22                   | 3.80                   |
| 930360955   | Mpandeli Sec.               | 20                             | 1                      | 19                   | 64.7                       | 4.0                            | 1.85                                   | 3.37                           | 1.33                   | 4.49                   |
| 930361125   | Mmbofheni Pri.              | 4                              | 1                      | 3                    | 138.3                      | 1.8                            | 3.46                                   | 2.33                           | 1.57                   | 3.66                   |
| 931331186   | Djunane Pri.                | 16                             | 1                      | 15                   | 79.7                       | 3.7                            | 1.99                                   | 3.20                           | 1.46                   | 4.67                   |
| 991102100   | Kgatelopele Pri.            | 8                              | 1                      | 7                    | 147.9                      | 4.7                            | 3.70                                   | 4.41                           | 1.51                   | 6.66                   |

The mechanism that is used in this simulation is basically the same as described in Section 3.2.3 above. The number of currently available class-rooms at each school is reduced by one class-room in order to see what the resulting school priority index would be. The augmenting factors are assumed to remain the same as initially estimated in Table B-3. The resulting school priority index shows the impact of loss of a damaged

class-room in present situation. However, the loss of a particular class-room is a future possibility, which is expected to happen in 1 year for buildings in condition “1” and in 4 years for buildings in condition “2”. Therefore, to reflect the future priority index in present-day terms, this school priority index must be discounted back by 1 and 4 periods for buildings in condition “1” and “2”, respectively. Table B-13 shows how the index discounting takes place for all identified damaged class-rooms.

**Table B-13. Estimation of PV of Future School Priority Index.**

| School    | Class-room        | Condition | Future PI without a Classroom | PV of Future PI |
|-----------|-------------------|-----------|-------------------------------|-----------------|
| 901340425 | 901340425.Class A | 2         | 4.91                          | 3.23            |
| 901340425 | 901340425.Class B | 2         | 4.91                          | 3.23            |
| 904220415 | 904220415.Class A | 2         | 0.22                          | 0.14            |
| 904220415 | 904220415.Class B | 2         | 0.22                          | 0.14            |
| 904220415 | 904220415.Class C | 2         | 0.22                          | 0.14            |
| 904220415 | 904220415.Class D | 2         | 0.22                          | 0.14            |
| 904220415 | 904220415.Class E | 2         | 0.22                          | 0.14            |
| 911360252 | 911360252.Class A | 2         | 5.15                          | 3.39            |
| 911360252 | 911360252.Class B | 2         | 5.15                          | 3.39            |
| 914450056 | 914450056.Class A | 2         | 5.78                          | 3.81            |
| 914450056 | 914450056.Class B | 2         | 5.78                          | 3.81            |
| 914450056 | 914450056.Class C | 2         | 5.78                          | 3.81            |
| 914450056 | 914450056.Class D | 2         | 5.78                          | 3.81            |
| 918511029 | 918511029.Class A | 2         | 3.51                          | 2.31            |
| 922220873 | 922220873.Class A | 2         | 2.22                          | 1.46            |
| 922220873 | 922220873.Class B | 2         | 2.22                          | 1.46            |
| 922220873 | 922220873.Class C | 2         | 2.22                          | 1.46            |
| 922220873 | 922220873.Class D | 2         | 2.22                          | 1.46            |
| 923240419 | 923240419.Class A | 1         | 2.04                          | 1.84            |
| 924651262 | 924651262.Class A | 2         | 3.06                          | 2.02            |
| 924651262 | 924651262.Class B | 2         | 3.06                          | 2.02            |
| 924651262 | 924651262.Class C | 2         | 3.06                          | 2.02            |
| 924651262 | 924651262.Class D | 2         | 3.06                          | 2.02            |
| 925630685 | 925630685.Class A | 1         | 4.17                          | 3.76            |
| 925660495 | 925660495.Class A | 1         | 5.53                          | 4.98            |
| 925660495 | 925660495.Class B | 1         | 5.53                          | 4.98            |
| 925660495 | 925660495.Class C | 1         | 5.53                          | 4.98            |
| 925660495 | 925660495.Class D | 1         | 5.53                          | 4.98            |
| 925660495 | 925660495.Class E | 1         | 5.53                          | 4.98            |
| 925660495 | 925660495.Class F | 1         | 5.53                          | 4.98            |
| 925661160 | 925661160.Class A | 1         | 1.68                          | 1.52            |
| 925661160 | 925661160.Class B | 1         | 1.68                          | 1.52            |
| 925661245 | 925661245.Class A | 2         | 3.35                          | 2.21            |
| 926540379 | 926540379.Class A | 2         | 4.46                          | 2.94            |
| 926540379 | 926540379.Class B | 2         | 4.46                          | 2.94            |
| 926540379 | 926540379.Class C | 2         | 4.46                          | 2.94            |
| 926540379 | 926540379.Class D | 2         | 4.46                          | 2.94            |
| 926540683 | 926540683.Class A | 1         | 6.85                          | 6.17            |
| 926540683 | 926540683.Class B | 1         | 6.85                          | 6.17            |
| 926540683 | 926540683.Class C | 1         | 6.85                          | 6.17            |
| 927430229 | 927430229.Class A | 1         | 4.46                          | 4.02            |
| 928330756 | 928330756.Class A | 2         | 2.32                          | 1.53            |
| 930320100 | 930320100.Class A | 2         | 4.74                          | 3.12            |
| 930361125 | 930361125.Class A | 2         | 3.66                          | 2.41            |

The column with the future school priority index is taken directly from Table B-12, which already estimated PI without a class-room for every school in the sample. Then, that PI is discounted by the economic opportunity cost of capital back into 1 period for buildings in condition “1” and into 4 periods for buildings in condition “2”. For example, class A of Motsheudi Secondary School (#901340425) is currently in condition “2” and its current PI without one class-room is 4.91. The present value of this index in 4 years is estimated as 3.23 ( $= 4.91 / [(1 + 11.0\%)^4]$ ).

#### **B.5.4 Rehabilitation Priority Index**

Section 3.2.5 already introduced the concept of “rehabilitation priority index”, which should be computed for each identified damaged class-room. It is defined as the PV of the school priority index without a class-room divided by the relative cost of rehabilitation of that particular class-room. The index effectively matches the cost aspect of rehabilitation and the need of the school for additional infrastructure. Table B-14 shows the estimation of estimation of rehabilitation priority index for each damaged class-room.

This table is built using the results of the preceding Table B-11 and Table B-13. The “costs” panel shows the relative cost of rehabilitation to the present value of future cost of class-room replacement, as computed in Table B-11. The “priority” section is taken directly from Table B-13, and shows the resulting PV of the school’s priority index without a damaged class-room discounted to the base year 2004. The last “ranking” panel consists of two items: the rehabilitation priority index and class-room ranking. The rehabilitation priority index is obtained as the PV of the school’s priority index without a class-room divided by the relative rehabilitation cost.

For example, class A of Motsheudi Secondary School (#901340425) is currently in condition “2” and to remain functional, it requires an immediate expense of R 60,000 otherwise this class-room will become totally useless in 4 years. Because the PV of the replacement in 4 years is estimated as R 69,200, Table B-11 suggests that the relative rehabilitation cost of this class-room now is only 0.87 times of its replacement cost in the future. At the same time, if Motsheudi Secondary School (to which this class-room belongs) suffers a loss of this or any other class-room then its current priority index would rise from its current level of 4.60 (Table B-6) to 4.91 (Table B-12). However,

because this particular class-room without any repair is expected, on the average, to serve additional 4 years, this school PI should be discounted back to reflect its lower importance in the future. Thus, Table 12 shows that the 4.91 school priority index in a 4-year time will be equivalent to only 3.23 in its present-day value. Then, the rehabilitation priority index for class A of Motsheudi Secondary School is now estimated as 3.73.<sup>28</sup>

**Table B-14. Estimation of Rehabilitation Priority Index and Ranking.**

| School    | Class-room        | Condition | Rehab Cost / PV of Replacement | PV of Future PI | Rehabilitation Priority Index | Rehabilitation Ranking |
|-----------|-------------------|-----------|--------------------------------|-----------------|-------------------------------|------------------------|
| 901340425 | 901340425.Class A | 2         | 0.87                           | 3.23            | 3.73                          | 19                     |
| 901340425 | 901340425.Class B | 2         | 1.01                           | 3.23            | 3.19                          | 24                     |
| 904220415 | 904220415.Class A | 2         | 0.72                           | 0.14            | 0.20                          | 40                     |
| 904220415 | 904220415.Class B | 2         | 1.08                           | 0.14            | 0.13                          | 44                     |
| 904220415 | 904220415.Class C | 2         | 0.94                           | 0.14            | 0.15                          | 42                     |
| 904220415 | 904220415.Class D | 2         | 1.01                           | 0.14            | 0.14                          | 43                     |
| 904220415 | 904220415.Class E | 2         | 0.80                           | 0.14            | 0.18                          | 41                     |
| 911360252 | 911360252.Class A | 2         | 1.01                           | 3.39            | 3.35                          | 23                     |
| 911360252 | 911360252.Class B | 2         | 0.94                           | 3.39            | 3.61                          | 21                     |
| 914450056 | 914450056.Class A | 2         | 0.87                           | 3.81            | 4.39                          | 15                     |
| 914450056 | 914450056.Class B | 2         | 0.80                           | 3.81            | 4.79                          | 11                     |
| 914450056 | 914450056.Class C | 2         | 1.01                           | 3.81            | 3.76                          | 18                     |
| 914450056 | 914450056.Class D | 2         | 0.72                           | 3.81            | 5.27                          | 6                      |
| 918511029 | 918511029.Class A | 2         | 1.01                           | 2.31            | 2.28                          | 29                     |
| 922220873 | 922220873.Class A | 2         | 0.65                           | 1.46            | 2.24                          | 30                     |
| 922220873 | 922220873.Class B | 2         | 0.80                           | 1.46            | 1.84                          | 34                     |
| 922220873 | 922220873.Class C | 2         | 1.01                           | 1.46            | 1.44                          | 38                     |
| 922220873 | 922220873.Class D | 2         | 0.87                           | 1.46            | 1.68                          | 37                     |
| 923240419 | 923240419.Class A | 1         | 1.00                           | 1.84            | 1.83                          | 35                     |
| 924651262 | 924651262.Class A | 2         | 0.87                           | 2.02            | 2.32                          | 28                     |
| 924651262 | 924651262.Class B | 2         | 0.72                           | 2.02            | 2.79                          | 27                     |
| 924651262 | 924651262.Class C | 2         | 0.65                           | 2.02            | 3.10                          | 25                     |
| 924651262 | 924651262.Class D | 2         | 1.08                           | 2.02            | 1.86                          | 33                     |
| 925630685 | 925630685.Class A | 1         | 0.95                           | 3.76            | 3.95                          | 17                     |
| 925660495 | 925660495.Class A | 1         | 0.85                           | 4.98            | 5.89                          | 4                      |
| 925660495 | 925660495.Class B | 1         | 0.95                           | 4.98            | 5.23                          | 7                      |
| 925660495 | 925660495.Class C | 1         | 1.06                           | 4.98            | 4.71                          | 12                     |
| 925660495 | 925660495.Class D | 1         | 1.00                           | 4.98            | 4.96                          | 9                      |
| 925660495 | 925660495.Class E | 1         | 0.90                           | 4.98            | 5.54                          | 5                      |
| 925660495 | 925660495.Class F | 1         | 1.11                           | 4.98            | 4.48                          | 13                     |
| 925661160 | 925661160.Class A | 1         | 0.90                           | 1.52            | 1.69                          | 36                     |
| 925661160 | 925661160.Class B | 1         | 1.06                           | 1.52            | 1.44                          | 39                     |
| 925661245 | 925661245.Class A | 2         | 1.08                           | 2.21            | 2.03                          | 32                     |
| 926540379 | 926540379.Class A | 2         | 0.58                           | 2.94            | 5.08                          | 8                      |
| 926540379 | 926540379.Class B | 2         | 0.80                           | 2.94            | 3.69                          | 20                     |
| 926540379 | 926540379.Class C | 2         | 0.87                           | 2.94            | 3.38                          | 22                     |
| 926540379 | 926540379.Class D | 2         | 0.72                           | 2.94            | 4.06                          | 16                     |
| 926540683 | 926540683.Class A | 1         | 0.85                           | 6.17            | 7.29                          | 2                      |
| 926540683 | 926540683.Class B | 1         | 0.79                           | 6.17            | 7.78                          | 1                      |
| 926540683 | 926540683.Class C | 1         | 0.95                           | 6.17            | 6.48                          | 3                      |
| 927430229 | 927430229.Class A | 1         | 0.90                           | 4.02            | 4.48                          | 14                     |
| 928330756 | 928330756.Class A | 2         | 0.72                           | 1.53            | 2.11                          | 31                     |
| 930320100 | 930320100.Class A | 2         | 0.65                           | 3.12            | 4.80                          | 10                     |
| 930361125 | 930361125.Class A | 2         | 0.80                           | 2.41            | 3.03                          | 26                     |

<sup>28</sup> Found as the PV of the future school PI without a class-room divided by the relative rehabilitation cost:  $3.23 / 0.87 = 3.73$ .

At the same time, B of the same Motsheudi Secondary School, while also is in condition “2”, requires a repair expense of R 70,000 to remain operational. Since the PV of the replacement in 4 years is estimated as R 69,200, its relative rehabilitation cost is 1.01 times of its replacement cost in the future. Since the priority index of this school in a 4-year time will be equivalent to only 3.23 in its present-day value, the rehabilitation priority index for class B of Motsheudi Secondary School is 3.19.<sup>29</sup> Thus, the rehabilitation priority of class-room A is higher than of class-room B because of the repair cost difference. The least expensive repair option is being preferred.

The resulting rehabilitation index is then ranked from the highest to the lowest value. The class-rooms ranking at the top indicate the highest need relative to cost of repair. Class-rooms B, A and C of Lorraine Banareng Primary School (#926540683) are ranked as first, second and third, respectively. This result is not surprising. This school has been identified as a location lacking infrastructure. The sequence of ranking among these three reflects their relative costs. Class-rooms B, A and C have relative costs of 0.79, 0.85 and 0.95, respectively.

The lowest ratings are associated with classrooms assumed to be located in Laerskool Pietersburg Noord School (#904220415). This school currently has an adequate infrastructure facilities and that is why its school priority index and rehabilitation index are both lower in comparison to other schools.

## **B.6 Allocation of Funds for Rehabilitation**

The top positions of the rehabilitation ranking in Table B-14 are occupied by class-rooms that are both relatively cheaper to repair and being located in schools with the highest need for additional infrastructure. Following the discussion in Section 3.3, the allocation mechanism should give funding to schools at the top of the rehabilitation ranking list and until the available budget funds for the current period are exhausted.

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<sup>29</sup> Computed as the PV of the future school PI without a class-room divided by the relative rehabilitation cost:  $3.23 / 1.01 = 3.19$ .

Assume that the total rehabilitation budget available for the current year is R 1.0 million. Then, the allocation rule would spend the funds starting at the top of the rehabilitation ranking up to a point when the funds are used up. Table B-15 illustrates this process.

With this fixed budget, a total of R 990,000 will be spent on rehabilitation of 13 class-rooms. Lorraine Banareng Primary School (#926540683) will have three of its class-rooms (B, A and C) repaired at a total cost of R 245,000. Then, Malegale Primary School (#925660495) should be financed to have 6 class-rooms to be rehabilitated at cost of R 555,000. Bhejani Primary School (#914450056) should be given funding for repair of 2 class-rooms worth R 105,000. In addition, class-room A in Rakgolokwana Secondary School (#926540379) will be repaired at a cost of R 40,000. Finally, class-room A of Manamani Primary School (#930320100) should be rehabilitated at a cost of R 45,000. This combination exhausts the budget available and maximizes the efficiency of rehabilitation spending.

In a situation when more funds become available for rehabilitation, the allocation rule would work in exactly the same way, by financing the top ranking rehabilitation in first place. In fact, if there were enough funds to finance all damaged buildings, the maximum budget would be R 3.03 million. That would cover all rehabilitation needs for 44 identified damaged class-rooms across 40 schools in the sample.

## **B.7 Concluding Remarks**

This annex has been prepared to show a practical application of the proposed “school priority index” and “rehabilitation priority index” for Limpopo Department of Education. The method ensures an efficient allocation of the scarce budget funds for the construction of new class-blocks and rehabilitation of the existing buildings. The data requirements for the estimation of the indices are very modest and the existing education management information system of the Department with a minimum additional effort can be employed to supply the data for estimation of the priority indices.

**Table B-15. Allocation of Rehabilitation Budget Funds.**

| Rehab Ranking | Class-room     | Rehab Cost (R '000s) | 9013404<br>25 | 9042204<br>15 | 9113602<br>52 | 9144500<br>56 | 9185110<br>29 | 9222208<br>73 | 9232404<br>19 | 9246512<br>62 | 9256306<br>85 | 9256604<br>95 | 9256611<br>60 | 9256612<br>45 | 9265403<br>79 | 9265406<br>83 | 9274302<br>29 | 9283307<br>56 | 9303201<br>00 | 9303611<br>25 | Rehab Cumulative Cost (R '000s) |
|---------------|----------------|----------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------------------|
| 1             | 926540683.Clas | 75                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 75            | -             | -             | -             | -             | 75                              |
| 2             | 926540683.Clas | 80                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 80            | -             | -             | -             | -             | 155                             |
| 3             | 926540683.Clas | 90                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 90            | -             | -             | -             | -             | 245                             |
| 4             | 925660495.Clas | 80                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | 80            | -             | -             | -             | -             | -             | -             | -             | -             | 325                             |
| 5             | 925660495.Clas | 85                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | 85            | -             | -             | -             | -             | -             | -             | -             | -             | 410                             |
| 6             | 914450056.Clas | 50                   | -             | -             | -             | 50            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 460                             |
| 7             | 925660495.Clas | 90                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | 90            | -             | -             | -             | -             | -             | -             | -             | -             | 550                             |
| 8             | 926540379.Clas | 40                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 40            | -             | -             | -             | -             | -             | 590                             |
| 9             | 925660495.Clas | 95                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | 95            | -             | -             | -             | -             | -             | -             | -             | -             | 685                             |
| 10            | 930320100.Clas | 45                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 45            | -             | 730                             |
| 11            | 914450056.Clas | 55                   | -             | -             | -             | 55            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 785                             |
| 12            | 925660495.Clas | 100                  | -             | -             | -             | -             | -             | -             | -             | -             | -             | 100           | -             | -             | -             | -             | -             | -             | -             | -             | 885                             |
| 13            | 925660495.Clas | 105                  | -             | -             | -             | -             | -             | -             | -             | -             | -             | 105           | -             | -             | -             | -             | -             | -             | -             | -             | 990                             |
| 14            | 927430229.Clas | 85                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 85            | -             | -             | -             | 1,075                           |
| 15            | 914450056.Clas | 60                   | -             | -             | -             | 60            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,135                           |
| 16            | 926540379.Clas | 50                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 50            | -             | -             | -             | -             | -             | 1,185                           |
| 17            | 925630685.Clas | 90                   | -             | -             | -             | -             | -             | -             | -             | -             | 90            | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,275                           |
| 18            | 914450056.Clas | 70                   | -             | -             | -             | 70            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,345                           |
| 19            | 901340425.Clas | 60                   | 60            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,405                           |
| 20            | 926540379.Clas | 55                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 55            | -             | -             | -             | -             | -             | 1,460                           |
| 21            | 911360252.Clas | 65                   | -             | -             | 65            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,525                           |
| 22            | 926540379.Clas | 60                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 60            | -             | -             | -             | -             | -             | 1,585                           |
| 23            | 911360252.Clas | 70                   | -             | -             | 70            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,655                           |
| 24            | 901340425.Clas | 70                   | 70            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,725                           |
| 25            | 924651262.Clas | 45                   | -             | -             | -             | -             | -             | -             | -             | 45            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,770                           |
| 26            | 930361125.Clas | 55                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 55            | 1,825                           |
| 27            | 924651262.Clas | 50                   | -             | -             | -             | -             | -             | -             | -             | 50            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,875                           |
| 28            | 924651262.Clas | 60                   | -             | -             | -             | -             | -             | -             | -             | 60            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 1,935                           |
| 29            | 918511029.Clas | 70                   | -             | -             | -             | -             | 70            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,005                           |
| 30            | 922220873.Clas | 45                   | -             | -             | -             | -             | -             | 45            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,050                           |
| 31            | 928330756.Clas | 50                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 50            | -             | -             | 2,100                           |
| 32            | 925661245.Clas | 75                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 75            | -             | -             | -             | -             | -             | -             | 2,175                           |
| 33            | 924651262.Clas | 75                   | -             | -             | -             | -             | -             | -             | -             | 75            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,250                           |
| 34            | 922220873.Clas | 55                   | -             | -             | -             | -             | -             | 55            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,305                           |
| 35            | 923240419.Clas | 95                   | -             | -             | -             | -             | -             | -             | 95            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,400                           |
| 36            | 925661160.Clas | 85                   | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 85            | -             | -             | -             | -             | -             | -             | -             | 2,485                           |
| 37            | 922220873.Clas | 60                   | -             | -             | -             | -             | -             | 60            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,545                           |
| 38            | 922220873.Clas | 70                   | -             | -             | -             | -             | -             | 70            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,615                           |
| 39            | 925661160.Clas | 100                  | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 100           | -             | -             | -             | -             | -             | -             | -             | 2,715                           |
| 40            | 904220415.Clas | 50                   | -             | 50            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,765                           |
| 41            | 904220415.Clas | 55                   | -             | 55            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,820                           |
| 42            | 904220415.Clas | 65                   | -             | 65            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,885                           |
| 43            | 904220415.Clas | 70                   | -             | 70            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 2,955                           |
| 44            | 904220415.Clas | 75                   | -             | 75            | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | 3,030                           |
|               |                |                      | 130           | 315           | 135           | 235           | 70            | 230           | 95            | 230           | 90            | 555           | 185           | 75            | 205           | 245           | 85            | 50            | 45            | 55            |                                 |

It is important to ensure that schools' data in the current education management information system is reliable and updated regularly. The process of estimation of both the “school priority index” and “rehabilitation priority index” can be automated so that the indices are computed for all schools in six provincial districts. This will enhance the efficiency of the allocation procedure.