

Optimising the planning of educational facilities: reflecting on the integration of asset base assessment and land use planning

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PREFACE

This research has encouraged me to do better, work harder, and achieve more where I am. "The closer you look, the more you will see" - the more you see, the better you plan! -Aaron Hartzler

Professor E.J. Cilliers, it was an honour to be inspired by you. Thank you for your guidance, support, and advice; it has been an incredible experience to be supervised by someone so multi-talented and resourceful.

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ABSTRACT

A constitutional obligation of the South African Government is to ensure that "everyone has the right to a basic education" (RSA, 1996:1257). The foundation for this fundamental right is adequate, sustainable infrastructure; however, the current state of education facilities in South Africa, as stated by Mohamed (2020), is "characterised by crumbling infrastructure, overcrowded classrooms and relatively poor educational outcomes are perpetuating inequality and as a result, failing too many of its children". By comparing South Africa to other developing countries, South Africa is well-developed in educational institutions (NDP, 2012:4).

The Norms and Standards Progress Report indicates that South African schools have inadequate infrastructure, and according to Amnesty International (2020:7), with the current statistics in South Africa, "it is not surprising that in terms of outcomes, South Africa has one of the most unequal school systems in the world." The unequal distribution of education facilities and unequal distribution of funds spent on infrastructure to specific areas where backlogs seemed the most significant result in the majority of facilities being left neglected and severely under-maintained. One of the findings of this research is that the funding distribution towards capital investment to address the gaps identified in education facilities resulted in little to no funding spent on maintaining existing infrastructure. This research evaluated the optimal use of existing facilities and maintenance. To address the severe infrastructure gaps, the government must first ensure that what currently exists is well maintained and can be considered quality education facilities.

It is evident that the government is working reactively to address the existing gaps in the system and, at this rate, will not be able to address the existing backlogs nor be able to move into a proactive planning manner. This research, therefore, started, as a point of departure to investigate the current asset base of school infrastructure, how this can be optimally utilised and how the gaps identified can be addressed through asset base assessment and land use planning to provide access to school for all children in South Africa.

Education facilities are currently planned on a needs basis in line with the Norms and Standards for Public School Infrastructure. Still, it is imperative to plan in line with spatial planning, which includes land use planning to ensure strategic development where spatially required. It is evident that silo planning is the order of the day between the different spheres of government; this is a result of the lack of consequences when not adhering to legislation, the lack of strategic focus between these spheres, the lack of prioritisation on a high level which will assist in integrated planning and the lack of proper communication between the different spheres of government. A challenge also identified within this research is the gap between planning and delivery. In some

cases, plans reflect the needs identified; however, these plans are seldom delivered as planned within the timeframes and budget.

This research was initiated to evaluate how the national and provincial governments can optimise educational facility planning by reflecting on the integration of asset base assessment and land use planning. The research drew reports on a national and international platform, academics, government data and media reports. Various sites were visited throughout this study to investigate the current infrastructure and the conditions and quality of infrastructure and gathered statistical and photographic information and evidence on these facilities.

This data was analysed to determine the current asset base of the Northern Cape Department of Education (NCDoE), the number of facilities and the condition thereof. The gap was then analysed and quantified in line with the Norms and Standards and the current asset base. A complete cost analysis was conducted from these data sets to determine the financial implication of the gap analysis within the Northern Cape, this funding requirement was measured against the available budget, and from this analysis, it was clear that alternative approaches needed to be investigated to ensure adherence to the Norms and Standards requirements within the set timeframes with the limited available budget.

It is recommended that three-stream model schools are developed to ensure that under-utilised education facilities are optimally used and that education facilities feed the need in the labour market for technical, vocational, and academic learners. Education facilities are recommended to be in line with future trends, and this research highlights that the planning and layout of new facilities should cater to future requirements in terms of remote and digital learning platforms. When planning optimally and sustainably, infrastructure can be the primary economic growth factor assisting in the local economic environment where the infrastructure is delivered through creating a value chain. In a value chain where building material is locally manufactured or produced and procured, local contractors are developed, empowered, and enabled to implement significant capital and maintenance projects.

This research concludes with recommendations aimed at maturity growth in the planning and implementation of the education infrastructure programme.

Keywords: Asset-based assessment; Demand; Gap Analysis; Prioritisation; Supply; and Sustainability

INLEIDENDE SAMEVATTING

Hierdie studie is geïnisieer om te evalueer op watter wyse die nasionale en provinsiale regerings die beplanning van onderwysfasiliteite kan optimaliseer deur die integrasie van batebasis-assessering en grondgebruikbeplanning. Die Suid-Afrikaanse regering het 'n konstitusionele verpligting om te verseker dat elke landsburger die 'reg op basiese opvoeding' geniet (Grondwet van die Republiek van Suid-Afrika, 1996:1257) Die grondslag vir hierdie basiese reg is voldoende, volhoubare infrastruktuur.

Dit is duidelik dat die regering tans op 'n reaktiewe wyse te werk gaan en indien die werkwyse nie verander nie, nie in staat sal wees om die bestaande agterstande uit te wis of aan te beweeg na 'n proaktiewe beplanningstyl nie. Hierdie studie het dus die bestaande batebasis ondersoek om vas te stel hoe dit optimaal benut kan word en hoe die gapings wat geïdentifiseer word, deur middel van batebasis-assessering en beplanning van grondgebruik aangespreek word en sodoende vir alle kinders in Suid-Afrika toegang tot skole met voldoende en betroubare infrastruktuur kan gee. Hierdie fasiliteite behoort binne stapafstand van leerders se huise te wees, of alternatiewelik behoort die leerder voorsien te word van koshuisakkommodasie of leerdervoer na die naaste skool waar die geografiese area en bevolkingsverspreiding nie 'n nader skool regverdig nie.

Die huidige reaktiewe benadering het 'n ongelyke verspreiding van onderwysfasiliteite tot gevolg, asook die ongelyke besteding van fondse op infrastruktuur in spesifieke areas waar die agterstand die grootste blyk te wees. Die resultaat hiervan is dat die meerderheid fasiliteite verwaarloos is en uiters swak in stand gehou word. Die verspreiding van fondse na kapitaalbeleggings met die doel om die tekorte in die beskikbaarheid van onderwysfasiliteite aan te spreek, het tot gevolg dat geen of weinig befondsing beskikbaar is vir die instandhouding van bestaande infrastruktuur nie. Hierdie studie fokus op die optimale gebruik van bestaande fasiliteite en die instandhouding daarvan. Om die ernstige infrastruktuurgapings aan te spreek, moet die regering eerstens verseker dat daar baie goed omgesien word na bestaande fasiliteite sodat dit as onderwysfasiliteite van hoogstaande gehalte beskou kan word. Fasette wat dus voldoende aandag moet geniet, is opknapping, restourasie en rehabilitasie; verskuiwing van ontoepaslike strukture, opgraderings en addisionele infrastruktuur en laastens, die voorsiening van nuwe onderwysfasiliteite.

Die studie stel voor dat infrastruktuur in lyn met wetgewing beplan moet word, maar 'dat dit uiters noodsaaklik is dat beplanning in lyn met ruimtelike beplanning, wat grondgebruikbeplanning insluit, gedoen word om te verseker dat dit strategies ontwerp word vir die spesifieke ruimte waar

dit benodig word. Dit is duidelik dat beplanning in die verskillende sfere van die regering tans in silo's plaasvind. Dit is die gevolg wanneer daar nie konsekwensies is as wetgewing nie nagevolg word nie en van 'n gebrek aan strategiese fokus tussen die verskillende sfere; 'n tekort aan hoëvlak prioritisering wat geïntegreerde beplanning as resultaat sou kon hê en van 'n gebrek aan effektiewe kommunikasie tussen die verskillende regeringsfere. Nog 'n uitdaging wat in die omvang van hierdie studie geïdentifiseer is, is die gaping tussen beplanning en lewering, waar beplanning in sommige gevalle wel die geïdentifiseerde behoeftes reflekteer, maar die resultate selde volgens beplanning gelewer word binne die beplande tydslyn en begroting.

Wanneer daar optimaal en volhoubaar beplan word, kan infrastruktuur die primêre element van ekonomiese groei wees en sodoende die plaaslike ekonomiese omgewing ondersteun deurdat 'n waardeketting geskep word. In 'n waardeketting waar boumateriaal plaaslik vervaardig, gelewer of verkry word, word plaaslike kontrakteurs ontwikkel, bemagtig en in staat gestel om voldoende kapitaal en instandhoudingsprojekte te implementeer. In 'n waardeketting wat teweeg gebring word met kapitaal- en instandhoudingsprojekte om onderwysfasiliteite te optimaliseer en waar plaaslike arbeid voorkeur geniet, kan werksgeleenthede geskep word en armoede-statistiek afneem.

Hierdie studie stel 'n sterk inligtingsbasis beskikbaar vir die beplanning van onderwysfasiliteite in die Noord-Kaap. Verder sluit dit 'n distriksanalise in, wat addisionele strategiese aanbevelings bied aan bestaande en nuwe skole en koshuise, asook by moontlike oorname van onderbenutte en gehuurde fasiliteite.

Aanbevelings word gemaak om te verseker dat instandhouding voorkeur geniet. Drie-stroom onderwysmodel skole word ontwikkel om te verseker dat onderbenutte onderwysfasiliteite optimaal benut word en dat sodanige fasiliteite in die behoefte van die arbeidsmark vir leerders met tegniese, beroepsgerigte, en akademiese opleiding voorsien.

Sleutelwoorde: Batebasis-assessering, Vraag, Gapingsanalise, Prioritisering, Aanbod, Volhoubaarheid.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABBREVIATION	DESCRIPTION
CBA	Cost Benefit Analysis
CFL	Compact fluorescent
CIDB	Construction Industry Development Board
COGHSTA	Department of Cooperative Governance, Human Settlements and Traditional Affairs
CSIR	Council for Scientific and Industrial Research
DBE	Department of Basic Education
DM	District Municipality
DORA	Division of Revenue Act
DP	Delivery Process
DPME	Department of Planning, Monitoring and Evaluation
DRDLR	Department of Rural Development and Land Reform
DRPW	Department of Road and Public Works
DWA	Department of Water Affairs
ECD	Early Childhood Development
EFMS	Education Facility Management System
EMIS	Education Management Information Systems
EMT	Executive Management Team
ESKOM	Electricity Supply Commission of South Africa
FET	Further Education and Training
GET	General Education and Training
GIAMA	Government Immovable Asset Management Act
GIS	Geographic Information System
HEDCOM	Head Committee
HOD	Head of Department
I&Aps	Interested and affected parties
IAMP	Infrastructure Asset Management Plan
ICT	Information Communication and Technology
IDIP	Infrastructure Delivery Improvement Programme
IDM	Infrastructure Delivery Model
IDMS	Infrastructure Delivery Management System
IDP	Integrated Development Plan
IDT	Independent Development Trust
IPMP	Infrastructure Programme Management Plan
IRM	Infrastructure Reporting Model
IUDF	Integrated Urban Development Framework
JBCC	Joint Building Construction Contracts
JTG	John Taolo Gaetsewe
LED	Light-emitting diode
LED	Local Economic Development
LEF	Learner Enrolment Figures
LUMS	Land Use Management Schemes
MEC	Member of the Provincial Executive Council
MOA	Memorandum of Agreement

ABBREVIATION	DESCRIPTION
MPSA	Ministry of Public Service and Administration
MTEF	Medium-Term Expenditure Framework
NC	Northern Cape
NCDoE	Northern Cape Department of Education
NCPG	Northern Cape Provincial Government
NDP	National Development Plan 2030
NEIMS	National Education Infrastructure Management System
NGO	Non-Governmental Organisation
NSDF	National Spatial Development Framework
NSDP	National Spatial Development Plan
OTP	Office of the Premier
PED	Provincial Education Departments
PFMA	Public Finance Management Act,
PGDP	Provincial Growth Development Plan
PIRM	Provincial Infrastructure Reporting Model
PPPFA	Preferential Procurement Policy Framework Act
PSDF	Provincial Spatial Development Framework
SASA	South African Schools Act 84 of 1996, as amended
SANS	South African National Standards
SCM	Supply Chain Management
SDF	Spatial Development Frameworks
SDI	Spatial Data Infrastructure Act
SG	Surveyor General
SGB	School Governing Body
SMME	Small, Medium and Micro Enterprise
SPLUMA	Spatial Planning and Land Use Management
TOR	Terms of Reference
U-AMP	User Asset Management Plan

(Source: Author's creation, 2022)

LIST OF DEFINITIONS

Additions – This means buildings that are added to an existing facility to increase its capacity after its original building's year-built date.

Administration Areas – This means areas in a school used by the school management and staff for administration and management purposes and the day-to-day running of a school (DBE, 2013:3).

Alternative solutions – include solutions in terms of “design, material or method of construction” that varies entirely or somewhat from those in the usual or acceptable solution (Law Insider, 2022:2; Building Performance, 2016:1). Mariani et al. (2018:2) defined the traditional solution to the building which is stone or brick masonry that is the most durable form of construction where brick or stones are placed in mortar. So, alternative building solutions are any other building method that is not brick masonry.

Asset - An asset is a physical component of a facility that has value, enables the provisioning of services and has an economic life of more than twelve months.

Asset Management - “The process of guiding the acquisition, use, safeguarding and disposal of assets to make the most of their service delivery potential and manage the related risks and costs over their entire life.” (KwaZulu-Natal Department of Treasury, 2013:2)

Asset Register - A record of asset information, including inventory, historical, financial, condition and technical information

Catchment Area – This means a human settlement from which learners attending a particular school are drawn, regardless of where such learners reside or are accommodated during the school term.

Cost-Effectiveness Analysis – It is a technique for assessing the achievements against the costs of different interventions and is not the only measure for determining in what way to allocate resources, but it is essential as it has direct financial and scientific relationships between the various involvements (Gift & Marrazzo, 2007:485; Robinson, 1993:793). The cost-effectiveness analysis can be exceptionally favourable when comparing interventions with one another: comparing different building materials to identify which one will be cost-efficient.

Early Childhood Development Centre - According to the (CSIR, 2012:102), a crèche is a facility that caters for more than six children. It can include a crèche, nursery school, day-care centre, after-care and play school.

Education Support Areas - “Means areas in a school that are required to create a healthy, safe and conducive school environment and to support the teaching and learning functions at the school” (DBE, 2013:3)

Full-Service/Inclusive School – Can be defined as a mainstream education establishment that delivers quality education to all learners for equality and also attempts to achieve accessibility for all learners, including disabled learners (DBE, 2010:7).

Gap Analysis – It is a process or technique to detect gaps in the emphasis area of study (Maxted et al., 2008:1019; Jennings, 2000:5). In educational facilities, the gap analysis will identify the gaps in sufficient infrastructure by utilising the enrolled learners at each facility and the requirements in line with the norms and standards to determine the gap.

Inappropriate Materials - Refers to inappropriate construction materials for education facilities, including mud bricks, timber/planks, corrugated iron, and asbestos.

Inappropriate Structure - The Regulations Relating to Minimum Norms and Standards for Public School Infrastructure (November 2013) state that schools/buildings or portions built from materials such as asbestos, metal, mud, and wood are deemed inappropriate and must be prioritised (DBE, 2013:7-8). Excluded in this definition is the normal utilisation of timber and corrugated iron in roof trusses, timber flooring, doors and roof cladding

Independent school – In 1996, the South African government passed the South African Schools Act that recognised two categories of public and independent schools. Independent schools are privately administrated with no governmental influence (ISASA, 2022:1). An independent school is also known as a private school.

Infrastructure - “Infrastructure” refers to fixed assets that are constructed or result from construction operations, which include: Construction works that include buildings, structures and facilities; and the Provisioning of bulk services such as water supply, sanitation, electricity supply, transportation and stormwater drainage systems.

Life Cycle Costing (LCC) – Can be defined as the total cost of funds allocated to the item from planning, construction and operation until the end of the item’s lifespan (Woodward, 1997:336; Korpi & Ala-Risku, 2008:241). Life Cycle Costing can be explained as the total cost of the item throughout its life cycle, and each item will have an estimated life duration with maintenance and

upkeep that would prolong the life cycle. The total cost of the item is classified as the life cycle cost.

Maintenance – Maintenance can be defined in general as actions anticipated to preserve the asset condition or to regulate the activities of the asset to be operational (Department of Public Works, 2015:11; Lateef, 2009:210). From a building maintenance perspective, the condition can range from minor or major maintenance to corrective or preventative. Preventative maintenance will regulate the activities of the building to be in operation. Barrelas, Ren and Pereira (2021:3) additionally explained that building maintenance can considerably increase the lifespan of the building and reduce the economic burden.

Minimum education areas - “Means the minimum teaching and learning areas in a school that are essential to carry out the teaching and learning functions at a school” (DBE, 2013:3).

MTEF (Medium Term Expenditure Framework) - “Means the medium-term expenditure framework containing the three-year spending plans of national and provincial governments, published at the time of the Budget” (DBE, 2013:3).

National Building Regulations - “Means the regulations issued in line with section 17 of the National Building Regulations and Building Standards Act, 1977” (Act No. 103 of 1977), which stipulate the requirements to be adhered to when undertaking construction activities.

New Schools - “means the South African National Standard with that number, issued by the South African Bureau of Standards in terms of the National Building Regulations” (DBE, 2013:3). It means a school that is built anew, where no school facility existed before and issued with a new EMIS Number.

Optimism Bias – “is the proven tendency for appraisers to be optimistically biased about key project parameters, including capital costs and operating costs, project duration, and resulting benefits delivery” (HM Treasury, 2022:9-10).

Overcrowding – This means a situation where there is a higher number of users per Functional Space than the design capacity of that Functional Space, thereby exceeding the prescribed net square meter space per user.

Planning Theory – Defining planning theory can be seen as a challenge as there is no clear definition. However, planning theory can be explained by uniting different elements to make up planning theories (Fainstein & DeFilippis, 2015:12). The uniting of other elements to formulate planning theories are economic, social, political and environmental elements

Public Ordinary School – Public schools are one of the schooling categories that the South African Schools Act recognised in 1996, and public schools are governed or controlled by the South African government (ISASA, 2022:1). That means that the State entirely controls public schools. In the South African context, public schools have governed by the DBE. There are ordinary, extraordinary and technical schools in the public schooling categories. Thus, ordinary public schools are classified as schools that do not offer specialised education (Law Insider, 2022:1).

Reasonable Walking Distance – Is a reasonable walking distance that is convenient and has a walking time of 5-10 minutes (CSIR, 2005:9)

Renewals and Additions – This means increasing an Education Facility's value, lifespan and capacity by renewing it and providing additional functional spaces to meet the current business requirements.

Replacement School – This means a school built anew either on the same/existing site (brownfield development) or a new site (greenfield development) to replace a previous school facility.

Special schools – Schools catering to special needs education for the physically and mentally challenged are provided on a regional/district level. As per education policy, learners with disabilities are catered for in mainstream schools where possible; however, these special education schools typically cater to learners requiring specialised care (CSIR, 2012:94; DBE, 2014:7).

Technical schools – are classified as technical vocational schools that offer twelve specialised technical curriculums and prepare learners for technical college (Equal Education, 2018:2). Moses (2016:1) stated that these schools are also identified as trade schools that educate learners in a specialised trade upon completion of their basic education.

Three Stream School / Three (3) Curriculum Stream Model – It is a more effective inclusive educational model that focuses not only on the two streams that are academic and technical vocational, but the inclusion of technical occupational streams of education (DBE, 2017:10). The third stream is technical occupational that mainly will focusing on preparing learners for the real world of work immediately after completing secondary education. It will comprise the development of skills like: “spray-painting, panel-beating, hairdressing, woodwork, glasswork, glazing, welding, upholstery, husbandry (farming)” and several more (Equal Education, 2018:2).

CHAPTER 1 INTRODUCTION

1.1. Chapter Introduction

Section 29 of the *Constitution of South Africa* (1996) states that “everyone has the right to a basic education, including adult basic education; and to further education, which the state through reasonable measures must make progressively available and accessible.” Furthermore, the Constitution indicates that “everyone has the right to receive education in the official language or languages of their choice in public educational institutions where that education is reasonably practicable.”

The Republic of South Africa is instituted as distinctive national, provincial, and local spheres of government. Each sphere has its area of operation, interdependent, requiring all three spheres to operate and acknowledge each other's area of jurisdiction and interrelated where intergovernmental relations should be among the three spheres. Schedule 4 of the *Constitution of South Africa* (1996): Education at all levels, excluding tertiary education, is within the Functional Areas of Concurrent National and Provincial Legislative Competence. Therefore two of the spheres of government have the responsibility to ensure education infrastructure delivery.

According to the latest Education Management Information System Statistics, the education system is the most significant in South Africa; in the publication, it was stated that South Africa has nearly 24 894 schools where 13 409 249 learners are catered for; this includes ordinary public schools as well as independent schools. Four hundred forty-seven thousand one hundred twenty-three (447 123) educators serve these learners within the nine provinces. As of July 2021, the data was calculated from the Learner Unit Record Information and Tracking System (LURITS) and Provincial Data Warehouses databases. As the primary study area, the Northern Cape accounted for 2.3% of these statistics for 2021 for public ordinary and independent schools with 304 566 learners, 10 486 educators and 585 schools. The total number of learners in Primary Grades, which are from Grades 1-7 for South Africa, is 7 687 696, of which 183 000 are learners in Northern Cape Schools, the total learners in Secondary Grades, which are from Grades 8-12 for South Africa is 4 921 270 of which 101 317 are learners in Northern Cape Schools. 2022 according to the latest learner enrolment numbers on the Education Information Management System (EMIS), the learner enrolment for 2022 is 310 561, an increase of 5995 learners from 2021 to 2022 (DBE, 2022:1).

The School Realities for 2021 furthermore indicated that the highest number of ordinary public schools nationally (6 408 or 28.2%) was in the 101 to 300 learner interval and that there were 2

141 schools (9.4%) in the 100 and below learner interval (micro-schools) and 799 schools (3.5%) in the above 1 500 learner interval (mega schools) (DBE, 2022:1). Micro-schools create a challenge in providing education infrastructure, especially in adhering to the Regulations relating to Minimum Uniform Norms and Standards for Public School Infrastructure (hereafter referred to as Norms and Standards) micro-school. Micro-schools should form part of the School Rationalisation Process to ensure that schools are viable and optimally utilised; this identifies one of the main problems elaborated on in the problem statement.

In planning for Education Facilities, there are various norms and standards, legislation, acts and policies to consider. The challenge is, however, to bring all of these together, to adhere and align to all the prescripts and still deliver value for money, still plan for sustainable education facilities that cater for the current needs and are adaptable to change for future needs and requirements to ensure that these education facilities will not become redundant. Figure 1-1 indicates the structure of this chapter:

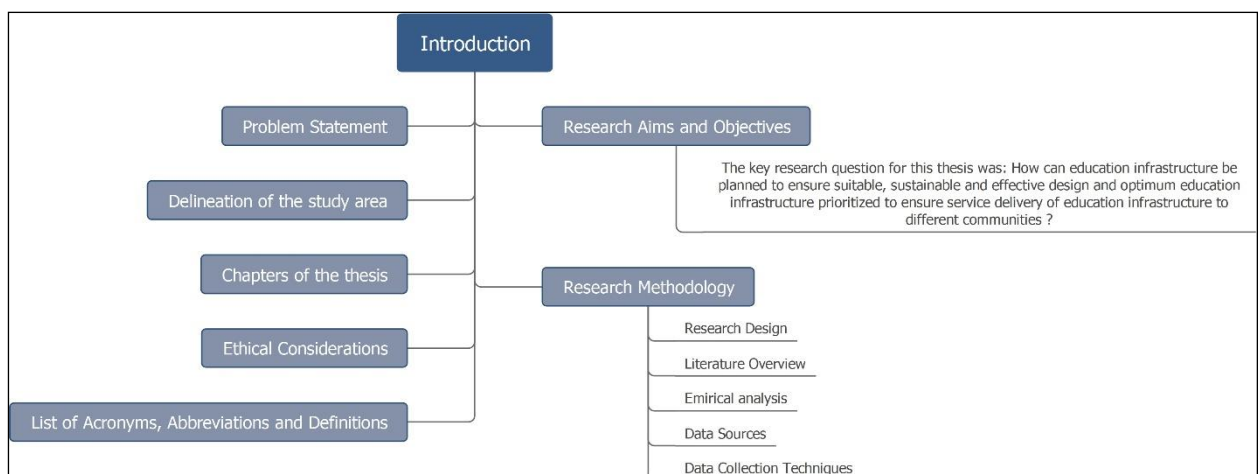


Figure 1-1: Chapter 1 Structure

(Source: Author's creation, 2022)

1.2. Problem statement and substantiation

Some of the main problems for the education sectors in many developing countries are the location of existing facilities and the effective utilisation of the availability of education facilities. The lack of adequate school buildings and other supporting infrastructure is regularly maintained and fit for purpose (Jenkins *et al.*, 2009:3). According to the National Development Plan, infrastructure, including educational infrastructure within South Africa, is poorly maintained, inadequate and under-maintained. Thus there is currently a focus on addressing backlogs in the service delivery of education infrastructure (National Planning Commission, 2012:25). Historically,

government infrastructure management practices resulted in the infrastructure slipping into disrepair due to improper planning, funding, and maintenance. It results in the government replacing existing assets rather than maintaining them. Government alone cannot meet the ever-growing needs in terms of population growth and migration within urban, peri-urban and rural populations in terms of the provisioning of infrastructure and thus, as an antidote, there has to be a motivation to stimulate sustainable growth, planning and development as a critical driver of sustainable social and economic development.

“It is challenging to design a space that will not attract people. What is remarkable is how often this has been accomplished” (Whyte, 2009:109). There is a direct relation between the density of the residential development and the provision of education infrastructure in close proximity to residential areas. Education infrastructure must be planned and designed to attract communities at the current population growth rate. Higher densities also imply a need for more extensive facilities were, in most cases, additional specialist services are required to support better service delivery. Education Infrastructure planning can be seen as providing new school facilities and upgrades and further development at existing schools, including maintaining thereof to cater to the future demographic distribution of learners.

This research has evaluated the effect of changing land use, population density, demographics and growth on the education sector and thus play an integral role in the strategic planning and design process behind the provisioning of education infrastructure, reflecting on the role of spatial planning to improve sustainability within the sector. The creation of environments which promote learning forms an integral part of the settlement-making process (CSIR, 2005:9). The informal learning experience can be enhanced by integrating educational facilities with the broader settlement structure. Integration can be achieved by locating schools, colleges, technikons, adult education centres and universities close to places of intensive urban activities.

1.3. Research aims and objectives

This research aimed to assess sustainable education infrastructure planning, design, and prioritisation. This study’s objectives included, amongst others, the reflection on the existing asset base of a province, in this case, the Northern Cape, to determine the existing supply of school infrastructure within the province, the functional performance, condition and utilisation of each of the facilities to identify aspects such as the life cycle costing and Infrastructure needs. It focussed on the demand for physical resources, the demand through communities, local and district municipalities (Integrated Development Plans) and the demand due to new developments and overuse of existing resources. In-depth research was done on all norms, standards, and

guidelines that inform the planning of educational and physical resources. Recommendations for the ideal planning guideline behind physical and educational resources were identified, which will adapt to forecasting changing needs such as alternative building technologies.

An in-depth option analysis to determine a range of options (financial, technical and design) for needed education infrastructure was done through a gap analysis that identified the gap between the supply and demand and analysed the cost-benefit of alternative building technologies against standard infrastructure solutions. Furthermore, the study considered the maintenance of these physical resources. A facility's life cycle starts with expressing a need that filters into a strategic vision, a feasibility stage, the design stage, the construction stage, the handover stage, and the operation and maintenance phase. The life of facilities is generally extended through several renovation and redevelopment projects to eventual closure, decommissioning and deconstruction. Planning of new school facilities within the Northern Cape was analysed to determine if the ideal location and site identification recognise the need for appropriate topography and location related to access and demographic realities. The planning identified a feeder zone with a radius of up to 5 kilometres. Furthermore, the planning considered the current planning of Municipalities in terms of the Spatial Development Frameworks and Integrated Development Plans.

The key research question for this thesis was: How can education infrastructure be planned to ensure suitable, sustainable and effective design and optimum education infrastructure prioritised to ensure service delivery of education infrastructure to different communities?

1.3.1. Sub-research questions:

- How did planning theories, including development theories and sustainable development theories, impact education facilities planning?
- What spatial principles are applicable when planning optimally for education facilities?
- How does legislation on a global, national, provincial and municipal level impact how and when education facilities are planned for?
- Are there acceptable norms, standards, and guidelines to assist in the uniform planning of education facilities?
- What standards are in place that regulates school infrastructure planning?
- What is the ideal location for school infrastructure?
- What services can education infrastructure be combined with to improve integrated planning?

- How can the sector ensure that existing assets are maintained and utilised to their full potential?
- Will it be more cost-effective to plan new facilities to address the demand or improve the existing education infrastructure?
- What existing education infrastructure (current supply) forms part of the Northern Cape assets, and what measures can be utilised to determine the characteristics?
- What education infrastructure is currently needed (demand)?

1.3.2. Research Objectives

The following research objectives were set:

- Investigate the current legislation, regulations and standards for the provisioning of school infrastructure and the planning and design behind it;
- Identify measures to determine the existing school infrastructure (supply) within the Northern Cape Province;
- Determine the demand for school infrastructure;
- Determine what school infrastructure is required based on needs assessments;
- To determine the role and function of planning in Education Infrastructure;
- To investigate the ideal locations of school infrastructure;
- To examine characteristics of the physical resources within the education sector of the Northern Cape;
- To identify and forecast changing needs
- To improve on standards that will ensure that physical resources are planned successfully and sustainable;
- To conduct empirical research on the physical resources within the Northern Cape Department of Education (NCDoE);
- Investigate the sustainability of existing physical resources;
- Conclusions will be made regarding the theoretical and empirical study; and
- Recommendations will be made regarding the planning and design of education infrastructure.

1.4. Research Methodology

1.4.1. Research Design

The non-experimental research design was adopted for this study as this research, and according to Thompson (2007:1), "The category of non-experimental designs is the most heterogeneous of

the three classification categories (experimental, quasi-experimental, and non-experimental)". "People-centred" planning, implementation and integration are not optional and are necessary for research towards sustainable development (De Jong, 2014:44). This study was observational, and the results are descriptive for the Northern Cape Education Facilities for the financial year 2022/23.

1.4.1.1. Qualitative Research

The empirical study adopted a qualitative approach of analysing several different literature and reports to conduct this study on optimising the planning of educational facilities and reflecting on the integration of asset base assessment and land use planning. The relationship of qualitative research to practical implementation is based on critical theoretical literature, going beyond just knowing something and putting meaningful research in context (Willis, 2007:87).

In light of the research aim, objectives and questions described in the previous sections, it is evident that this research requires an approach that considers both theories and practices relating to recent planning and environmental reform. The research design should ensure that data is collected, analysed and interpreted to answer the stated research questions. The research design is based on the primary research questions discussed in Table 1-1, followed by a more detailed discussion of the literature review, research design, and methodology.

Table 1-1: Research Design Methods

Primary research question	Method/ Technique	Description of method	Associated chapter(s)
How did planning theories, including development theories and sustainable development theories, Impact on education facilities planning?	Literature review	An extensive review of literature on the integration of development and planning theories into educational facilities	Chapters 2
What spatial principles are applicable when planning optimally for education facilities?	Literature review	An extensive review of literature on the South African reality, including the policy and legislative framework Including spatial planning in South Africa	Chapter 4
What is the ideal location for school infrastructure?	Literature review	Determining the Planning Behind New Schools in line with SPLUMA	Chapter 4
What services can education infrastructure be combined with to improve integrated planning?	Literature review	Analysing the planning of new schools and the Provision guidelines in terms of other facilities	Chapter 4

Primary research question	Method/ Technique	Description of method	Associated chapter(s)
How does legislation on a global, national, provincial and municipal level impact how and when education facilities are planned for?	Literature review Identifying legislation directives and review of legislation provisions	This section considered all applicable legislation toward Education Infrastructure and the planning and design. It defines all concepts relating to sustainable Education Infrastructure and addresses the current guidelines, norms and standards	Chapter 3
Are there acceptable norms, standards, and guidelines to assist in the uniform planning of education facilities?	Literature review	The relevant sector norms and standards and the impact of the methodology and processes applied in infrastructure provision and maintenance were analysed	Chapters 3 and 5
What existing education infrastructure (current supply) forms part of the Northern Cape assets, and what measures can be utilised to determine the characteristics?	Empirical study	Analysis and review of education infrastructure in the Northern Cape through Asset Registers, EMIS Data, Conditional Assessments, NEIMS data, and statistical data to determine the current supply of education infrastructure	Chapter 6
What education infrastructure is currently needed (demand)?	Case study Case research: Analysis and review of documents A critical review and discussion of Northern Cape implementation	Analysis and review of the current supply and demand to determine the gap in education infrastructure	Chapter 6
How can the sector ensure that existing assets are maintained and utilised to their full potential?	Literature review	Determining the life cycle costing and the background on maintenance to be able to plan for maintenance	Chapters 5 and 6
Will it be more cost-effective to plan new facilities to address the demand or improve the existing education infrastructure?	Literature review	Determining prioritisation and alternative solutions in infrastructure provisioning	Chapters 5 and 6

(Source: Author's creation, 2022)

1.4.2. Literature review

A systematic Literature review approach was followed to investigate and determine all relevant legislation, policies, norms, and standards that govern education infrastructure planning and design background. This section considered all applicable legislation toward Education Infrastructure and the planning and design. It defined all concepts relating to sustainable Education Infrastructure and addressed the current guidelines, norms, and standards.

Methods behind Education Infrastructure were investigated, focussing on the qualitative analysis that informed decision-making and utilised the Northern Cape Education Infrastructure data. This section explored the current supply and demand within the Northern Cape regarding Education Infrastructure. It identified the existing schools, their location (accessibility), the current utilisation

and the functional performance in terms of the level to which the assets allocated to the user meet the needs, considering the suitability and flexibility. This section consists of a case study that utilised the Department of Education's databases and school visits within the NCDoe, Department of Roads and Public Works and Department of Basic Education (DBE).

This process determined recommendations to guidelines that the DoE can use to plan schools to ensure sustainability. Current guidelines were analysed in terms of legislation and determined the ideal location behind the planning of new schools. It promotes integrated planning with other infrastructure development to improve sustainability, such as sports facilities and community halls.

1.4.3. Empirical analysis

The empirical investigation considered the asset base of the Northern Cape educational facilities. The asset base assessment was informed by data from the NCDoe to reflect on the provision of education facilities from a spatial perspective. A comprehensive range of data sources was used to conduct the research, including NEIMS Survey data, Education Management Information System (EMIS) data, and Condition Assessments from the Department of Roads and Public Works (DRPW) Statistics South Africa (StatsSA), records maintained by the Department on the provincial audit of infrastructure.

The analysis first considered the existing asset base of the Northern Cape Province to determine the current supply of school infrastructure within the province, the functional performance, condition and utilisation of each of the facilities to identify aspects relating to the life cycle costing infrastructure needs. It then focussed on the demand for physical resources, the demand through communities, local and district municipalities (Integrated Development Plans), and new developments.

An options analysis was conducted to determine a range of options (financial, technical and design) for needed education infrastructure, departing from the gap between the supply and demand and analysing the cost-benefit of alternative building technologies against standard infrastructure solutions. Furthermore, the study considered maintaining these physical resources. The life of facilities is generally extended through several renovation and redevelopment projects to eventual closure, decommissioning and deconstruction.

1.4.3.1. Personal Observation

Site visits were conducted to comprehend the quantitative data collected for this research, and the objective of the site visit was to gain insight into the current state of Northern Cape's Education Facility, to establish the current supply of Infrastructure throughout the Northern Cape, the condition of the education facilities and to determine the gap in terms of the Norms and Standards requirements at these facilities. Data was gathered and captured on the Education Facilities Management System (EFMS) on each building and room at the facility, the building material thereof and the condition of each element of the buildings and rooms. The number of facilities was captured, and measurements were taken to determine adherence to the minimum size per the Norms and Standards.

Site selection was made from January 2018 to July 2022 on education facilities where infrastructure projects reached practical completion throughout the Northern Cape Province; an amount of 205 (36,8%) Northern Cape education facilities were visited, and these schools were in all five districts and included rural and urban schools.

1.4.4. Data Sources

1.4.4.1. Primary Data Sources

The primary data source used was the Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure (Norms and Standards), which determined that there are accepted norms, standards, and guidelines to assist in the uniform planning of education facilities.

1.4.4.2. Secondary Data Sources

Development theories, planning theories, legislation, policies and frameworks were analysed to identify the implication on education facilities and the planning, design and prioritisation thereof. The empirical investigation considered the asset base of the Northern Cape educational facilities. The asset base assessment was informed by data from the NCDoe to reflect on the provision of education facilities from a spatial perspective.

A comprehensive range of data sources was used to conduct the research, including site visit data, NEIMS Survey data, Education Management Information System (EMIS) data, and Condition Assessments from the Department of Roads and Public Works (DRPW) StatsSA, records maintained by the Department on the provincial audit of infrastructure. Supplementary

data was captured from the district offices and schools within the province to inform the asset base assessment further.

1.4.5. Data Collection Techniques

Table 1-2 indicates the data collection techniques utilised in this study:

Table 1-2: Data Collection Techniques

Data Description	Data Source	Method/ Technique	Description of method	Associated chapter(s)
Regulations Relating to the Minimum Uniform Norms and Standards on Public School Infrastructure (Norms and Standards)	Primary Source	Document Review ¹	Sourced from Library and electronic websites	Chapters 3
Articles, books and research papers on the Development and planning theories	Secondary Source	Systematic Literature Review ²	Sourced from Library and electronic websites	Chapter 2
Articles, books and research papers on Planning and provisioning of Education Infrastructure	Secondary Source	Systematic Literature Review	Sourced from Library and electronic websites	Chapter 2
Legislation, Policies, Frameworks and Acts relevant to Education Facility Planning	Secondary Source	Systematic Literature Review	Sourced from Library and electronic websites	Chapters 3, 4 and 5
Site Visits at 205 Northern Cape Schools to gather primary and secondary data	Secondary Source	Personal Observation	Site Visits were conducted at 205 Northern Cape Schools to comprehend the quantitative data collected for this research	Chapter 6
NEIMS Assessment data on the Education Facility Management System	Primary Source	Document Review	Sourced from the Education Facilities Management System as captured by the NCDoE quarterly	Chapters 1 and 6
EMIS Data	Secondary Source	Document Review	Sourced from the NCDoE EMIS database	Chapter 6
Condition Assessments	Secondary Source	Document Review	Sourced from the NCDoE Condition Assessments as conducted by the Northern Cape Department of Roads and Public Works	Chapter 6
StatsSA data	Secondary Source	Descriptive statistical analysis ³	Sourced from the StatsSA website and publications	Chapters 1 and 6

(Source: Author's creation, 2022)

¹ Document review is also known as a document analysis system that is adopted from the qualitative research methodology of evaluating documents as a means requiring data to examine to understand the area of study and develop an empirical study (Bowen, 2009:27).

² Systematic literature review is also known as a scientific literature review focusing on a specific area of focus that is important in the process of identifying the research questions and to justify any future research in the area (Torres-Carrión et al., 2018:1370).

³ Descriptive statistical analysis is an approach that is used to define special features of data in the research that uses published data (William, 2022:1).

1.5. Chapters of thesis

Figure 1-2 indicates this thesis's literature and empirical chapters and how they are interlinked and aligned with the aims and objectives of this study.

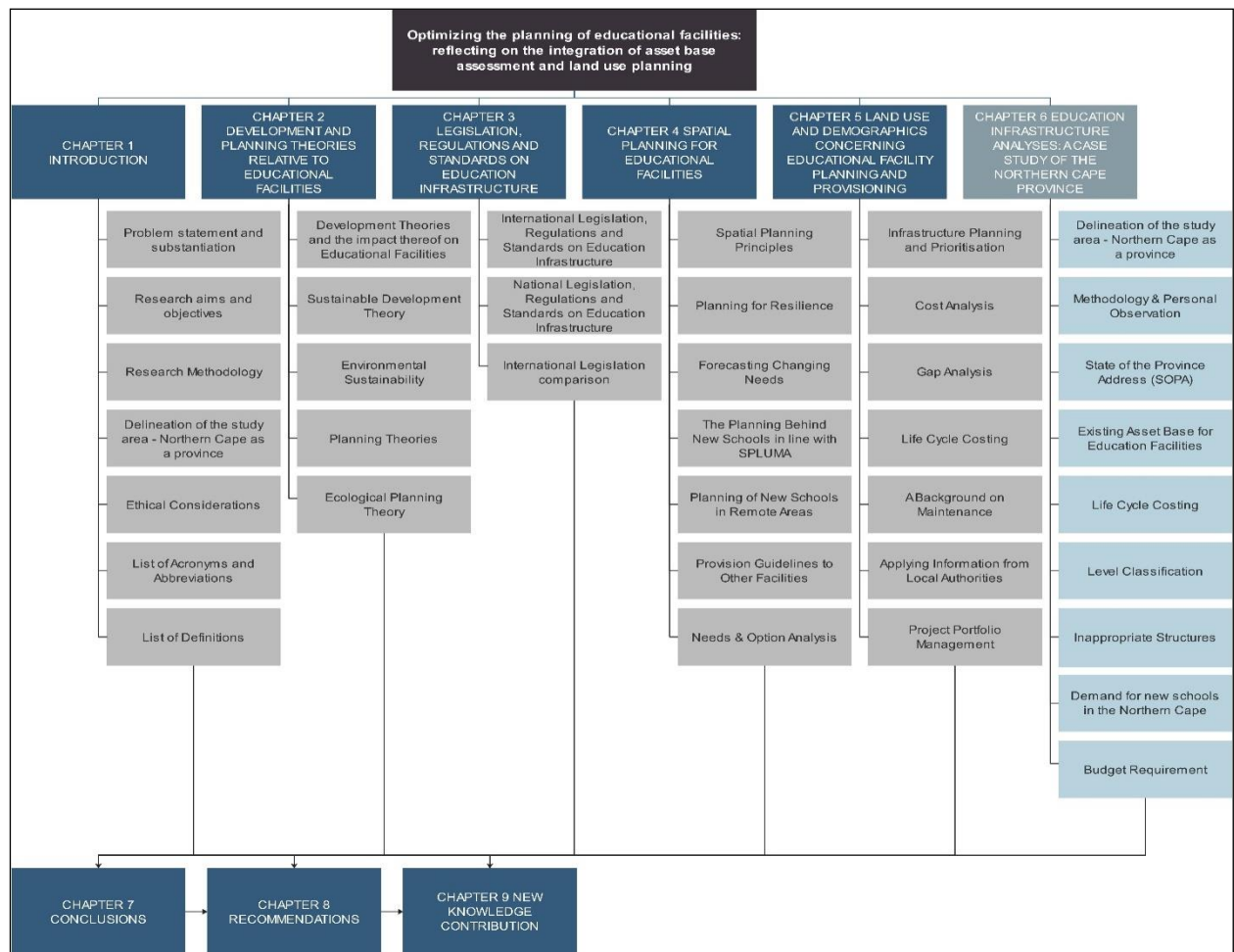


Figure 1-2: Chapters of thesis

(Source: Author's creation, 2022)

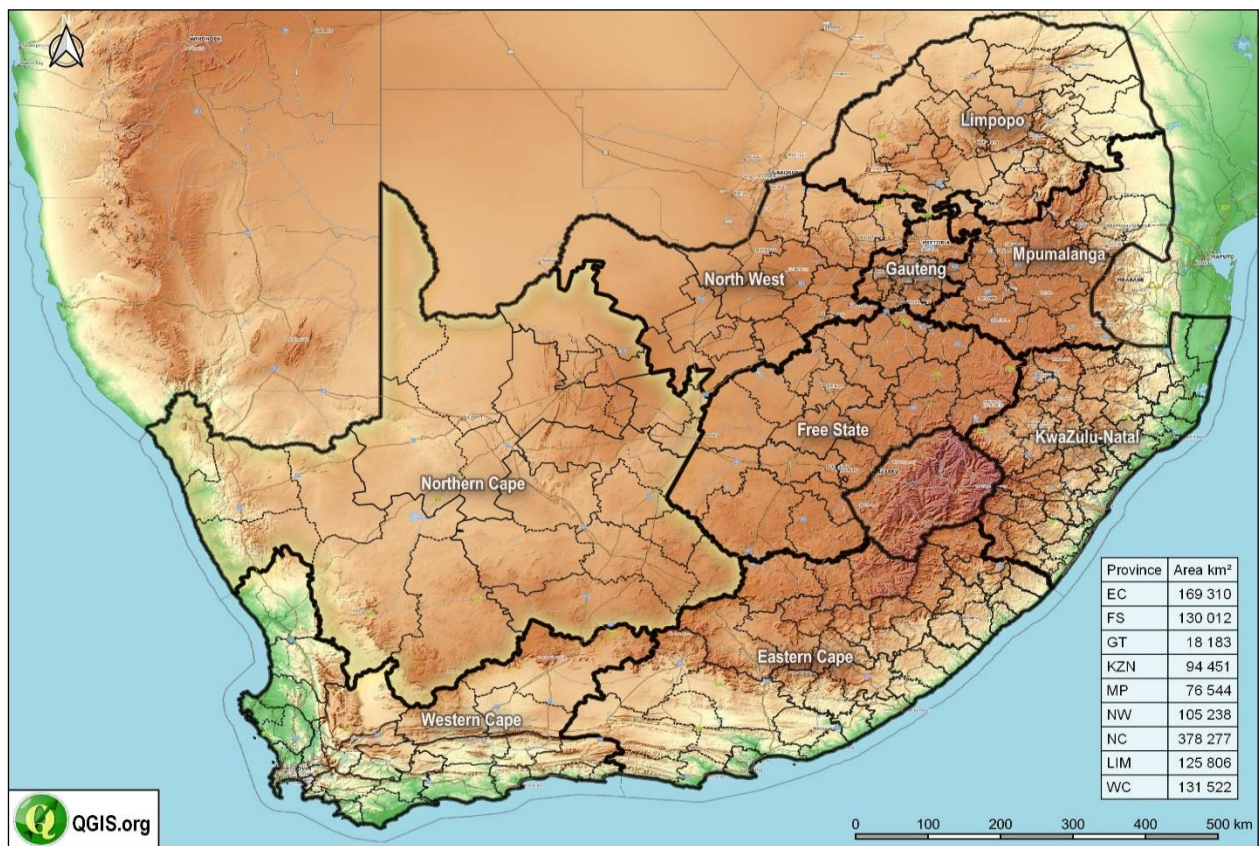
1.6. The rationale behind the demarcation of the study area

The Northern Cape is a unique province with a vast distance between settlements, small communities, and various challenges linked to the service provisioning within these communities. The rationale behind identifying the Northern Cape was mainly due to the researcher's knowledge of the province and the education sector, as the researcher has been an employee of the Northern Cape Department of Education since 2013 and has been in a middle management position since 2015. The researcher served on various committees within the Northern Cape and national level gaining expert knowledge of the sector and the challenges experienced by all provinces. The challenges identified in the Education Infrastructure are nationwide. However, due to the uniqueness of the Northern Cape, the limited budget, and the significant backlog, it became key

in identifying recommendations to address the challenges, optimise the existing infrastructure and ensure that infrastructure is provided suitably and sustainably for future generations.

1.7. Delineation of the study area - Northern Cape as a province

The Northern Cape is the most extensive province within South Africa, located in the north-western corner. According to (Stats SA, 2018), “the province was formed on 27 April 1994 after the split from the Cape Province. It is demarcated into five districts (see Map 1-1) and twenty-six local municipalities. The province shares borders with four other provinces: Western Cape, Eastern Cape, Free State and North West. It also shares borders with the states of Namibia and Botswana, respectively.”



Map 1-1: Delineation of the study area – the Northern Cape

(Source: Wells, 2022)

The province accounts for 30,5% of the total landmass of South Africa and only accommodates 2,2% of the South African population despite its incredible size; as per Provincial Mid-Year Estimates, the province 2016 conducted by Statistics South Africa.

“The Northern Cape Province is a unique part of the globe. It is unique primarily due to its rich endowment of natural, cultural, economic and human resources. As a consequence,

our province has become an international economic, scientific and environmental focal area, as is demonstrated by, among other things, the designation of the Square Kilometre Array (SKA, now referred to as the SARA0) project, UNESCO's registration of both the Richtersveld Botanical and Landscape as well as the ǀKhomani Cultural Landscape World Heritage Sites, and the growing investors' interest in the Gamagara Development Corridor" (Office of the Premier, 2019:3).

According to the latest Education Management Information System Statistics (EMIS, 2022), the education system is the most significant system in South Africa; in the publication, it was stated that South Africa has nearly 24 894 schools where 13 409 249 learners are catered; this includes ordinary public schools as well as independent schools. Four hundred forty-seven thousand one hundred twenty-three (447 123) educators serve these learners within the nine provinces. July 2021, the data were calculated from the Learner Unit Record Information and Tracking System (LURITS) and Provincial Data Warehouses databases. As the primary study area, the Northern Cape accounted for 2.3% of these statistics for 2021 for public ordinary and independent schools with 304 566 learners, 10 486 educators and 585 schools (DBE, 2022). 2022 according to the latest learner enrolment numbers on the Education Information Management System (EMIS), the learner enrolment for 2022 is 310 561, an increase of 5 995 learners from 2021 to 2022. Table 1-3 demonstrates the distribution of the 596 schools per district in the Northern Cape:

Table 1-3: Northern Cape School Distribution

District Municipalities	Frances Baard	John Gaetsewe	Taolo	Namakwa	Pixley Ka Seme	ZF MgCawu
Number Schools	Of 142	179		81	93	101

(Source: NCD0E, 2022)

1.8. Ethical Considerations

Orb et al. (2001:95) specified that all research must be led by "the principles of respect for people, beneficence, and justice" this means that the research will not negatively affect any citizens or the NCD0E. Therefore, this study adopted a qualitative approach of analysing several different literature and reports to conduct this study of optimising the planning of educational facilities: Reflecting on the integration of asset base assessment and land use planning. The study was ethically cleared under the minimal risk category at the North-West University (NWU) with the following ethical clearance number: NWU-01168-19-A9. Additionally, a letter of acknowledgement was sent to the NCD0E (see Annexure A: NCD0E letter of consent) that granted me approval to conduct the research.

CHAPTER 2 DEVELOPMENT AND PLANNING THEORIES RELATIVE TO EDUCATIONAL FACILITIES

2.1. Chapter Introduction

This chapter illustrates how development and planning theories integrate into educational facilities. It is essential to recognise the concept theory. Stewart (2016:1) stated that theories are numerous things that might happen at different phases of our life, and we are not always cognisant of these theories. Thus, it is essential to note that theories are alarmed with the actual world. Pieterse (2010:1) states that theories are: the “Critique, revision and summation of past knowledge in the form of general propositions and the fusion of diverse views and partial knowledge in the general framework of explanation”. Theories can then be summarised as several of past knowledge of the actual world circumstances that can be used to express universal regulated frameworks.

Therefore, this chapter mainly focused on development, sustainable planning, and theories. Development theories started in the 18th century and focused on the urban form and the spatial patterns taken by the distribution of people, buildings, and education facilities across a city’s terrain (Kim *et al.*, 2019: 608). Theories such as Howard's Theory of Garden Cities, Marxism Theory, Neo-Marxist Theory and Neo-Liberalism Theory were analysed to understand how development theories are relevant to educational facilities. Sustainable development is a theoretical concept that states that all development must not negatively affect the current or future needs of the communities (Kim *et al.*, 2019: 608). In this chapter, the need for sustainable development was investigated as to how educational facilities in settlements will positively affect the needs of the communities.

Furthermore, the chapter comprehended planning theories and how these theories will relate to educational facilities and how educational facilities will be planned to be sustainable. Through analysing the planning theories, eight practical planning theories were identified, and this chapter further discusses these theories to understand their relevance to educational facilities. The chapter also focuses on sustainable planning, such as Ecological models of urban form, which elaborates on the spatial patterns taken by the distribution of people, buildings, and Education Facilities across a city’s terrain. “Urban form is one of the main characteristics of urban areas which affect its sustainability” (Colaninno *et al.*, 2011:2). Figure 2-1 indicates the structure of this chapter:

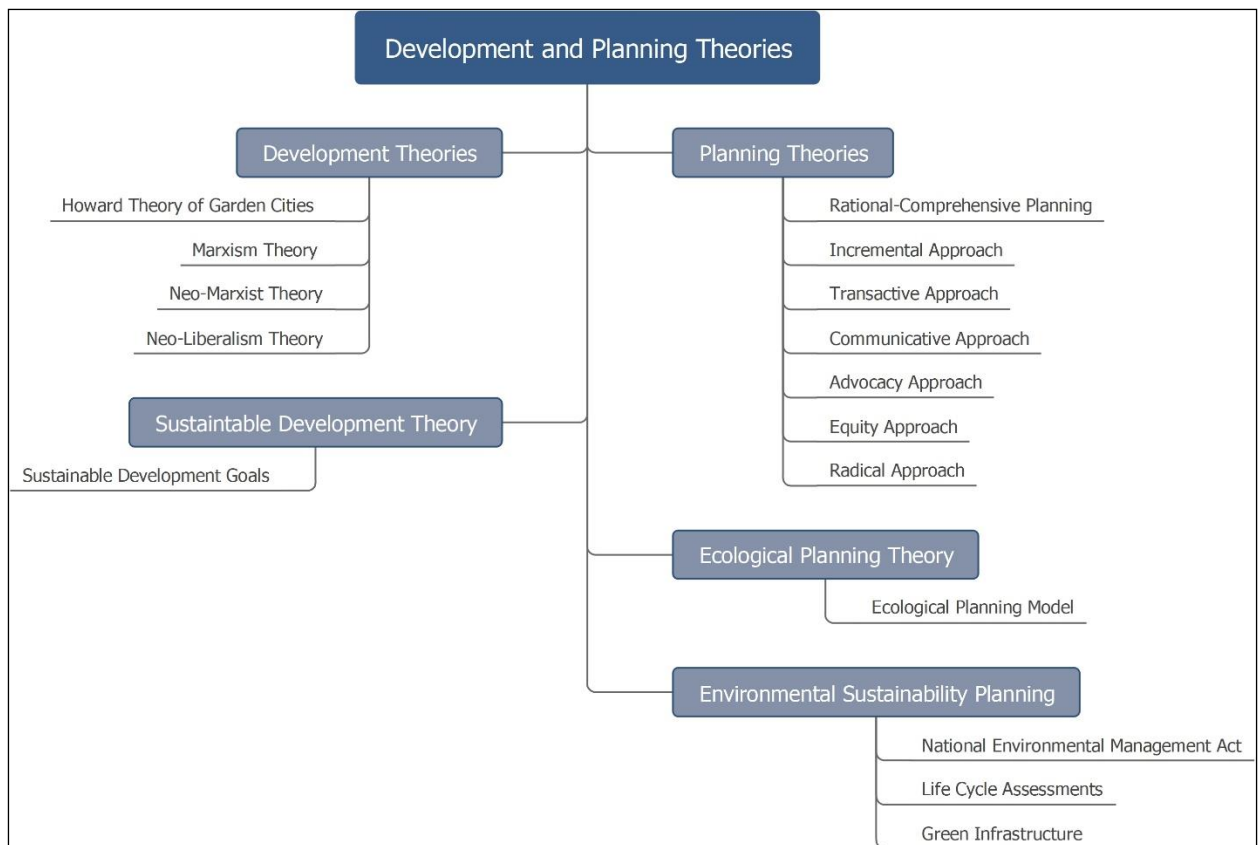


Figure 2-1: Chapter 2 Structure
(Source: Author's creation, 2022)

2.2. Development Theories and the impact thereof on Educational Facilities

Pieterse (2010:1) illustrated theories as “critique, revision and summation of past knowledge in the form of general propositions and the fusion of diverse views and partial knowledge in a general framework of explanation”. Nevertheless, this section focused on development theories and the effect on planning for educational facilities over the decades. Developmental theories were altered by “political shifts, changes in intellectual currents and practical development experiences”, and these theories are customary to radical change in several different developmental problems (Bull & Bøa^os, 2012:331). Therefore, the concentration on theories relevant to urban and regional planning and how these theories have influenced educational facilities planning.

2.2.1. Howard's Theory of Garden Cities

Bacon (1974:1) indicated that during the 18th century, most European countries experienced the Industrial Revolution, which contributed to the influx of rural societies that migrated to urban areas to find employment. The migration of rural communities to the areas starts with social problems,

as the urban areas will become densified, and there will be a decline in environmental resources. Therefore, in the early 1900s, Howard acknowledged a need for urban transformation to integrate the rural agricultural fields into the urban areas as Garden Cities to resolve the current problems of the Industrial Revolution established in the metropolitan cities (Alexandri, 2007:4).

The Garden City was designed to decentralise the urban areas to the rural areas to optimise the livelihood of the residents (Gatarić *et al.*, 2019:34). Howard Garden City theory would combine urban and rural environments to establish an environmentally friendly environment. Additionally, Legeby (2010:29) explained that the garden city would have been self-sustainable, as it had been planned to accommodate approximately 30 000 residents in a circle outside the urban centre, illustrated in Figure 2-2. Establishing these smaller residential areas outside the urban centre was part of the decentralised of the metropolitan. Gatarić *et al.* (2019:35) identified that Howard's planning theory of the Garden City spatial plan established six residential areas with approximately 5 000 residents on the outskirts of the main urban centre, and these residential areas or suburbs are linked through transportation with each other and the urban centre as demonstrated in Figure 2-2.

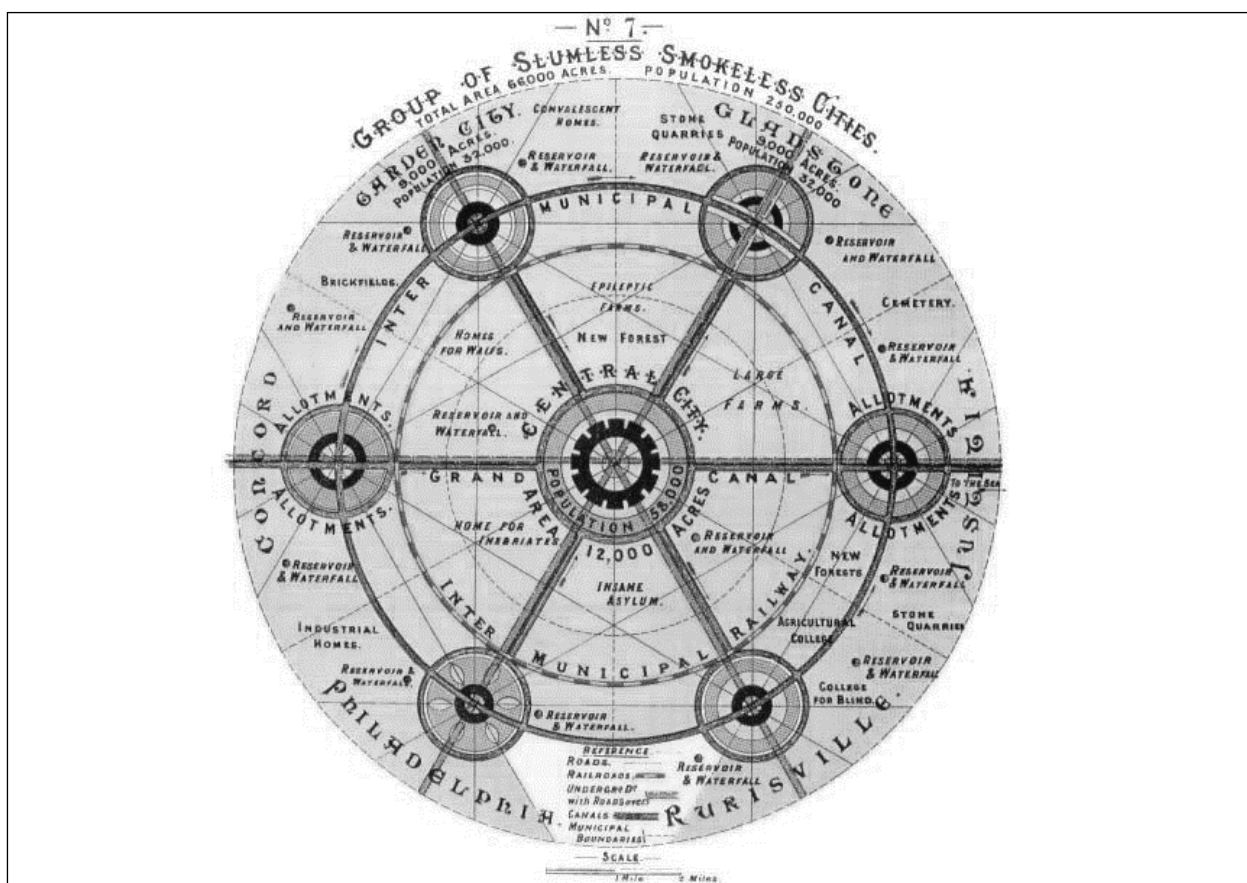


Figure 2-2: Howard Garden city diagram for planning
(Source: Ramadan, 2010:67)

Figure 2-2 explains the Garden City's overall design to establish the urban centre and the six residential areas or suburbs surrounding the central hub. Therefore, Figure 2-2 further illustrates how the design of Howards Garden City theory is executed in more detail and focuses on only one of the six residential areas. This theory's critical aspect included the rural agricultural sector into the urban residential and industrial sectors, limiting travel duration and decentralising the different sectors.

The following Figure 2-3 demonstrates that the spatial planning of Garden City was designed to develop residential and industrial sectors in the centre of agricultural land and also include several open public green spaces in each centre. Gatarić *et al.* (2019:35) stated that Garden City was designed with a principle of spatial wall zoning, also identified as a green belt with the intention for agricultural growth and to limit the urban development of the population and the expansion of the residential or industrial zoning of the surrounding land.

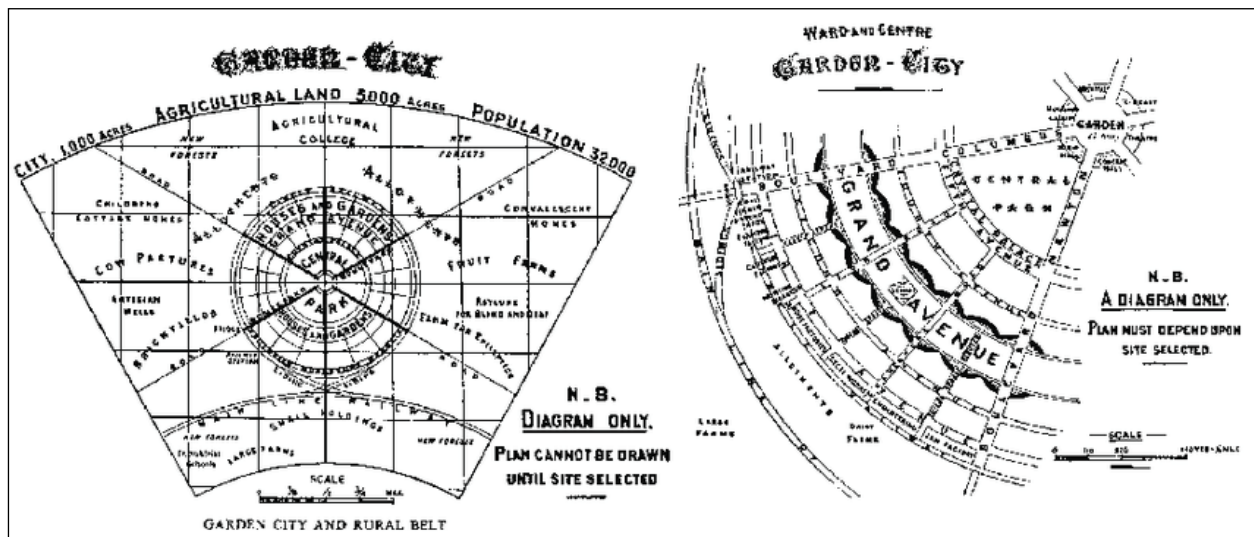


Figure 2-3: Howards Garden City Design
(Source: Legeby, 2010:29)

Howard (1965:22) explained that the central urban circular would be planned to include a “beautiful and well-watered garden, and surrounding this garden, each standing in its own ample grounds, are large public buildings, as a town hall, principal concert and lecture hall, theatre, library, museum, picture-gallery and hospital”. Additionally, Nuzir and Primadona (2012:8) and Gatarić *et al.* (2019:35) acknowledged that each housing or settlement neighbourhood of the Garden City with an estimated 5 000 residents, and for these residents, each neighbourhood will be supplied with only one school and additionally supplied with other social infrastructure as an outdoor play area and public facilities and the following industrial sector infrastructure as,

sweatshops, workshops and warehouses accessible to the railroad connecting all the different areas of the Garden City.

Howard believed that his urban planning would have achieved social justice and radical change (Legeby, 2010:29). Several scholars argued that his theory was not sustainable planning for all citizens' social justice but only focused on the agricultural sector's growth (Hall, 2014:98). He is shifting the focus back to the social infrastructure of Garden City as he identified that only some of the social and health infrastructure is located in the central centre of the planning and only one school per neighbourhood for 5 000 residential. Therefore, the residents residing in the six neighbourhoods on the outskirts need to travel to the central centre to access social and health emendates.

The United States Census Bureau (2020: Online) identified that 23.2% of the population are between the ages of 6 to 18 and are classified as the portion of the population attending education. Thus, if each garden city neighbourhood has an estimated 5 000 residents, approximately 1 160 of the residents must attend school, and there is only one school per neighbourhood. The only educational facility must be a combined school offering primary, middle, and high education. According to the Norms and Standards (1992:2), the minimum required area for this school is 6.5 acres (2.6 ha) with a standard of 40 learners per classroom, which entails the school having 29 classrooms to accommodate all the learners. These learners do not have the freedom of choice of which school they want to attend. Still, they are mandated to attend the only school in their neighbourhood, which clearly illustrates no social justice for the residents in Garden City's outskirt neighbourhoods (Legeby, 2010:31).

2.2.2. Marxism Theory

Brewer (2002:25) explained that the Marxism theory to promote the capitalist system would have been possible to develop independently without expanding into neighbouring capitalist civilizations. Starting a capitalised state of governing will primarily focus on the State's economic growth and be a top-down approach to governing the State. Stolzman and Gamberg (1973:105) identified that the Marxist theory favours class diversity and could create class inequalities and uneven distribution of the resources and essential needs for the lower classes. In the South African context, the birth of the apartheid era started in 1948, which was to relocate the different racial classes and the birth of the Apartheid City (Smith, 2003:41). The relocation of the working force to the homeland or the outskirts of the urban areas negatively affected the relocated citizens' livelihood. They had no right to dispute the South African government's decision.

Urban segregation in South Africa was executed through decades of legislation that contributed to racial segregation (Maylam, 1995:27):

- Before 1900 racial restrictions were included in the title deeds for urban-dwelling owners, which contributed to new suburbs being established on the urban edge's outskirts and classified as racial segregation.
- The 1919 Public Health Act endorsed racial segregation to control the disease problems in urban areas due to the congested and unhygienic living circumstances of inner-city Africans.
- "Central Housing Board" was one of the instruments set up under the 1920 Housing Act that the South African government executed for racial segregation that would only have approved grants relating to racial housing projects.
- The 1934 Slums Act was an added measure that pursued suburban segregation to remove the "black slum communities" from the urban suburbs to provide space for the advantaged inhabitants to grow (housing and business developments).

The Group Areas Act governed the final contribution to racial segregation in South Africa 41 of 1950 (Maylam, 1995:27). The Group Areas Act 41 of 1950 stated that all coloured (disadvantaged) South Africans would be bound to townships and homelands, only be permitted to the white areas during a specific time, and only conduct essential services (RSA, 1950:43). Therefore, this Act made provision for drastically spatial transformation identified as the establishment of Apartheid Cities in South Africa that restructured the city into several segments to accommodate the different ethical groups.

Figure 2-4 demonstrates the layout of an Apartheid City. Figure 2-4 recognises the separation of the different classes in the Apartheid City. The white inhabitants are also segregated into their sections according to their wealth. Additionally, the figure identified a buffer strip between the lower and middle-class white residents divided from the other ethical residential suburbs or townships' lower outskirts of the urban edge. The Apartheid City was designed to develop the industrial sector within close travelling distance of the working force (lower white class and other ethical classes), as demonstrated in Figure 2-3. Du Plessis *et al.* (2003:243) mentioned that as part of the Apartheid City initiative, the government established formal settlements for the homeland's citizens during the 1950s to 1960s. However, these citizens still faced the challenge of being discriminated against and lacking social facilities, access to basic needs, and the other class suburbs. The Marxist theory and the South African Apartheid City only favoured selected citizens.

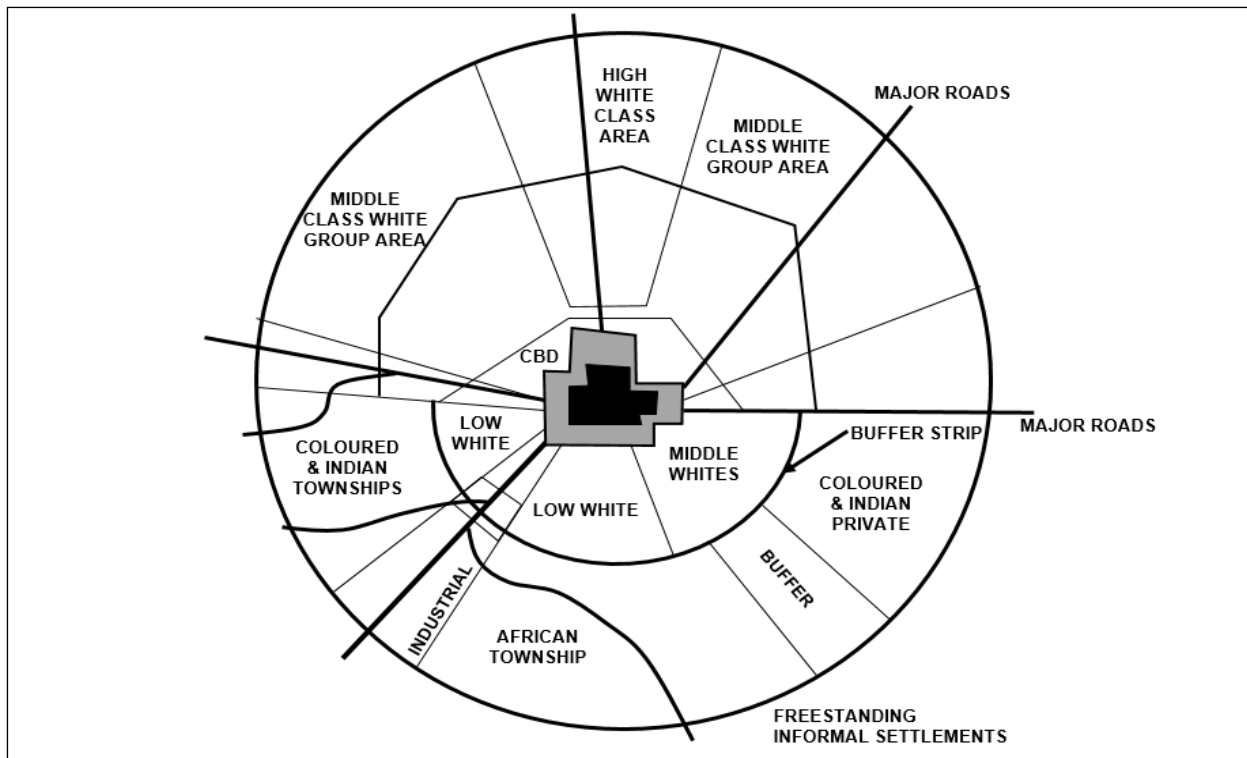


Figure 2-4: Example of South African Apartheid City

(Source: Du Plessis *et al.*, 2003:245)

Arrighi *et al.* (2010:412-421) identified that the Apartheid Cities in South Africa accumulated wealth through the dispossession of the lower white classes. The African inhabitants segregated townships as cheap labour for the white settler bourgeoisie. This accumulation was identified as the privation accumulation of wealth and ensured by dispossessing the other classes in South Africa. Mackay (1996:134) explained that the white classes had the privilege of high housing levels. The disadvantaged residents were bound to the outskirt townships with limited infrastructure and had to provide for their shelters in the townships. Therefore, this increased the informal structures (shacks) in the townships, and they had minimal basic service, as the advantaged classes enjoyed the privilege of access to all the essential services and social infrastructure available to them.

In 1936, almost 70% of the African South African youth were not attending school due to limited educational facilities, and the existing facilities were overcrowded or understaffed (Johnson, 1982:217). Thus, this further identifies that the advantage classes provided enough educational facilities for their youth's growth by dispossessing African youth. Johnson (1982:217-219) also recognised that the quality of education of the African youth was substandard to the advantaged youth. Thus, illegal Banto educational facilities were erected in the townships to improve the quality of the education of their youth.

2.2.3. Neo-Marxist Theory

In the 1970s, the Neo-Marxist theory for development was innovated as the new age of Marxist thinking about class theory to embrace the middle classes' challenges and focus on the wealth accumulation of the higher classes (Neilson, 2018:274). Dodson (2006:227) identified that the Neo-Marxist development theory is the "role of the state" governed by capitalism. Thus, Neo-Marxist theory shifted its focus to other classes, but it is still a top-down approach to providing for citizens. Venter (2017:13) stated that Neo-Marxist theory encourages "state-led development" methods to stabilise the previous effects of the Marxist impact of capitalism. The Group Areas Act of 1950 was still implemented in South Africa, significantly contributing to racial segregation in the urban areas. During this period, different Housing financial policies were introduced to reduce the financial burden on the various spheres of government (Smith, 2003:41). Thus, the newly elected South African government still encouraged the Apartheid City way of planning and segregating the urban areas but formulated top-down policies and programmes to provide housing to the city's other class and ethnic groups and not only focus on the wealthiest residents.

Smith (2003:41-43) identified that the Minister of Native Affairs announced that all the capital sectors of South Africa must contribute to the fund to provide housing and essential service to the residents relocated to the townships and homelands during the start of South African racial segregation. Additionally, in 1952 the "Native Service Levy Act" was passed to force employers' capital sectors to contribute monthly to the Black Housing fund. The National Party introduced Mass Democratic Movement that contributed to the central government implementing mass housing construction projects with a political, human rights outlook and not focusing on providing housing as a commodity (Huchzermeyer, 2001:307-308). However, the Neo-Marxist theory was only formulated in the 1970s.

The South African government had already identified a movement toward a state-led development approach of providing housing and essential service to the racial groups' bund to the townships during racial segregation. The disadvantaged residents were not always in agreement with the state-led development approaches. As they had no human rights, they had to comply with the states' programmes; however, in the 1950s, communities started to stand up for themselves. These communities refused to allow the government to demolish their dwelling and relocate them as part of the Black Housing programmes in South Africa (Smith, 2003:42). Johnson (1982:219) identified that the Bantu Education shifted as an integrated fragment of the policy planning for "socioeconomic development for the Bantu people that led to the Bantu Education Act of 1953". This passed legislation centralised African Education governed under the

national sphere of government. The State must approve all the establishment of Bantu educational facilities and an initiative to eradicate those inequalities in the African educational system in South Africa.

Castells (in Venter, 2017:14) supported the Neo-Marxist theory that class inequalities had emerged due to capital accumulation and uneven wealth distribution of the advantaged citizens in the urban areas. Therefore, Du Plessis *et al.* (2003:243) identified that in the 1970s, the South African rural population migrated to the urban areas for employment opportunities as cheap labours, which placed great strain on the townships and homelands to provide housing for these rural migrants. As a result, informal settlements were established on the homelands' outskirts to accommodate these migrants to access the industrial sector. Several scholars defined informal settlements as slums, and Cockburn, Romero, Lucci and Lenhardt (2015:9) demarcated slums as "poor-quality housing", which entails replacement and as the majority of these dwellings are erected illegally on private or State land, and this can result in "evicting residents and destruction of their homes". Informal settlements are dense, self-constructed dwellings "under the informal or traditional land tenure" (Reed, Aigbavboa and Thwala, 2010:235). Castell's theory is to eradicate the class inequalities in the housing provision in South Africa, as all the housing and social project for the townships are planned and implemented by stated-led development (top-down) approach, and the disadvantaged residents are still disadvantaged. Du Plessis *et al.* (2003:243) also mentioned that the established townships became overcrowded, and formal residential areas also had to relocate to the homeland's outskirts, contributing to increased public transport from their residential area to their employees daily.

The inequalities of residing in informal settlements are that the residents do not have access to water, sanitation, electricity, secure tenure and limited access to social infrastructures (Ziblim *et al.*, 2013:6). Thus, the learners residing in the informal settlements have a slight chance to attend schooling. Johnson (1982:220) explained that during this period of the advantage, learners' education was compulsory, and the African learners only a small portion of them had access to educational facilities as the financial resources to erect educational facilities for the African learners were utilised to provide educational facilities to the advantage learners as their education was compulsory. Furthermore, due to the shortage of educational facilities for African learners, approximately 50% of the African learners that are enrolled in primary school are forced out of the system before they can complete their primary school education and the percentage of African learners that complete their senior certificate was only one-tenth of the primary graduates.

The South African government implemented the Neo-Marxist development theory to improve the African residents' inequalities. Their initiatives only favour the well-being of the advantaged residents in South Africa. However, they did implement some programmes to provide housing solutions to the bounded residents of the homelands and townships. However, these programmes only worsen the racial segregation and the inequalities of the African citizens as they have limited access to social infrastructure and have to travel long distances daily to access their employment.

2.2.4. Neo-Liberalism Theory

Jessop (2002:453) explained that the liberalism theory focused on the political, economic and social aspects of the institutions that already had the freedom of choice. This theory would only favour the former free institutions to maximise their access to the free markets. Therefore, liberalism is closely associated with "free market capitalism", and the State must still actively promote capitalism (Venter, 2017:18). The liberalism theory would not have been able to promote the democratic vision of South Africa. Marais (in Gelderblom and Martin 2005:136) identified that before the African National Congress (ANC) won the initial democratic election of South Africa in 1994, there was already a clear indication of a "neoliberal macro-economic policy", and this movement would ensure the previous disadvantage classes will be able to benefit from the movement to the neo-liberalism theory.

Neo-liberalism theory can be argued to define the number of macro-level changes occurring in our globalised world today (Turner, 2014:8). Cohen and Kennedy (in Gelderblom and Martin 2005:12) stated, "Neo-liberalism is an economic doctrine that placed great emphasis on the free market and unconstrained competition". Therefore, this would be achieved if the State did not intervene in the economy. Post-1994, the South African government shifted its political outlook to developmental policies with a socialist character. The Reconstruction and Development Programme (RDP) for economic growth to promote employment and reduce political violence and crime among all the citizens of the new democratic South Africa (Narsiah, 2002:29). The ANC party was established as part of their campaigning to correct the previous imbalance and inequalities of the Apartheid regime (Manomano, 2013:14 & Masiteng, 2012:19). Therefore, the RDP was intended to guarantee all citizens' success; equality and justice were determined through a rearrangement development path to achieve democracy.

2.2.4.1. Reconstruction Development Programme (RDP) 1994

Manomano (2013:14) stated that the RDP inclusive programme proposed to redress all the former inequities caused by the Apartheid regime of South Africa. Further, Masiteng (2013:19) identified

that the RDP was the manifesto of the ANC during the elections. After winning the election, they tried to correct all the imbalances from the previous government. The programme focussed on resolving the most severe social problems as most African citizens lacked proper dwellings and limited access to social infrastructure. Moolla *et al.* (2011:139) recognised that an RDP housing settlement was developed in Soweto in 1996 in Bramfischerville, located on Soweto Roodepoort's border. Moolla (cited in Moolla *et al.*, 2001:139) elaborated that the mentioned housing development in the urban area of Soweto will include the provision of residential dwellings, all basic services (water, electricity and sanitation facilities) and other social infrastructure that is required for establishing a human settlement (schools, clinics and recreation area). This human settlement can upgrade informal dwellings or establish a new settlement, and residents will relocate.

The RDP housing reflected a neo-liberal approach to providing low-income dwellings as the community members were not included in this RDP housing (Bond, 2003:4). Thus, no community participation was incorporated in the programme's planning and planning construction (top-down approach). On the other hand, educational facilities planning was also a top-down approach during RDP settlements planning. The local authority only planned according to the projected inhabitants of the settlement without consulting with the settlement communities. An example of the RDP housing constructed in South Africa is illustrated in Figure 2-5:



Figure 2-5: Reconstruction Development Programme Housing
(Source: ESI Africa, 2019:2)

In conclusion, the RDP housing initiative provided formerly deprived South African citizens with housing as they felt omitted from the planning. Huchzermeyer (2003:595) specified that inhabitants of the informal settlements had to relocate to the newly demarcated sites, and they were not impressed with these arrangements. The residents also felt that their children were

already enrolled in the education facilities within walking distance of the informal settlements. They did not want to relocate their children to the newly planned and constructed schools, as they believed it would have negatively affected the results of the children. That would then have created additional transportation costs for the DoE.

The RDP housing development programme was a South African-founded programme to address the previously disadvantaged South African citizens. The following two programmes were adopted from international theoretical programmes for providing acquired housing for residents.

2.3. Sustainable Development Theory

In 1992, The United Nations (UN) established Agenda 21, adopted by 178 countries as an inclusive action plan for universal sustainable development and this partnership will improve human livelihood and conserve the environment (UN, 2019:2). During the adoption of Agenda 21, the South African government was still governed by the Apartheid regime. The Apartheid regime was the primary cause of political, social and economic inequalities in South Africa was the working of years of colonialism and bounding the disadvantaged citizens to the homelands (Department of Environment and Tourism, 2008:17). In 1996, the newly democratic South African government passed the supreme law as the Constitution of the Republic of South Africa 1996. Provision is made for the social democracy built on “human dignity, equality and freedom” for all South African citizens (The Republic of South Africa, 1996:15). The South African government passed several sustainable development legislation mandated by the supreme law. Thus, this was the birth of sustainable development in South Africa. Then in 2002, the South African government adopted the UN Agenda 21 and endorsed the international community’s guarantees of poverty eradication (UN, 2019: Online).

Kim *et al.* (2019:608) explained that sustainable development is when the existing requirements will not compromise future conditions’ capability. Such as, the current event will still be sustainable in the long run, and future development can easily integrate with the existing developments. Naess (2001:504) also stated that sustainable development guarantees that everybody from the north to the south’s current needs for future generations is met. Sustainable development is often depicted as the centre of the three pillars of the economy, the environment and equity (Connelly, 2007). This simplistic view disregards the complexity of the trade-offs required to balance people's welfare and the planet (Campbell, 1996; Kemp *et al.*, 2005). Then in 2015, the UN implemented the seventeen Sustainable Development Goals. After years of establishing Global Sustainable Development plans, these Goals will be integrated into the 2030 Agenda for Sustainable Development (Biermann *et al.*, 2017:26).



Figure 2-6: UN Sustainable Development Goals

(Source: UN Sustainable Development Goals, 2020:3)

These identified Sustainable Development Goals must be achieved before any area can be classified as sustainable. Additionally, Biermann *et al.* (2017:26) recognised that one of the primary challenges the UN is continuously facing is the corporation of different governments. Achieving sustainable development requires a bottom-up approach, and some governments still utilise the top-down approach to planning and implementation. As stated with the newly elected democratic government in 1994, South Africa shifted from its previous top-down approach of Marxism, and Neo-Marxist theories to a free-market approach as Neo-Liberalism provided previously disadvantaged citizens but was still a top-down approach. They then adopted the UN Agenda 21 of a bottom-up approach to governing the country to include the public's participation in all their decision-making. Guidelines Relating to Planning for Public School Infrastructure (2012:9) mentioned that educational facilities must be within a 5km radius or a maximum of 10km walking distance for the learners and educators to develop sustainably. Additionally, The Norms and Standards (DBE, 1992:2) also identified that when allocating educational facilities sites, the following criteria must also be taken into consideration to ensure the site allocation is sustainable:

- The school site, including the sports facilities, cannot be smaller than 2.8ha for a primary school and 4.8ha for a secondary school.
- When allocating a site, it needs to accommodate all the required facilities, including various environmental factors, and a primary school cannot be multi-story. All these factors must be evaluated when identifying a school site.
- The identified site must be reachable for basic services—for example, water and electricity supply, sewage line and roads. When a school needs to be constructed in a rural area,

alternative solutions provide the basic services: drilling a borehole, solar electricity, and a septic tank.

- It is crucial to avoid identifying a site close to a cemetery, taxi rank, sewage treatment plant, business centre, public hostel, or busy roads.
- The site may not exceed a slope of 15 degrees and should be preferably rectangular.

In South Africa, the right to a safe and healthy environment is entrenched in the Constitution (1996). The South African government 2002 adopted the UN Agenda 21 and endorsed the international community's guarantees of poverty eradication (UN, 2019: Online). Following the South African Constitution, all South Africans have the right to a safe and healthy environment. Environmental sustainability (ES) is a theory under sustainable development theory, and the following section will deliberate more on ES theory and how it is related to educational facilities.

2.4. Environmental Sustainability

Environmental sustainability development has been identified as a fundamental need that will be maintainable for years to come. Therefore, environmental sustainability is a derivative of sustainable development that only focuses on the environment. Goodland (1995:10) identified environmental sustainability "as the maintenance of natural capital," and Goodland and Daly (1996:1003) further elaborated that improving social sustainability can also contribute to environmental sustainability. Humanity can utilise natural resources for sustainability and not damage the environment. Morelli (2011:4-5) defined environmental sustainability as:

"A condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity".

Thus, planners must incorporate the environmental sustainability of the developed location when drafting a site development plan. For example, the site layout utilises the most natural elements. In 1998, the South African Legislation passed the National Environmental Management Act (NEMA) 107 as the South African environmental management framework to recognise, forecast and calculate the different influences that development might have on the environment (DEA, 1998:31).

Jeong *et al.* (2015: 538) explained that buildings and infrastructure could significantly impact (positive or negative). Therefore, most of the newly constructed buildings and infrastructure are designed and implemented to be incorporated into and conserve the environment. Internationally,

South Korea identified that they formulated measures to reduce Educational Facilities' effect on their environment and implemented the "Green Schools Project" (Jeong *et al.*, 2015: 538). Jang *et al.* (2015: 144) stated that it is essential that an environmental impacts assessment (EIA) of the buildings should be conducted to identify the environmental impacts the construction of the educational facilities will have on the environment and to ensure the educational facilities are environmental sustainability. Then they further recognised that a "life cycle assessment (LCA) that is a representative method of assessing the environmental impacts of buildings has been used in many previous studies" (Jang *et al.*, 2015:144).

The LCA will identify if the educational facilities are ES, and in South Africa, designing environmental sustainability educational facilities is still a new concept. However, the first Green School in South Africa was constructed in the Cape Winelands (Western Cape Province) and is projected to operate in 2021 (Jacobs, 2020: Online). Green School South Africa (2020:4) recognised that the educational facility planned to be defined by its surrounding environment. The facility spatially consists of "various clusters of buildings, nestled amidst orchards, vegetable gardens, meandering routes, landscaped terraces and spill-out spaces".

A series of organic-shaped 'werf' walls weave the individual clusters of buildings into a coherent whole, creating a world of passageways and spaces for learners to discover while waterbodies are connected with 'lei water' channels are gravity fed, both referenced from the vernacular, Cape Dutch Architecture. The positions of the different buildings have carefully considered passive design principles, feng shui and the Living Building petals. The result is harmonious spaces where humankind and nature can reconnect. The Green School in Paarl Valley was constructed to spatially arrange the buildings and the spaces between them at a macro level. These buildings are organic tectonic shapes positioned within different zones to ensure passive design principles. These buildings were constructed from locally sourced building materials and with green infrastructure initiatives such as rainwater collection, natural light and ventilation.

Figure 2-7 demonstrates the Green School in South Africa as the first entirely green educational facility. This green educational facility is an example that makes it possible for greener educational facilities to be planned for and implemented in South Africa.



Figure 2-7: Example of a Green School

(Source: Green School South Africa, Abdel, 2021: Online)

2.5. Planning Theories

Planning theory was initially viewed as a theorised “bi-continental, Euro-American enterprise” (Friedmann, 1998:245). Planning theory was established through a cooperative relationship between two regions, Europe and America, the birth of planning theory. Fainstein and DeFilippis (2015:12) mentioned that defining planning theory is challenging as the explanations can often be irritatingly repetitive or unsatisfactory. Additionally, Friedmann (2011:131) clarifies that planning theory can be pronounced by uniting different elements to formulate planning theory. Consequently, planning theory is intertwined with social, economic, environmental and political theories, and together they can appraise the creation of planning theories.

Fainstein (2005:121) articulated the following questions for planning theory: “(1) under what conditions can conscious human activity produces a better city for all citizens? (2) How do we explain and evaluate the typical outcomes of planning as it has existed so far?” By answering these questions, planners can determine if accurate planning theories were utilised. Then,

Whittmore (2015:76) identified eight practical planning theories, known as today's principal theories of planning techniques. These are as follows, “the rational-comprehensive approach, the incremental approach, the transactive approach, the communicative approach, the advocacy approach, the equity approach, the radical approach, and the humanist or phenomenological approach”. As a result, by grounding these theories in the modern practises of planners, students and specialists can better understand planning theories and if they are sustained and significant. Therefore, the following sections will recognise each of the eight planning theory approaches (see Figure 2-8) to understand how they can be classified as planning theories and how they can be relevant to educational facilities.

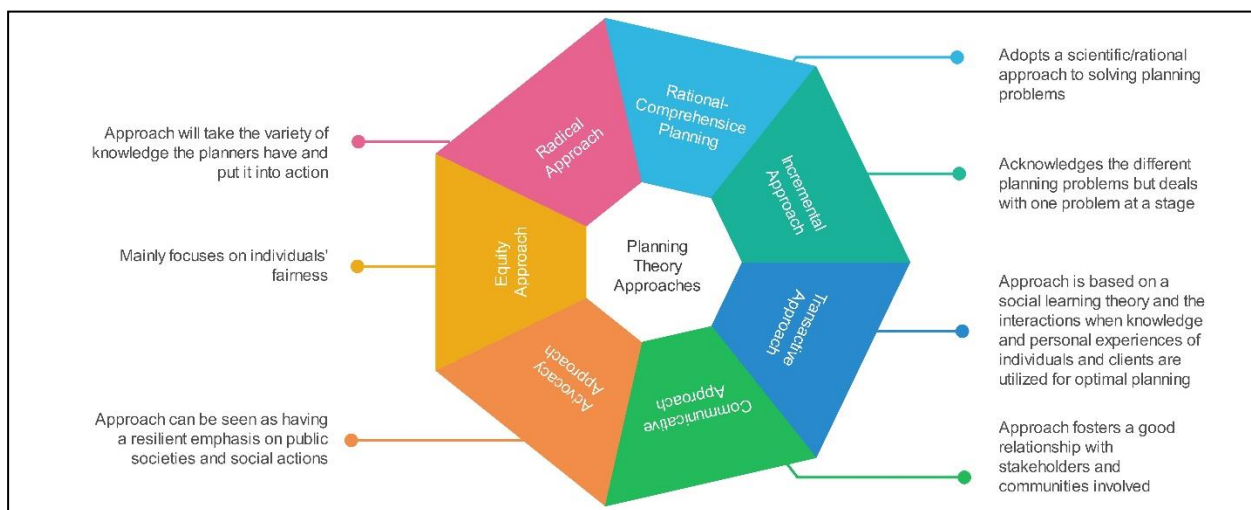


Figure 2-8: Planning Theory Approaches
(Source: Author's creation, 2022)

2.5.1. Rational-Comprehensive Planning

Hostovsky (2006:382) stated that rational-comprehensive planning adopts a scientific/rational approach to solving planning problems by thoroughly investigating the potential factors that will affect a given set of situations and all possible alternatives to resolve the issue. The rational-comprehensive planning approach embodies the most significant strengths and weaknesses of the identified planning problem, and by identifying the strengths and weaknesses of the planning problem, the problem can be scientifically resolved. Thus, Whittmore (2015:79) explained that for a planning problem to be resolved scientifically, planners require data to ensure they can analyse the data and use system approaches. In the case of educational facilities planning, the planners would need the following data to enable them to scientifically plan for educational facilities, such as having access to all demographic data of the settlement that requires an educational facility, projected population growth of the settlement and list of the different educational facilities in the settlement and surrounding areas with the utilisation of each facility. This planning theory is linked

to the planning approach behind new schools, as discussed in Chapter 4 and to the approach taken in the empirical research in determining the needs for existing and new facilities in Chapter 6, where the learner enrolment, the existing facilities and the condition of the facilities were analysed as potential factors, the strengths and weaknesses and possible alternative approaches to address these.

2.5.2. Incremental Approach

Although current planning implementations still comprise rational-comprehensive planning components, the current planning practices are more adaptive and incremental than expected (van Karnenbeek & Janssen-Jansen, 2018:402). Then, Hitge and Van Dijk (2012:593) explained that incrementalism is a political change that occurs through minor stages and is not like rational-comprehensive planning that focuses on many possible alternatives for the problems outlined in the indefinite future. So, the incremental approach acknowledges the different planning problems but deals with one problem at a stage and then continues to the next problem. Planners will acknowledge all the educational facilities' needs and shortfalls, but the incremental approach will prioritise and solve the problems. Chapter 3, Section 3.3.3.1 The Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure, 2013 (Norms and Standards) are analysed. This policy document is an incremental approach, first dealing with access to basic services. Overcrowded inappropriate structures, reliable basic services, partially inappropriate structures and classrooms then elaborate on other priorities while guiding departments to address the first-line priority programmes and incrementally sort out their challenges.

2.5.3. Transactive Approach

The transactive approach of planning is an approach that focuses on the process of engagement with different stakeholders and communities that are involved with the planning to foster an excellent active cycle of knowledge and learning among the stakeholders and communities of interest (Wray, 2011:610). Thus, the transactive planning approach can also be identified as an integration approach to integrate the knowledge of stakeholders and the communities for sustainable planning. Nguyen *et al.* (2016:11) also mentioned that the transactive planning approach is based on a social learning theory and the interactions when knowledge and personal experiences of individuals and clients are utilised for optimal planning. This planning theory is based on an integrated educational facility planning approach. The planners will conduct community meetings to understand the need for educational facilities in different communities.

Additionally, a good relationship must be fostered between the planners and the clients, and the clients will be the DoE and the local municipalities. This approach can be linked to the consultative approach that should be followed in planning education facilities, as discussed in chapters 4, 5 and 6. The stakeholders involved in planning educational facilities are indicated in Table 4-1: Roles and Responsibilities of various key Role-Players.

2.5.4. Communicative Approach

The transactive and communicative approaches are closely similar, as the transactive approach fosters a good relationship with stakeholders and communities involved in the planning. Sager (2009:3) stated that communicative planning requires more communication and participation with the stakeholders to formulate processes to inform the public of the different plans merely. Additionally, Fischler (2000:358) described the communicative planning approach as real-life cases to make planners aware of the risks of inaccurate communication and create opportunities for further consensual decision-making models. This planning approach can be identified as an open approach in the sense of being comprehensive and transparent so that the public can gain knowledge of the plans (Sager, 2009:3). Therefore, in educational facilities, the communicative planning approach will give the public gain knowledge of all the educational planning, as such to publish all plans for the public knowledge. The Departmental Plan needs to be included in the IDPs and SDFs of municipalities, and the Department needs to consult with the respective municipalities to review and renew their LUMS about possible school sites, as indicated in Chapter 3.

2.5.5. Advocacy Approach

The advocacy planning approach can be seen as having a resilient emphasis on public societies and social actions, as the supreme “equity-oriented bureaucrats” do not have the right to act on their own, and there is a need for external planning practice pressures to change the planning practices (Benner & Pastor, 2015:309). So, the advocacy planning approach is identified as planners are advisories for the community members and focuses on social actions. Kennedy (2007:1) acknowledged that advocacy planning can also help institutionalise community collaboration in planning, focusing mainly on the public sphere. The theory can be seen as a double-edged sword. For instance, instructed opportunities for involvement can offer a position for struggle (as the authority does not want to surrender its power). The other edge of the theory is that participation today is typically organised into a win-win agenda (incorporating the inputs from the stakeholders for optimal planning). As a result, the advocacy planning approach can be seen as either positive or negative; it was identified that participation might contribute to struggles

and might be seen as a win-win approach for optimal inclusion planning. From the educational facilities perspective for the advocacy planning approach, the Education Department can permanently appoint planners or consultancies to act as advisories for the department and the community to ensure optimal inclusion of all social infrastructure. The planning of resilient communities is further discussed in Section 4.3 and forms part of the recommendations of this research.

2.5.6. Equity Approach

Altintas (2018:3-4) explained that equity theory is grounded on the driving force of individuals to fairness, which identifies that their life's outputs are determined by their received inputs for fairness. Thus, the equity theory concept mainly focuses on individuals' fairness. Moreover, understanding the relationship between equity theory and planning as an equity planning approach. Metzger (1996:112) emphasised equity planning as a framework in which planners in the governmental sphere utilise their unique skills to impact opinion, organise underrepresented communities, and develop and implement policies and programs that restructure public and private resources for the poor working class. Planning for equity thus does not promote growth or obstruct development; it instead increases the opportunities for the community members to build their capacity to voice their responses for fairness. Adopting the equity planning approach for educational facilities to plan for fairness allows the communities to recover their rights as a bottom-up approach to planning. This approach enables the communities to voice their educational needs for their community, and the planners must note these needs when planning to allow for fairness. This approach is linked to Section 4.2, (Source: Author's creation, 2022)

Spatial Planning Principles.

2.5.7. Radical Approach

As understood by John Friedmann in 1987, the radical planning approach is defined as the thoughtful handover of knowledge to action for social transformation in the public sphere. It will also comprise conventional planning practices (Tironi, 2015:3). Social transformation is critical in the public sphere, and the radical planning approach will take the variety of knowledge the planners have and put it into action. Miraftab (2009:41) mentioned that radical planning practices for social transformation require insurgent (fighting against a government) planning to interrupt neoliberal efforts through building inclusion relationships. As neoliberal governance is created, inequalities and the radical planning practice will aid in correcting these inequities' challenges through inclusion.

2.6. Ecological Planning Theory

At the end of the nineteenth and early twentieth centuries, three leading planning philosophers underwrote the ecological planning theory as the call for more comprehensive planning that impacts human activity on the environment (Steiner *et al.*, 1988:31). This means that the theory plans for the environment with the impact of the human action. The social-ecological theory incorporates the social and personal factor interventions into the environmental factor for optimal planning that will promote both aspects (Whittemore *et al.*, 2004:88). The social-ecological is also known as the human ecology. Then to further understand the ecological planning theory model, the following section will elaborate on the ecological planning model.

2.6.1. Ecological Planning Model

The ecological planning model has been formulated to investigate the problems of understanding the environmental resources' ideals with ensuring the resources' sustainability (Van Riet & Cooks, 1990:341). With this said, the main aim of the ecological planning model is to preserve the environmental resources (EIA must be compiled to assess the resources) and include the human aspect in the planning. The human element will influence the depletion of resources if planning is not correctly implemented, and if the human element is utilised correctly, it will also be a guiding tool. Beaton *et al.* (2008:471) furthermore stated that the ecological planning model is a layered preparation for succeeding at basic levels. These layers are characterised by several organisational levels of environmental educational facility planning. Thus, the environmental educational facility planning model emphasises the universal and joint interconnection of the different phases of the model cycle and identifies how the planning will be conducted on a large scale. This entire environmental educational facility planning model will avoid planning in silos and adopt a more integrated planning approach.

Figure 2-9 illustrates that the model has eleven steps, which will be discussed in the environmental educational facility planning processes. The first step is the problem/need and or opportunity identification. When an infrastructure-related problem or need has been brought to the planner's attention or the planner sees the opportunity for additional planning. Then the planning continues to the following step: goal establishment, also known as the initiation phase (also identified in the IDMS), focuses on all the components the planners must take before the project can be approved. Also, this step is where the importance of the project is identified and prioritised accordingly. Steps three and four, as indicated in Figure 2-9, are both inventory and analysis from two different levels. First is the regional inventory level, and analysis is when the planners identify the gaps in the environmental educational facilities on provincial or municipal

levels by analysing the gaps in the Northern Cape province or the numerous municipalities (district or local) in the Northern Cape province. Then step four will focus more on only identifying the gaps in residential towns that focus on the environmental educational facilities planning. The gaps will be identified through these two steps, and the following steps will be project driven.

The following three steps of the model are project-based initiatives, and the environmental aspect will mainly be included here. Figure 2-9 demonstrates that step five is the detailed studies section of the model, also known as the Pre-Feasibility study. This step will start with an EIA for the environmental aspect of the project to see if the site is feasible and then investigate the need per project and project objectives. Then step six is the planning concept, also known as the concept/feasibility study. It is to develop the different design concepts to satisfy the project requirements, test other alternative solutions for the project, investigate the budget requirements, and set out the time-frames of the project. Once these two steps are complete, the following step seven is known as the landscape plan, also known as the site development plan. This step will take the recommendation made by steps five and six to place the new infrastructure correctly on the school site, and a site development plan illustrates this.

Step eight is the education and citizen involvement aspect of the planning. Figure 2-9 identified that this step of the planning is in the middle of the figure, illustrating that this step is linked with almost all the different steps, excluding the implementation step. One of the most critical steps in South African planning as public participation is fundamentally vital to South African democracy. The public and relevant stakeholders must be part of the planning process to meet their needs.

Step nine is when the planning process has concluded and is now in the specification compilation step. Figure 2-9 identified that step nine is the design exploration step, also known as design development, which means the project will be procured or go out on tender to appoint a contractor. The second last step is when the project will start work step. Figure 2-9 shows that step ten is the plan and design implementation step, which means the contractor has been appointed and the construction has started. The last step, eleven, is the administration step which is when the project is completed, which means it is all the administration to hand over the project to the school and the public to occupy the facility.

Figure 2-9 will illustrate the environmental planning model formulated in line with the environmental educational facilities planning.

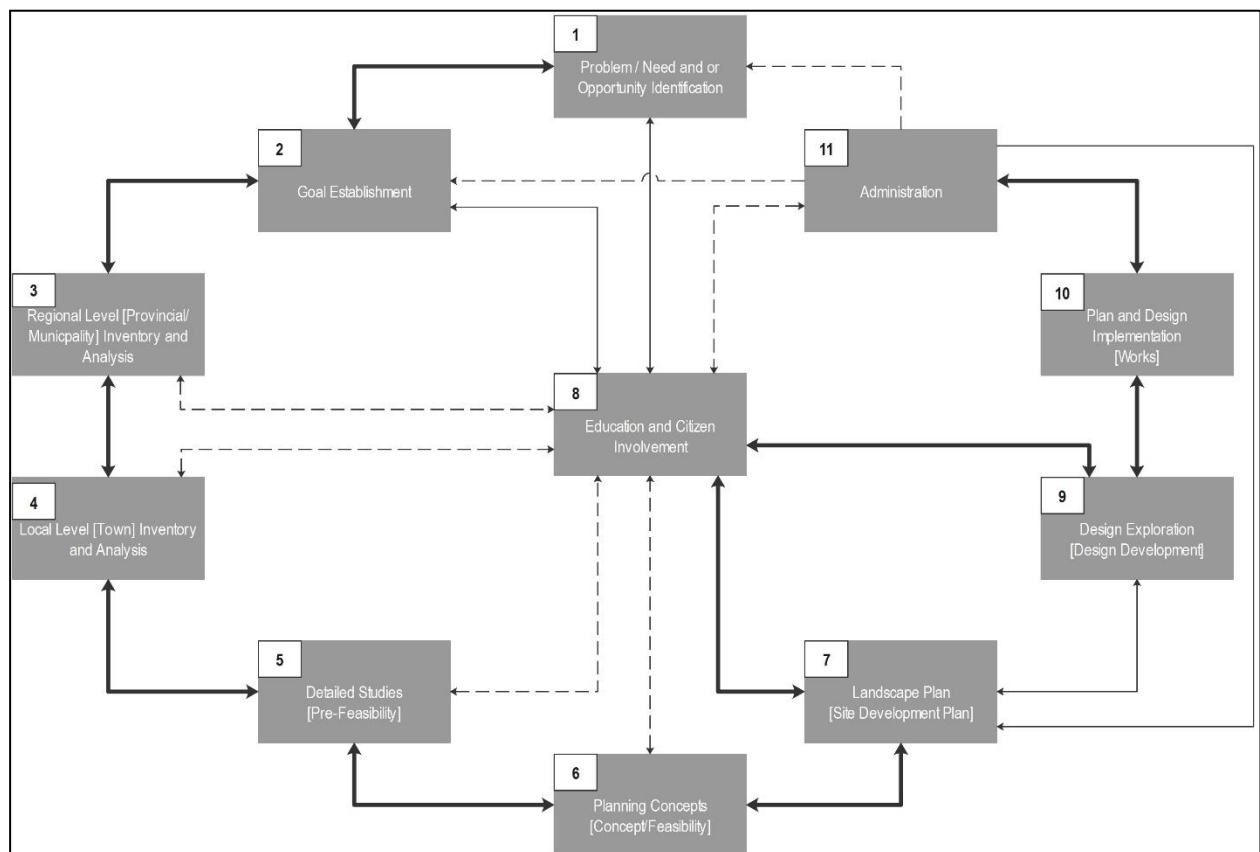


Figure 2-9: Environmental Educational Facility Planning Model

(Source: Britz, Ahern, 2005:126)

2.7. Chapter Conclusion

This chapter evaluated the historical evolution of the development and planning theories related to educational facilities planning. First, the literature review focused on the development theories and how these theories impacted educational facilities. The following theories were demonstrated, Howard's Theory of Garden Cities, Marxism Theory, Neo-Marxist Theory and Neo-Liberalism Theory. All four of these theories are developed-orientated, and each of these development theories evolved from the other, keeping a small component of the previous theory. Then the theories shifted to the sustainable development theory, identified the seventeen sustainable development goals, and included the environmental sustainability theory. The environmental sustainability theory also identified the planning of green educational facilities and how these facilities will significantly contribute to a sustainable environment. The developmental theories related to education facilities have been discussed, and then the chapter shifted the focus to the planning theories and how these theories influence educational facility planning. Out of the planning theories, seven theories were demonstrated, and each of these planning theories has

been discussed in the planning of educational facilities. Additionally, the planning theories section also identified the ecological planning theory that had been discussed that incorporates the environmental and human aspects when planning for educational facilities. The ecological planning theory formulated the ecological planning model with eleven steps to be followed when planning for environmental education facilities.

Table 2-1: Legislation Level of Support and lessons learned

Relevant Theories (Development & Planning Theories)	Level of Potential Optimising planning of educational facilities	Support for the of Lessons Learned
Howard Theory	3	The theory is pro-planning for educational facilities according to the Norms and Standards section 3.3.3. For the number of learners in each neighbourhood, one combined school needs to be planned to ensure that the neighbourhood's youth have access to education. Additionally, this theory did not make any provision for the social justice aspect of students having the freedom to choose where they want to obtain their education. Therefore, a component of this theory is very relevant to planning for educational facilities but requires the social justice aspect to be revised.
Marxism Theory	4	This theory is very relevant to education planning because this theory focuses on moving away from the colonised ways of planning for educational facilities. A lesson learned is that to correct the previous discrimination aspect of the Apartheid City, school facilities should be planned and prioritised for the demarcated areas, and equal distribution of facilities among the different areas is key to addressing these past inequalities.
Neo-Marxist Theory	2	Neo-Marxist development theory to improve the African residents' inequalities, and their initiatives only favour the well-being of the advantaged residents in South Africa. However, they did implement some programmes to provide housing solutions to the bounded residents of the homelands and townships. However, these programmes only worsen the racial segregation and the inequalities of the African citizens as they have limited access to social infrastructure and have to travel long distances daily to access their employment. Therefore, the educational facilities planning did not receive the attention it required.
Neo-Liberalism	4	This theory focuses on the micro changes in planning educational facilities and ensuring a free market approach to achieving democracy in South Africa. One of the approaches the government adopted was the RDP to construct low-cost housing in the established informal settlements, as the residents did not feel strongly about the notion of relocating their livelihood to a new area. Therefore, the RDP replaced the informal settlement structures with formal structures and educational facilities were planned for these areas to ensure the residents' children have access to education.
Sustainable Development Theory	4	The sustainable development theory focuses on the sustainable development goals formulated by the UN and planning for educational facilities focused on sustainable development goal number 4, quality education. That was linked to the Norms and Standards section 3.3.3, which ensured the learners had access to educational facilities.
Environmental Theory	3	The environmental theory is relevant to the global environment to protect it. However, a significant amount of literature has been published on environmental sustainability for educational facilities. In the South African context, improvements are still required as there are still no single solution best practices. This research identified a further gap in planning environmentally friendly educational facilities in South Africa.
Planning Theories	4	The planning theories discussed in this research indicate that there should be a collaborative approach to planning where the community and all the stakeholders are involved in the planning and implementation process. Planning should be equal and communicative, where knowledge and decisions are shared.

Relevant Theories (Development & Planning Theories)	Level of Support Potential for Optimising the planning of educational facilities	Lessons Learned
Ecological Planning Theory	4	The environmental educational facility planning model emphasises the universal and joint interconnection of the different phases of the model cycle and identifies how the planning will be conducted on a large scale. This entire environmental educational facility planning model will avoid planning in silos and adopt a more integrated planning approach. The importance of thorough planning is to ensure that the actual need is addressed to benefit the community. It ensures that all steps are taken and that the

Evaluation colour and scale	Level of Support for Optimising the planning of educational facilities
1	Very Weak
2	Weak
3	Medium
4	Strong

(Source: Author's creation, 2022)

Table 2-2 provides as a concluding remark of this chapter the link between the conclusion reached and the relevant objective in line with the research objectives and primary research questions of this study:

Table 2-2: Linking research objectives to chapter purpose and conclusion

Research Objectives	Primary research question	The conclusion reached within this chapter
Investigate the current legislation, regulations and standards for the provisioning of school infrastructure and the planning and design behind it;	How did planning theories, including development theories, sustainable development theories, and legislation, impact on education facilities planning?	The development theories (Section 2.2) analysed in this chapter indicated the past influence on how education facilities were planned; this is relevant to this study as these educational facilities are, in some cases, still the facilities utilised today. The Sustainable Development Theories (Section 2.3) and Environmental Sustainability (Section 2.4) informed Chapters 4 and 5 as these are linked to the planning of new sustainable education facilities. The Planning (Section 2.5) and Ecological Planning Theories (Section 2.6) are lined with the processes that should be followed in planning and implementing new education facilities and elaborate on the importance of community involvement and communication to ensure success when implementing these projects.

(Source: Author's creation, 2022)

The Development and Planning theory-based framework analysed in Chapter 2 was accordingly considered against the South African reality in terms of the legislation, regulations and standards on education infrastructure (Chapter 3) and utilised in Chapter 6 to analyse the case study area in the empirical investigation.

CHAPTER 3 LEGISLATION, REGULATIONS AND STANDARDS ON EDUCATION INFRASTRUCTURE IN SOUTH AFRICA

3.1. Chapter Introduction

In terms of the historical background, South Africa's democratically elected government inherited an inequitable and unequal education infrastructure distribution where most schools had no basic services, insufficient classrooms and little or no education support spaces. This section investigated all legislation, acts, norms and standards, guidelines and plans that apply to the education sector and, more specifically, education infrastructure. This section aims to clarify the position of education facilities in international policies and legislation to reveal the global approach toward education infrastructure. Figure 3-1 indicates the flow and hierarchy of all legislation discussed in this section.

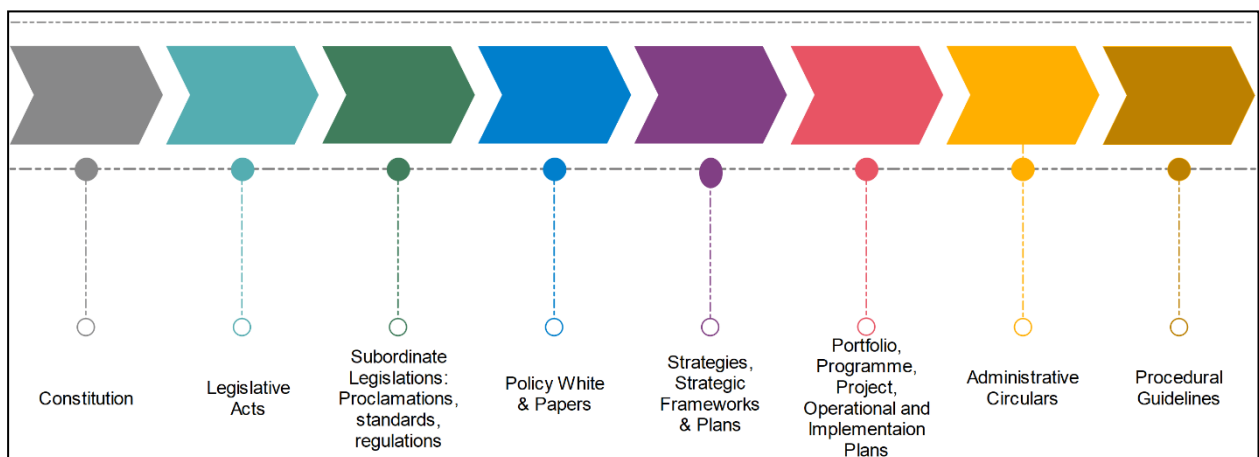


Figure 3-1: Legislation hierarchy

(Source: Author's creation, 2022)

3.2. International Legislation, Regulations and Standards on Education Infrastructure

3.2.1. Global Developmental Agenda

The Global Developmental Agenda is legally founded within the Charter of the United Nations. The United Nations Department of Economic and Social Affairs (2007:1) highlights that: "the first paragraph of the Charter of the United Nations expresses the determination of the peoples of the world to 'promote social progress and better standards of life in larger freedom' and to 'employ international machinery for the promotion of the economic and social advancement of all peoples'".

Article 55 expands on these purposes: to create conditions of stability and well-being that the United Nations shall promote:

- Higher standards of living, full employment, and conditions of economic and social progress and development;
- Solutions to international economic, social, health, and related problems; and international cultural and educational cooperation; and
- “The Universal respect for and observance of human rights and fundamental freedom for all.

With the onset of the new millennium, the United Nations passed a resolution adopted by the General Assembly [without reference to a Main Committee (A/55/L.2)] 55/2, i.e. United Nations Millennium Declaration, which reaffirms the commitment to the United Nations and the stipulations of Article 55 discussed above. The United Nations Millennium Declaration (2000) highlights the right to development and to poverty eradication in sections 11 and 12, which states: “We will spare no effort to free our fellow men, women and children from the abject and dehumanizing conditions of extreme poverty, to which more than a billion of them are currently subjected. We are committed to making the right to development a reality for everyone and freeing the entire human race from want”. Therefore, we resolve to create an environment conducive to development and eliminate poverty at the national and global levels. The eradication of poverty, inequality and unemployment is embedded within the seventeen Sustainable Development Goals (SDGs) adopted at a special historic United Nations Summit.

3.2.2. United Nations Millennium Development Goals

Concerning the United Nations Millennium Development Goals (MDGs), to which South Africa is a signatory, Goal No.4 is to “quality education”. The enrolment rate in emerging regions increased, and the dropout rate declined, which is an improvement. High poverty levels and other emergencies have affected progress in developing regions, and inequalities between rural and urban areas also remain high. The United Nations Development Programme (UNDP) (2015) reported that “achieving inclusive and quality education for all reaffirms the belief that education is one of the most powerful and proven vehicles for sustainable development”. All children should have access to free primary and secondary schooling by 2030, and this goal can be assessed by measuring their access to education. The objective identifies challenges “with the enrolment of Grade R Learners and Learners with Disabilities” (UNDP, 2015: Online).

3.3. National Legislation, Regulations and Standards on Education Infrastructure

3.3.1. The Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa ("The Constitution") seeks (RSA, 1996:1243) "to heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights; lay the foundations for a democratic and open society in which government is based on the will of the people."

According to the Constitution of the Republic of South Africa, Section 29 (the Bill of Rights), "everyone has the right to a basic education, including adult basic education; and to further education, which the state through reasonable measures must make progressively available and accessible." Furthermore, the Constitution indicates "that everyone has the right to receive education in the official language or languages of their choice in public educational institutions where that education is reasonably practicable" (RSA, 1996:1256). The bill of rights application prompts the planning and provision of infrastructure to address shortfalls in education. For instance, the DBE and Provincial Departments of Education's obligation is to ensure that children still learning under trees must be provided with adequate and conventional spaces to learn. New Schools must be provided where learner numbers far exceed the current infrastructure assets available for learning purposes to ensure every learner's right to quality basic education and access to learning facilities.

3.3.2. National Education Policy Act 27 of 1996

In terms of the National Education Policy section 3(4), the National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment was published in 2010. In her foreword, the Minister of Basic Education stated (DBE, 2010:6), "School infrastructure remains a critical issue on the social agenda in South Africa for several reasons." These reasons are due to the infrastructure discrepancies that are extensive, inadequate and significant unequal access to quality facilities. This policy referred to the school register of needs that was updated in 2006 and renamed the National Education Infrastructure Management System. Even though at the time of publication of this policy, there was evidence of progress made in the delivery of infrastructure to address the shortcomings, significant challenges persisted, and the inequalities were not discussed yet. There was a lack in the specification of targets, a lack of best practices approaches, and inadequate benchmarks of adequacy. This policy was developed "to guide the provisioning of an enabling physical teaching and learning environment that are sustainable, equitable for all learners in South Africa and to ensure that future investments are aligned with that definition" (DBE, 2010).

3.3.3. South African Schools Act 86 Of 1996

The South African Schools Act 86 of 1996 (DBE, 1996:2) “provides for a uniform system for the organisation, governance and funding of schools; to amend and repeal certain laws relating to schools, and provide for matters connected in addition to that. It promotes access, quality and democratic governance in the schooling system. It ensures that all learners have the right to access quality education without discrimination and makes school compulsory for children 7 to 14”. It provides two types of schools – independent schools and public schools. The Norms and Standards are relevant to comply with the Act's prescripts.

The Basic Education Laws Amendment Act 15 of 2011 (DBE, 2011:6), as published in the Government Gazette No. 34620 of 19 September 2011, amended, among others, section 36 of the South African Schools Act by the following subsections:

“(4) (a) A governing body may, with the approval of the Member of the Executive Council - (i) lease, burden, convert or alter the immovable property of the school to provide for school activities or to supplement the school fund of that school: and (ii) allow any person to conduct any business on school property to supplement the school fund. (b) A governing body may not allow any activity on school property hazardous or disruptive to learners or prohibited by this Act. Subsection (4), "school property" means immovable property owned by the State, including property contemplated in sections 13 and 55 and any immovable property bought by a school from the school funds or donations to the school.”

The Provincial Minister of Education is the approving authority for implementing section 36(4) of the Act. The powers limit the governing body's authority to lease, burden, add to, convert, or alter the school's immovable property. Section 16(2) of the SASA states (DBE, 1996:4), "a governing body stands in a position of trust towards the school". All governing bodies must act according to expected corporate governance principles in discharging their functions. All decisions taken by the governing body must be in the best interest of the learners, and the governing body must ensure that learner members are not bound by any contract a governing body may sign. Section 20(1) (g) (DBE, 1996:16) of the SASA states that the governing body,

"must administer and control the school's property, and buildings and grounds occupied by the school, including school hostels, but the exercise of this power must not in any manner interfere with or otherwise hamper the implementation of a decision made by the Member of the Executive Council or Head of a Department in terms of any law or policy."

The following legislative requirements are interrogated and applied to the infrastructure delivery programme. These indicate the relevant sector norms and standards and impact the methodology and processes applied in infrastructure provision and maintenance. Some of the more high-impact and applicable legislation is discussed below.

3.3.3.1. The Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure, 2013 (Norms and Standards)

The National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment was published in 2010. This policy was developed to address the inequalities and inadequacies in the teaching and learning environments. A school register of needs (SNR) was created and published to identify the gap and the magnitude of these inequalities and inadequacies updated in 2006 and is called the National Education Infrastructure Management System (NEIMS). The policy then guided the provisioning of an enabling physical teaching and learning environment to ensure all South African learners' sustainability and equitable environments. It provided the basis for planning and implementation whilst addressing the persisting challenges by building on past successes and addressing the persisting gaps. According to the National Policy for an Equitable Provision of an Enabling School Physical Teaching and Learning Environment (2010;10), "the development of this policy is therefore prompted by a dual need to more clearly and systematically define what constitutes an enabling physical teaching and learning environment for all South Africa's learners, and to ensure that future investments are aligned with that definition".

The SNR survey conducted in 1996 determined the baseline database on school buildings' condition and the availability of facilities at ordinary public schools. This exercise was conducted again in 2000 and 2006 when it became known as NEIMS. This database then provided an opportunity to track the improvements made.

The existing sector policies and programs affect the demand for sustainable, adequate, and practical education facilities and the requirements that should reflect within Norms and Standards to adhere to these policies and programmes. These include, among others, learner admissions into ordinary public schools, Early Childhood Development and Pre-Primary Education, Inclusive Education for learners with special needs, E-Education, reading, mathematics and science education, the curricula and pedagogical reforms, which affect the overcrowding of classrooms and emphasizes the shortage of laboratories, sport in education, and the national school nutrition programme.

The demands forced the notion of increasing efficient utilisation and management of facilities to maximise existing resources and improve educational facilities. Norms and Standards had to be developed to improve the quality and effectiveness, address past inequities, and provide the relevant infrastructure that is efficiently utilised and managed. There was also a better focus on the life-cycle management of assets to maintain the infrastructure, avoid unaffordable refurbishment, and even replace school infrastructure. Various challenges were identified within this policy, which, several years later, the case of the development of balanced norms and standards, the implication of affordability of the Norms and Standards as a shortage of funding leads to a gap between what needs to be implemented and what is affordable to implement—the capacity to implement the norms (DBE, 2010:33).

It is clear that from this policy, the prioritisation of needs at a national and provincial level differs. At the national level, the priority was from a total lack of a school and overcrowding of existing schools and applied to rank geographical regions from the most to least needy. On the provincial level, there were diverse ways of identifying and prioritising needs which include some of the following: needs derived from a list determined by districts where the criteria utilised were unclear, prioritisation of classrooms where learners are being taught under trees or where infrastructure is unacceptable as well as overcrowded, tracking of new developments, needs where prioritised utilising data and consultation with districts, latest population statistics and trends. There was a clear indication of how the development of policies affected prioritisation. Still, there was no consensus on how infrastructure should be prioritised norms (DBE, 2010:33).

The Guidelines Relating to Planning for Public School Infrastructure published in 2012 emanated from the policy, and as stated in the foreword by the Minister of Basic Education in the Guidelines Relating to Planning for Public School Infrastructure (2012:3), “the objective of the policy is to guide the provision of an enabling physical teaching and learning environment that is sustainable and equitable for all learners in South Africa, as well as to ensure that future investments are aligned with this definition”.

The guidelines classified primary schools offering Grades R to 7 and secondary schools offering Grades 8 to 12 into small, medium, large and mega schools. It provided measures for an enabling school environment that included basic safety, minimum and optimum functionality, and an enrichment environment and criteria to prioritise accordingly. Therefore, a school must have access to water and sanitation, no toxic substances in the school environment, unsafe building structures or overcrowded classrooms, and adequate fencing to meet the basic safety requirements. Addressing these conditions became the priority. To meet the minimum

functionality requirements of basic safety, the school must have sufficient classrooms, ablution facilities, electricity and teaching aids. A school was considered to meet the optimal functionality if basic safety and minimum functionality requirements were met, including having adequately-sized classrooms, specialised teaching spaces, a staff preparation room, an administration block, multipurpose classrooms, a school hall, laboratories, adequate equipment, a library and a computer room or media centre. An enriched school environment was not intended to apply to all schools but needed to meet the optimal functionality requirements and promote enriched environments. It classified schools into the various categories of small, medium, large or mega, and their size determined the number of spaces required (DBE, 2013:8).

Planning for school infrastructure was aligned with the guidelines' principles; the feeder zone had a radius of up to 5 kilometres and a walking distance that did not exceed 10 kilometres. The planning of a new facility included considerations in terms of environmental factors. The minimum size for a school site, including sporting facilities, was 2.8 hectares for a primary school and 4.8 hectares for a secondary school. Regarding the geographic location, the site's slope should not exceed 15 degrees. A school may not be close to or adjacent to cemeteries, business centres, railway stations, taxi ranks, sewage treatment plants, public hostels, and busy roads unless adequate preventative measures have been taken to ensure the safety of learners (DBE, 2012:9-10).

The Guidelines Relating to Planning for Public Schools Infrastructure was then replaced as the Regulations Relating to Minimum Uniform Norms and Standards for Public School Infrastructure (2013) (referred to as the Norms and Standards) was published and developed due to the South African Schools Act, 1996 (Act 84 of 1996). In terms of the Norms and Standards, all schools should comply with the following:

- Accessibility: Fully accessible, including ramps, handrails, space for manoeuvrability, parking spaces and toilets for the disabled, adequate notice boards, signage and other aids necessary.
- New schools must not be located adjacent to cemeteries, business centres, railway stations, taxi ranks, sewage treatment plants, public hostels, busy roads, bottle stores and shebeens.
- Classrooms to be provided at 40 learners per classroom for grades 1-12 and 30 learners per classroom for grade R
- Ablution facilities are to be provided as per the following tables as per the Norms and Standards

The Norms and Standards (2013:7-8) provided the following timeframes within which school infrastructure backlogs must be eradicated –

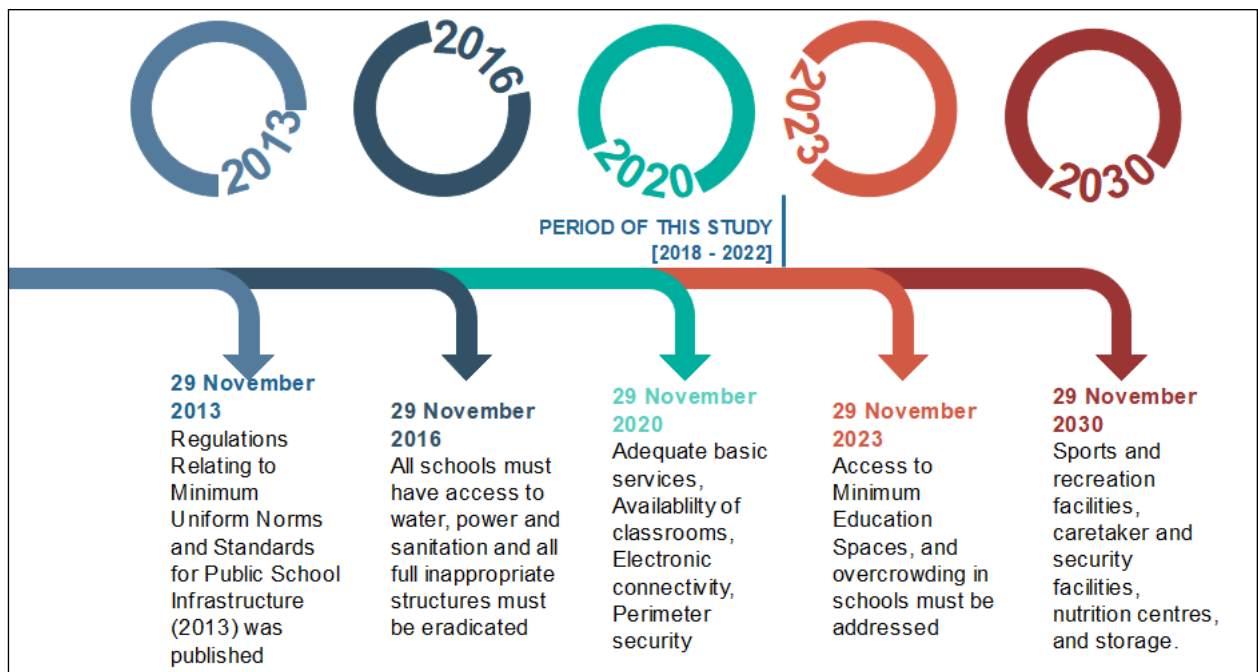


Figure 3-2: Norms and Standards for Public School Infrastructure timeline
(Source: Author's creation, 2022)

3.3.3.2. Judgement of the Regulations Relating to Minimum Norms and Standards for Public School Infrastructure

According to the judgement (In the case of *Equal Education v Minister of Basic Education* on the Norms and Standards for Public School Infrastructure, 2018:40), it was stated that the government must “provide safe and adequate school infrastructure as a component of the right to basic education in terms section 29(1)(a) of the Constitution”. The judgement “affirms that this obligation is immediately realisable, and any failure to meet the obligation must be justified in full by the government”.

According to the order (In the case of *Equal Education v Minister of Basic Education* on the Norms and Standards for Public School Infrastructure, 2018:40), Sub-Regulation 4(5)(a) of the Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure, 2013 is “inconsistent with the Constitution, the South African Schools Act 84 of 1996 (“SASA”) and the order granted on 11 July 2013 by Dukada J in this Court under case number 81/2012, and is accordingly unlawful and invalid”. The order stated that **all** schools affected by inappropriate building materials such as asbestos, metal and wood must be done within three years as stated in the Norms and Standards; this should include not only schools built

from these materials but classrooms as well. Such structures should accord with the National Building Regulations, SANS 10-400 and Occupational Health and Safety Act 85 of 1993.

According to the order, “the word entirely” whenever it appears in regulation 4(3)(a) is struck out; alternatively, the phrase “Schools built entirely” is struck out wherever it appears in regulation 4(3)(a) and is replaced with the words “classrooms built entirely or substantially” it furthermore states that any new schools, replacement schools, additions and or alterations to schools also adhere to the Regulation (In the case of *Equal Education vs Minister of Basic Education on the Norms and Standards for Public School Infrastructure*, 2018:40).

3.3.3.3. Proposed Amendments to the Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure

Department of Basic Education (2022:139) published an invitation to comment on the amendments to the Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure issued in terms of Section 5A(1)(a) of the South African Schools Act, 1996. The proposed amendments resulted from the case of *Equal Education vs the Minister of Basic Education on the Norms and Standards for Public School Infrastructure*. The amendments included the following in order of priority, must be prioritised for planning and implementation-

- New additions, alterations and improvements to schools must not be constructed from inappropriate building materials. As far as inappropriate structures are concerned, all structures built entirely or substantially from asbestos, metal, mud, and wood must be replaced with structures which comply with the National Building Regulations: SANS 10-100 and Occupational Health and Safety Act 85 of 1993.
- Schools that do not have access to water, sanitation or electricity must comply with the norms and standards;
- All schools that do not have sufficient classrooms to accommodate the enrolled learners;
- All schools that do not have adequate perimeter fencing;
- All schools do not have other minimum education areas for an enabling school environment.

The Department of Basic Education (2022:142) proposed the insertion of the following paragraph: “All the norms and standards contained in these regulations must be planned, prioritised and phased in in line with the National Development Plan.” The substitution of the following sub-regulation (Department of Basic Education, 2022:142-143):

(2) “Implementing these regulations, every reasonable possible avenue must be explored and alternatives considered to give effect to the norms and standards contained in these regulations.”

(3) “The Department of Basic Education must, as far as practically possible, facilitate and coordinate the responsibilities of the government agencies and entities who have a role in the provision of infrastructure-related services.”

(4) “Each Provincial Department of Education must annually, on a date and in the manner determined by the Minister, provide the Minister with a detailed report on plans and progress on implementing the norms. These progress reports and plans shall be published on the DBE website and websites of all nine provincial departments for access by the public”.

(5) “Measures taken to comply with the norms and standards contained in these regulations must be funded through the relevant budgetary sources and processes for new facilities and the upgrading of existing facilities at schools.”

The DBE (2022:143) proposed the deletion of sub-regulations (6), (7) and (8) and the substitution of (18) (15) with the regulation where the use of alternative or innovative building technologies is to be considered for the implementation of the norms and standards certification of Agreement South Africa or the signed off by a competent person, as per the National Building Regulations.

3.3.4. Action Plan 2014, towards the realisation of Schooling 2025

As captured in the Action Plan 2014, the vision of Infrastructure towards the realisation of Schooling in 2025 is to have “School Buildings and facilities that are spacious, functional, safe and well maintained. Learners, teachers, and the school community look after their buildings and facilities because they take pride in their school” (DBE, 2011:47). According to the problem statement within the Action Plan 2014, school buildings and facilities for the realisation of Schooling 2025 vary from very good to very poor, where educational spaces are not conducive for learning.

The Action Plan 2014 states that “the inherited apartheid disparities are glaring, with schools in historically advantaged areas generally being good, and the average in historically disadvantaged areas generally being poor. However, the inequalities are more complex than this. The standard of infrastructure in rural areas often varies greatly, sometimes even within the same district. These inequalities are at odds with the policy imperative of providing an equal education start in life to all young South Africans” (DBE, 2011: 150).

The Action Plan speaks to infrastructure backlogs and the gap between the supply (the current situation) and demand (what infrastructure is believed to be acceptable). Schools without a water supply, with no sanitation or electricity, which refers to basic services, schools that are deemed inappropriate that are constructed from mud, asbestos, metal or wood, and schools where there is a backlog in terms of classrooms and educational support spaces such as libraries and computer centres. Furthermore, it identifies a policy gap in planning and maintaining school infrastructure.

“The quality of school buildings is critically important in the drive for improving education. Good quality facilities provide teachers and students with supportive environments responsive to their changing needs and could make a real difference to learning and teaching”. Within the Action Plan 2014, towards the realisation of Schooling 2025, a historical backlog is still enormous, despite increases in annual spending in recent years. The average budgetary growth is inadequate to deal with the need to repair, upgrade and, in some cases, completely replace existing school buildings and facilities (DBE, 2011:28). Therefore, alternative financing mechanisms are required.

“Goal 24 of Action Plan 2014, towards the realisation of Schooling 2025, requires the Department to provide every school with the physical infrastructure and an environment that inspires learners to want to come to school and learn, and teachers to teach” (DBE, 2011:9). Adherence to this action plan will ensure that all new schools have libraries, laboratories and adequate classrooms. The decision by the current administration to place education at the apex of its priorities informs and drives the sector's strategic position. Functions and activities are designed to support the delivery of quality education cost-effectively. The national strategic document for the education sector, Schooling 2025, provides the canvas for the departmental strategic objective statements. It clearly states the service delivery context and the minimum requirements for achieving service delivery objectives. The Norms and Standards support the national strategic objectives. The core of the objectives in the Schooling 2025 document can be summarised as follows (DBE, 2011):-

- All Public schools to have attained basic functionality levels by 2014
- All Public schools to be minimally functional with all relevant core education spaces by 2020
- All Public schools to be at an optimal functional level with all relevant supporting educational spaces by 2025

Therefore, the delivery of infrastructure to support this critical priority of the country is implemented to support education as a number one priority. The priorities form the basis for

developing a strategic approach to school infrastructure delivery. Education White Paper. The Education White Paper 5 on Early Childhood Development and the Children's Act sketch a broad vision of comprehensive ECD services spanning early childhood, encompassing home-, community- and centre-based services across health, education, social protection and socio-economic development. Action Plan 2014: Towards the realisation of schooling 2025 – Goal 11 states: "Improve children's access to quality early childhood development below Grade 1". White Paper on Social Welfare, 1997 addresses the provisioning for children from birth to four. It emphasises a family approach to childcare and targets child caregivers and parents. National Development Plan Chapter 9 indicates the improvement of quality education whereby by 2030, South Africa needs an education system with the following attributes:

- High-quality, universal early childhood education
- Make early childhood development a top priority among the measures to improve the quality of education and future generations' long-term prospects.
- Dedicated resources should be channelled towards ensuring that all children are well cared for from an early age and receive appropriate emotional, cognitive and physical development stimulation.
- All children should have at least two years of preschool education.

The above is intended to be contributed to through ECD Classrooms' provision within an anticipated four (4) year period.

3.3.4.1. Action Plan 2019, towards the realisation of Schooling 2030

The Action Plan 2019 is an update to the Action Plan of 2014. It reflects on the progress of planning service delivery and encapsulates the priorities, targets and programmes articulated in the National Development Plan, 2030. Inadequate school infrastructure is still a challenge in the sector, creating barriers to providing quality education. These include inadequate school infrastructure. Infrastructure development was "strengthened to adequately address school infrastructure challenges". The Action Plan utilises existing "interprovincial and inter-governmental structures to more closely link policies, programmes and resources to impact quality improvement in our system". Goal 24 in the Action plan is to "Ensure every school's physical infrastructure and environment inspire learners to want to come to school and learn, and teachers to teach" (DBE, 2015:4-5). In line with the National Development Plan to build more with the available funding is the development of cost measures to construct quality schools reasonably.

3.3.4.2. Action Plan 2024, towards the realisation of Schooling 2030

The Action Plan 2024 was formulated before the COVID-19 pandemic and the realisation of the impact of the pandemic. DBE (2020:2) stated that “the pandemic provided an opportunity for South Africans to prove their resilience and ingenuity at a time when the nation faced a common enemy”. It did not change but, to some extent, reshaped the sector's priorities and affected milestones and timeframes. Goal 10 in the Action Plan 2024 aims to “ensure that all children remain effectively enrolled in school at least up to the year in which they turn 15”. Accessibility to appropriate, functional, well-resourced and well-run schools is one of the enablers of this goal. To this effect, Goal 24 is to “ensure that every school's physical infrastructure and environment inspire learners to want to come to school and learn, and teachers to teach.”

3.3.4.3. Guidelines for Rationalisation and Re-Alignment of Public Schools: A Holistic Approach

The Guideline for Rationalisation and Re-alignment of public schools affects Sections 12A and 33 of the South African Schools Act. According to the Minister of Education, Mrs A.M. Motshekga, “South Africa comprises rural, farm, township, sub-urban and urban settlements. Some of these settlements are located in remote areas with very small population sizes” (DBE, 2017:3). These settlements have population sizes of less than 2500; however, service delivery is expected to be provided to these communities cost-effectively regardless of the size of the settlements. The Norms and Standards provide for different categories of schools: Primary Schools to accommodate Grades R to 7 learners and Secondary Schools to accommodate Grades 8 to 12.

The School Rationalisation and Re-alignment Process aims to guide the processes that must be followed when schools are rationalised and re-aligned. The guideline makes provisions for occurrences where closure or merger would not be possible for various reasons. In these cases, the affected schools can continue to operate and should be provided with appropriate facilities, adequate resources, and necessary support. The primary objective of rationalisation and re-alignment is to ensure that the sector offers accessible quality basic education rationally and cost-effectively.

It further provides for different sizes of schools, per Learner Enrolment Figures (LEF) as reflected in the continuum in; Figure 3-3 illustrates the school size classifications:

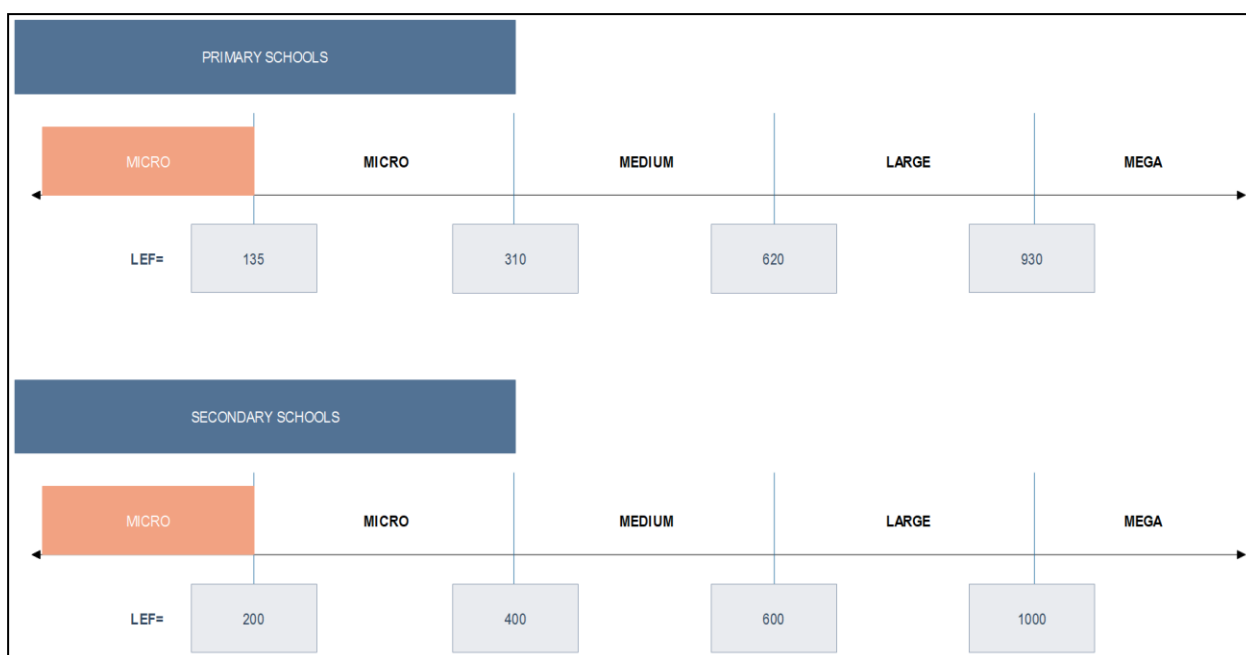


Figure 3-3: School Size Classification

(Source: DBE, 2017:16)

Micro schools, which are Primary schools with less than 135 learners and secondary schools, which are schools with less than 200 learners, are common in these small settlements. DBE (2017:3) identified that these micro-schools are such that the sector cannot provide its services cost-effectively. The quality of teaching is compromised due to multi-grade teaching that becomes necessary, the unavailability of vast subject choices, especially for Secondary School learners and the inability of the learners to partake in sports and other extra-curricular activities. To provide quality education in a cost-effective, affordable manner and taking into consideration the challenges associated with micro-schools, the DBE (2017:3) identified a “need to consider closing down certain of the micro-schools and merge them with other schools, doing so after extensive technical assessments and inclusive stakeholder consultations have been carried out”.

3.3.4.4. National Learner Transport Policy

According to the National Scholar Transport Policy, the location of schools in a province significantly impacts transportation patterns and roadway service demands, residential choices, housing development and prices, and water and utility demands. School infrastructure planning is integrated with other infrastructure and development planning at local and district levels.

Learner Transport's rationale is to improve access to quality education by providing safe, decent, effective, integrated and sustainable learner transport (Department of Transport, 2015:14). The policy seeks a holistic approach to managing learner transport services.

The Department of Education's priorities of providing access to quality education and safe communities resonate in this Learner Transport Policy. The regulatory framework guides learner transport operations' safety norms, standards, and regulations. The policy's objective is that learners, schools, parents, communities, planners and law enforcement authorities must be governed by a uniform set of regulations.

3.3.4.5. Education White Paper

The Education White Paper 5 on Early Childhood Development and the Children's Act sketch a broad vision of comprehensive ECD services spanning early childhood, encompassing home-, community- and centre-based services across health, education, social protection and socio-economic development. Action Plan 2014: Towards the realisation of schooling 2025 – Goal 11 states: Improve children's access to quality early childhood development below Grade 1. White Paper on Social Welfare, 1997 addresses the provisioning for children from birth to four. It emphasises a family approach to childcare and targets child caregivers and parents. National Development Plan Chapter 9 indicates the improvement of quality education whereby by 2030, South Africa needs an education system with the following attributes:

- High-quality, universal early childhood education
- Early childhood development should be a top priority among the measures to improve the quality of education and future generations' long-term prospects.
- Dedicated resources should ensure that all children are well cared for early on and receive appropriate emotional, cognitive and physical development stimulation.
- All children should have at least two years of preschool education.

The above is intended to be contributed to through ECD Classrooms' provision within an anticipated four (4) year period.

3.3.5. Public Finance Management Act 1 of 1999

The purpose of the Public Finance Management Act 1999 is to promote (National Treasury, 1999:1) "the principles of efficiency, effectiveness, economy and transparency in departmental management. Strategic planning and performance measures as basic requirements for service delivery and the preparation of budgets". National Treasury (1999:1), "To regulate financial management in the national government and provincial governments; to ensure that all revenue, expenditure, assets and liabilities of those governments are managed efficiently and effectively; to provide for the responsibilities of persons entrusted with financial management in those governments, and to provide for matters connected therewith". A strategy plan in line with the

Medium Term Expenditure Framework must be prepared and submitted for approval by the relevant executive authority. The plan must include details of planned capital projects and rehabilitation and maintenance of the physical asset (National Treasury, 1999).

3.3.5.1. Division of Revenue Act, 2022

The Division of Revenue Act is published annually and follows the Division of Revenue Bill's publishing. The act is aligned with the Appropriation Act, which ensures that (Appropriation Bill, 2022:2) "appropriate money from the National Revenue Fund for the requirements of the State" this act is published annually and applies to the next coming financial year. This Division of Revenue Act aims to provide for the equitable division of revenue raised nationally among all spheres of government for each financial year. It determines each province's equitable share and allocations. It provides for conditions that each department needs to adhere to in terms of the Education Infrastructure Grant, such as the submission of a list of all infrastructure projects for education over the medium-term expenditure framework for tabling in the tabling provincial legislature with the provincial Appropriation Bill in the format determined by National Treasury. An infrastructure plan with prioritised project lists for ten years, a preventative and corrective maintenance plan for all maintenance programmes and various requirements in terms of monthly infrastructure reports, and to ensure compliance with the construction industry best practice guidelines and Norms and Standards (Minister of Finance, 2022).

3.3.6. The National Development Plan, 2030

As a result of the painful legacy of apartheid and the former homeland system, South Africa has suffered an uneven development of Education Facilities and disparate provision of infrastructure in these facilities, with local communities in former homelands extensively involved, over several years, in building a number of their school facilities, using locally available building materials and bearing in mind that social investment in education is the responsibility of Government and one of its key priorities, as espoused in the National Development Plan.

The National Development Plan is shaped by the vision of the Freedom Charter & Constitution and can be seen as a comprehensive plan for the whole nation and was a product of extensive consultation in harmony with the ANC Strategy and Tactics and its programme to create a National Democratic Society (National Planning Commission, 2012).

The National Planning Commission (2012:322) states that "the improved quality of basic education is the uppermost priority of the South African Government as basic education is seen as a major contributor to the country's social and economic growth." The National Development

Plan 2030 (National Planning Commission, 2012) lists education as one of the core elements to eliminate poverty, reduce inequality, and create an equal society. The realisation of schooling in 2025 (DBE, 2011) and the National Development Plan for education are complementary. Despite the global recession at home and abroad, and due to pioneering interventions and our recognition of our system's quality and equity challenges, the Department remained fixed on infrastructure provisioning.

The National Development Plan speaks about demographic trends, and according to these trends, the country in 2030 will have reached a stage where the population stabilises. Demographic trends will impact the population structure and, in the end, on-demand for services, including education. Education is critical in ensuring a decent living standard and creating equal opportunities. To build on these capabilities and unlock development potential in areas lacking social infrastructures, such as schools that do not generate financial returns, should be financed.

To improve the quality of teaching and learning, the provisioning of adequate infrastructure is critical. Infrastructure such as science and computer laboratories allows for the identification and appointment of educators for these subjects and the provision of conducive learning environments that are key to maintaining and increasing anticipated pass rates.

The focus is to ensure that all children aged five attend educational institutions by 2014, attributed to the significant increase in these five-year-olds attending Early Childhood Development. The availability of funds has hampered the construction of more Early Childhood Development Centres (ECDs). The Education Sector is committed to prioritising ECD centres. However, the Departments are dependent on funding to ensure that all primary schools will be equipped with an ECD classroom, either through the construction of a new asset or the conversion of under-utilised existing classrooms to an ECD.

The National Planning Commission (2030) prepared an extensive review of public sector infrastructure delivery and performance, culminating in its December 2020 Review of Economic Progress. It found that the public sector infrastructure delivery is below what is required to support the NDP objectives. The NPC makes constructive and concrete recommendations for course correction.

3.3.6.1. Capital Planning Guidelines

The main objective of the Capital Planning Guidelines (National Treasury, 2018:3) “in support of the National Development Plan and the New Growth Path” is to provide guidelines for the

continual improvement of service delivery. The National Treasury guides how infrastructure should be planned, appraised and evaluated before committing significant funds. The acquisition of new infrastructure or rehabilitation and refurbishment, including maintenance, requires comprehensive assessment and planning considering the asset's entire life cycle cost. These guidelines will enable decision-makers to evaluate and decide whether capital investments are in the best public interest (National Treasury, South Africa), (2018).

The guidelines elaborate on the life-cycle evaluation process that ensures alignment between departmental planning processes and is consistent with legislation requirements such as the Government Immovable Asset Management Act (GIAMA). GIAMA, which provides guidelines and minimum standards for immovable asset management, and the Infrastructure Development Act (IDA) “facilitates the coordination of public infrastructure development projects so that there is better planning, evaluation and implementation of Strategic Infrastructure Projects (SIPs) as they move through the project life-cycle”. The Framework for Infrastructure and Delivery and Procurement Management (FIDPM). This Framework aims to achieve value for money in all stages of infrastructure projects. It provides approaches to delivering and executing projects to improve project outcomes and innovative methods to respond to current maintenance challenges and contracting strategies (National Treasury RSA, 2018).

Projects planned may include new or replacement schools, upgrades or additional infrastructure in extension to existing education facilities or refurbishment. These Capital Planning Guidelines indicate what needs to be done for any capital work. It includes a needs and demands analysis that will ensure that the current and future demand is analysed and an options analysis that will identify and evaluate the feasible options to achieve affordability and value for money. It includes a demand analysis and a technical engineering analysis to determine the location, the scale and the design, and the maintenance aspect of the project. Furthermore, an environmental analysis that includes the undertaking of an Environmental Impact Assessment (EIA), a socio-economic analysis to ensure the exploration of the economic and social benefits and legal and regulatory due diligence that include, among others, the zoning and town planning requirements and the Environmental legislation are some of the requirements as stated in these Capital Planning Guidelines.

The Capital Planning Guidelines guide that a viability evaluation is done to analyse the financial cash flow, to conduct a cost-benefit analysis (CBA) to ensure that the capital investment is the most efficient utilisation of resources and a risk assessment to predict possible risks in terms of the execution of the project. As an outcome of this analysis, a preferred option can be identified,

and implementation readiness can be ensured to deliver the project within time, budget, and specifications.

3.3.7. Infrastructure Development Act 23 of 2014

The Infrastructure Development Act of 2014 stipulates that the Act is (The Republic of South Africa, 2014:2)

“to provide for the facilitation and coordination of public infrastructure development which is of significant economic or social importance to the Republic; to ensure that infrastructure development in the Republic is given priority in planning, approval and implementation; to ensure that the development goals of the state are promoted through infrastructure development; to improve the management of such infrastructure during all life-cycle phases, including planning, approval, implementation and operations; and to provide for matters incidental thereto”.

The Presidential Infrastructure Coordinating Commission has various functions, which include the implementation of the National Infrastructure Plan and the coordination and monitoring thereof to determine priorities in terms of infrastructure development; and to ensure cooperation between organs of state.

3.3.7.1. National Infrastructure Plan

The National Infrastructure Plan 2050 (NIP 2050) was developed for implementation in line with section 4 (a) of the Infrastructure Development Act 23 of 2014. As stated by (the Department of Public Works and Infrastructure (2022:6), “Infrastructure development is critical to attaining South Africa’s long-term economic and social goals”. The investment in public infrastructure is a non-negotiable foundation. It is essential to “achieving greater productivity and competitiveness, reducing spatial inequality and supporting the emergence of new job-creating sectors”. Infrastructure development generates work and broad-based black economic empowerment opportunities and contributes to the National Development Plan (NDP) goals.

The Department of Public Works and Infrastructure (2022:6) described, “the cost of delivering infrastructure to meet NDP development objectives is estimated to exceed R6 trillion between 2016 and 2040”. The NIP 2050 aims to create a foundation for achieving the NDP’s vision of inclusive growth, sustained improvement in infrastructure delivery and “promote dynamism in infrastructure delivery, address institutional blockages and weaknesses that hinder success over

the longer term, and guide the way towards building stronger institutions that can deliver on NDP aspirations” (Department of Public Works and Infrastructure, 2022:6).

“Knowledge and innovation services for capability in planning, monitoring, budgeting, finance, procurement, project preparation, project management and sector-specific innovation” (Department of Public Works and Infrastructure, 2022:6). The NIP 2050 enables evidence-based decision-making, improves cost-effectiveness, mitigates risk, and helps optimise and can contribute significantly to enhancing infrastructure quality, delivery and sustainability. Where appropriate, public-private cooperation and stimulation of competition in the delivery of public infrastructure. Spatial transformation promotes more inclusive development in line with the National Spatial Development Framework (NSDF). Blended project finance and innovative green finance. A safe, secure, and ethical environment for public infrastructure delivery.

3.3.8. Intergovernmental Relations Framework Act 13 of 2005

The Act's purpose is to establish a framework for all government spheres to promote intergovernmental relations (The Republic of South Africa, 2005:2) “and provide mechanisms and procedures to facilitate the settlement of intergovernmental disputes”. This act aims to: Promote coherent government, promote the adequate provision of services, Monitor the implementation of policy and legislation, and facilitate the realisation of national priorities. This Act applies to all spheres of government and all organs of the state.

3.3.9. Construction Industry Development Board Act 38 of 2000

The Construction Industry Development Board Act's (2006:2) purpose is to “provide for the establishment of the CIDB; to implement an integrated strategy for the reconstruction, growth and development of the construction industry”. The Act has the objectives to provide strategic leadership to construction industry stakeholders; Promote and encourage “sustainable growth, reform and improvement of the construction sector and the participation of the emerging sector.” Promote the uniform application of policy concerning the construction industry; Provide for the establishment of national Register of Contractors and Register of Projects to manage risk. This act applies to all spheres of government.

3.3.10. Spatial Planning and Land Use Management Act 16 of 2013

The Spatial Planning and Land Use Management (SPLUMA) are “to provide a framework for spatial planning and land use management in South Africa” it stipulates the connection between the land use management system and spatial planning and “provide for the inclusive, developmental, equitable and efficient spatial planning at the different spheres of government”.

The act gives guidance to the development of policies, principles, norms and standards for spatial development planning and land use management and aims “to address past special and regulatory imbalances”; It further aims “to provide for the facilitation and enforcement of land use and development measures” and all matters related to it (The Republic of South Africa, 2013:2).

The Constitution stipulates that if the Department is looking for a new school location, it must collaborate with the local government planning agency. Therefore the Department has to prioritise the attendance of Local and District Municipality planning meetings and needs to participate in the development of the Integrated Development Frameworks (IDP), Spatial Development Frameworks (SDF) and Land Use Management Schemes (LUMS) of the municipalities. The Departmental Plan needs to be included in the IDPs and SDFs of municipalities, and the Department needs to consult with the respective municipalities to review and renew their LUMS about possible school sites.

Currently, the SPLUMA provides for cooperative government and intergovernmental relations amongst the national, provincial and local spheres of government, redresses past imbalances, and ensures equity in applying spatial development planning land use management systems. Therefore all spheres offer incentives for school infrastructure planning as part of the larger urban development plan. Where learner numbers are expected to increase dramatically, and the demand for new school accommodation is unacceptably high, the Department requests the relevant authority to identify and make land provisions in the immediate area to accommodate the appropriate school's infrastructure project. The identification informs the need for a primary/secondary school where learner numbers are anticipated to increase.

The quality and provisioning of a school's infrastructure significantly influence student achievement and future economic competitiveness. Schools are also public infrastructure, and the location, design, and physical condition of schools as public infrastructure is a critical determinant of neighbourhood quality, regional growth and change, and quality of life. The following recommendations apply to the Northern Cape Department of Education:

- Provincial departments, in their strategic planning, must take note of the Provisions of the Act; especially Section 17 (2), which states (The Republic of South Africa, 2013:30):
 - “All provincial development plans, projects and programmes must be consistent with the provincial spatial development framework”.
 - Provincial departments must provide their inputs when SDF's are compiled;

- Provincial sector departments, in their strategic planning, must include municipalities in their strategic planning sessions; and
- Provincial departments provide their inputs/comments in terms of the draft regulations.

3.3.10.1. Draft National Spatial Development Framework, 2019

The Draft National Spatial Development Framework was developed in line with and guided by the Spatial Planning and Land Use Management Act (SPLUMA). The National Draft Spatial Development Framework (2019:24) “seeks to make a bold and decisive contribution to bringing about the peaceful, prosperous and truly transformed South Africa, as articulated in the Freedom Charter, the Reconstruction and Development Programme and the National Development Plan”. It recognises the past's unjust spatial development patterns and the valuable lessons learned since the Democracy of South Africa in 1994. It has a solid drive to ensure a sustainable future. It strives to bring about “necessary changes in planning, budgeting and implementation in and between the three spheres of government” (DRDLR, 2019:22).

Pursuing a better life and the desire for quality urban living and spaces in urban and rural areas are linked to sustainable access to social services. The investment in social infrastructure is, according to this Framework (DRDLR, 2019:52), “high-quality facilities that are well-equipped, maintained and operated, and staffed to the correct level by well-trained personnel who provide a range of critical social services to the community”. There is currently a shortage, an inadequate supply of social facilities, and poor maintenance of buildings. However, planning for the existing backlogs and the foreseen population growth is an opportunity. Throughout this framework, spatial planning is noted to guide social infrastructure investment to be highly effective and sustainable. However, it cannot be over-emphasized – “establishing a sound spatial-location logic that optimises human capital development with economic impact is imperative to address inequality and ensure inter-generational justice” (DRDLR, 2019:52-53). Effective, affordable and equitable service delivery through the investment in social infrastructure should be planned well, designed for multiple uses and placed in the right location, such as close to public transport routes with adequate municipal services. It must contribute to place-making, urban densification, and diversification, reduce transport costs, and limit urban and rural sprawl (DRDLR, 2019:96).

The Draft National Spatial Development Framework (Department of Rural Development & Land Reform, 2019:96) propose that “The National Spatial Social Service Provisioning Model put forward in the NSDF as a National Spatial Development Lever, works on a hierarchical base, with the highest order services with the largest spatial reach in each category, being placed in the

highest order places”. Thus in terms of Education Facilities, in line with Figure 3-4, the National Urban Core, Education Facilities such as Universities can develop in the Regional Development Anchor, Early Childhood Development (ECD) Hub, and Further Educational Training Centres can develop in the Small Service Centre High Schools. ECD’s can develop, and Small Town Rural Settlement Small Schools, Primary Schools, and ECD Centres can develop. This hierarchy was developed to guide decision-making on the spatial allocation of social facilities across space.

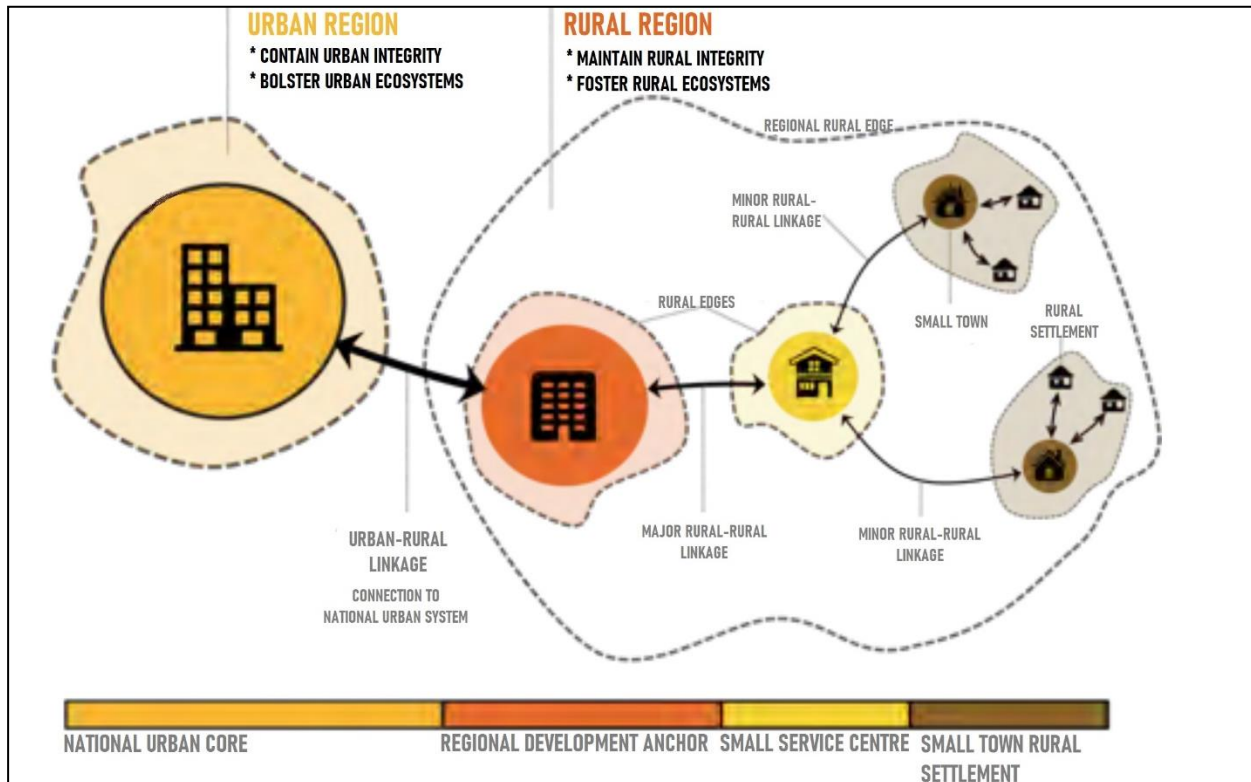


Figure 3-4: Schematic Presentation of a Regional-Rural Development Model
(Source: DRDLR, 2019:95)

3.3.11. The Integrated Urban Development Framework (IUDF)

The Integrated Urban Development Framework strives to improve settlements, focusing on functionality integration and balance. This framework's vision is “liveable safe, resource-efficient cities and towns that are socially integrated, economically inclusive and globally competitive, and where residents actively participate in urban life”. Within this framework, there is a strive to maximise urban areas' potential, have integrated planning, and ensure that development improves urban areas and enhances urban form in coordinating our cities and towns.

As one of the priorities and opportunities stated within the Integrated Urban Development Framework, housing delivery must be integrated with social infrastructure provisioning and public transport planning. The planning for this social infrastructure, including the maintenance thereof,

needs to be done in an integrated and sustainable way. Resilience should be considered a “powerful instrument for steering the development of an efficient, equitable and resilient urban form and facilitating access to social and economic opportunities” (COGTA, 2016:69).

3.3.12. Government Immovable Asset Management Act 19 of 2007

According to the Government Immovable Asset Management Act (2007:2): The purpose of the Government Immovable Asset Management Act 2007 is stated: “to provide for a uniform framework for the management of an immovable asset that is held or used by a national or provincial department”, and it provides direction and guidelines to the use of an immovable asset and the management thereof.

This Act applies to all state organs and provides guidelines on the relationship between the custodian, the Department of Public Works, and the immovable asset user. Throughout this Act, it is clear that an immovable asset must be utilised efficiently and that alternative service delivery methods must be identified and considered to minimise the demand for acquisition. An acquisition is prioritised when a non-immovable asset solution is viable when an immovable asset changes its service delivery objective and life cycle cost-justify an acquisition. Value for money must be realised in the operation, maintenance and acquisition of an immovable asset. If this is impossible, the user can dispose of the immovable asset. The GIAMA states that “its strategic planning process contemplated in the Public Service Regulations, 2001” the user departments have to prepare a user asset management plan (The Presidency, 2007:9). It provides for the minimum requirements of this user-immovable asset management plan. This plan is revised annually in line with the budget allocation, a strategic document that will guide and inform all decisions regarding immovable asset management.

3.3.13. State of the Nation Address

In his 2019 State of the Nation Address, President Ramaphosa mentioned that we are confronting water crises as South Africa is a water-scarce country. It was stated that they are developing a comprehensive, integrated national plan that addresses water shortages, ageing infrastructure and poor project implementation. It will also affect the Northern Cape as this province is water-scarce and is facing numerous issues (Ramaphosa, 2019). The President indicated that they urgently establish an inter-governmental rapid response technical team, reinforced by specialist professionals, to intervene in areas experiencing severe water problems.

President Ramaphosa stated that ECD centres' responsibility would migrate from Social Development to Basic Education and proceed with two years of compulsory ECD for all children before entering Grade 1.

It was stated that infrastructure development has been the flywheel of our economy's engine and has yielded tremendous benefits for the country. President Ramaphosa stated that we must do more and that our infrastructure development has slowed down. Infrastructure provisioning is not integrated between the different spheres of government.

President Ramaphosa stated in his 2022 State of the Nation, "Government is introducing an innovative social infrastructure delivery mechanism to address issues that afflict the delivery of school infrastructure" (Ramaphosa, 2022). It was stated that this Infrastructure Delivery Mechanism would be piloted in the Northern Cape and Eastern Cape schools to "address the speed, financing and funding, quality of delivery, mass employment and maintenance".

3.3.13.1. Movement of ECD from Social Development to the Department of Education

President Ramaphosa, in the SONA of 2019, stated that ECD centres' responsibility would migrate from Social Development to Basic Education and proceed with two years of compulsory ECD for all children before they enter Grade 1. The mandatory two years before Grade 1 is stated within the National Development Plan and will assist in developing learners before they enter school.

In his State of the Province speech, Dr Zumani Saul stated that progress had been made in the "Transfer of Early Childhood Development function from the Department of Social Development to the DoE as of April 2022" (Premier Zamani Saul, 2022). The Children's Act 38 of 2005 recognises the inter-sectorial nature of ECD services.

The implication of movement on Infrastructure – A national audit was done in 2013, and the Department of Social Development conducted a condition assessment in 2018 for Frances Baard and John Taolo Gaetsewe and in 2019 for the remaining three district municipalities; however, it is essential to do a complete condition assessment as needs are ever-changing in the Infrastructure environment. A comprehensive survey will still have to be conducted in line with the Norms and Standards that the DBE will determine. This assessment will need to determine the current infrastructure at the existing centres to determine the condition and availability of water, sanitation and electricity. There is a high possibility that these facilities still have PIT Latrines which will have to be eradicated. Furthermore, there will be inappropriate structures due to the

material they are constructed from, such as metal, wood, and asbestos. Significant issues for Infrastructure:

- Privately owned Infrastructure and how investment and support will be implemented;
- Upgrading of Private ECD Centres vs the Building of Public ECD Centres;
- Expanding on ECD Facilities at existing Primary Schools;
- Scholar Transport will also be affected;
- Minimum Norms and Standards to adhere to access funds;
- Possible amendments to the Norms and Standards; and
- Municipal By-Laws, Health and Safety.

Priorities that need to be looked at:

- Consolidate with Grade R;
- Increase access to Grade RR;
- Prioritise Centres / Communities in Quintiles 1-3; and
- All new schools to include an ECD Facility for Grade RR.

3.3.13.2. Infrastructure Implementation Model

Speaking at the 2020 State of the Nation Address (SONA 2020) in Cape Town, President Cyril Ramaphosa said that infrastructure development is sluggish and has slowed down. However, the country has made significant progress with infrastructure provision over the past five years. According to Ramaphosa, the cabinet's new infrastructure implementation model will underpin the infrastructure Fund. Through the new model, the government has committed to contributing R100 billion over ten years to the infrastructure fund and using this to leverage financing from the private and development finance institutions. Ramaphosa noted that the government's first step towards improved implementation would expand on current projects, such as student accommodation (Ramaphosa, 2020). Ancillary to poor project implementation, cost overruns and project delays were just as important. Although valuable lessons were learned in building new infrastructure, the president would focus on improving budget spending, monitoring systems to improve project integration, and building a relationship on infrastructure between the private sector and organised labour; this earmarked a clear opportunity for clients doing business in the infrastructure sector and boosted investor confidence (Ramaphosa, 2020).

Ramaphosa reflected on the progress made over five years, with more than R1.3-trillion invested in infrastructure (Ramaphosa, 2020). He was calling infrastructure development the "flywheel" of

S.A.'s economy. However, focusing on the past was insufficient, and the president called on all spheres — government, investors, the private sector and the public — to do more (Ramaphosa, 2020). A significant area of concern is the technical capacity of the government to ensure project delivery. The challenges affecting poor infrastructure implementation and integration will be met by adopting new models supported by investment and state funding. Advisory teams will address the lack of technical capabilities within the government. In strengthening technical capacity, Ramaphosa said that the cabinet plans to strengthen the technical capacity in government to ensure that projects move, building a pool of engineers, project managers, spatial planners and quantity surveyors, and an action team that can affect progress. "We plan to do things differently, starting with a deeper partnership with our communities in the planning, building and maintenance of infrastructure," Ramaphosa noted (Ramaphosa, 2020).

3.3.14. National Building Regulations and Building Standards Act 103 of 1977

The National Building Regulations and Building Standards Act (1977:2) provides "uniformity in law relating to the erection of buildings in the areas", prescribing building standards and matters in addition to that. All new buildings should be designed in compliance with SANS 10400-XA as the requirements for passive heating and cooling, and alternative energy will become more extensive in the foreseeable future. The following South African National Standards include, but are not limited to, have an impact on education facilities and the planning thereof:

- SANS 10400 (full series);
- SANS 204:2011 – Energy Efficiency in Buildings;
- SANS 1263:2013 – Safety and Security Glazing Materials for Buildings;
- SANS 660:2015 – School Furniture;
- SANS 10103:2008 – The Measurement and Rating of Environmental Noise concerning Annoyance and Speech Communication;
- SANS 241:2015 – Drinking Water;
- SANS 10252:2016 – Water Supply and Drainage for Buildings;
- SANS 10142-1:2012 – The Wiring of Premises (Part 1 Low Voltage Installations);
- SANS 51176-1:2010 – Playground Equipment and Surfacing;
- SANS 428 – Fire performance classification of thermally insulated building envelope system;
- SANS 1449 – Ceramic wall and floor tiles;
- SANS 1200 (full series);
- SANS 2001 (full series);

- SANS 10305 – Paints, primers and varnishes – pigment thickness, flexibility, impact and scratch resistance, washability, application; and
- Any other applicable SANS.

3.3.15. Other Legislation Impacting Education

The following policies, standards, guidelines and notices, as amended from time to time, also impact Education Facilities:

- Promotion of Access to Information Act 2 of 2000: This act encourages transparency and accountability in public and private bodies;
- Preferential Procurement Policy Framework Act 5 of 2000: provides specific procedures for allocating tenders to historically disadvantaged individuals and entities;
- The Promotion of Administrative Justice Act 3 of 2000: To give effect to the right to administrative action that is lawful, reasonable, and procedurally fair and to the right to written reasons for administrative action as contemplated in section 33 of the Constitution of the Republic of South Africa, 1996; and to provide for matters incidental to that;
- List of Registered Independent schools: List of independent schools in the Northern Cape registered in the South African Schools Act 84 of 1996;
- Post Provisioning Norms of the Department of Basic Education;
- National Norms and Standards for School Funding (Aug 2006);
- Applicable National Treasury Regulations, Practice Notes and Instructions;
- National Environmental Management Act (Act No. 107 of 1998), as amended;
- Occupational Health and Safety Act (Act No. 85 of 1993);
- National Sport and Recreation Act (Act No. 110 of 1998), as amended;
- Construction Regulations (2014), issued by the Department of Labour;
- Asbestos Regulations 2001, published by the Department of Labour on 10 February 2002 in Government Gazette No. 23108;
- Regulations for the Prohibition of the Use, Manufacturing, Import and Export of Asbestos and Asbestos Containing Materials under Section 24B of the Environment Conservation Act, 1989 (Act No. 73 of 1989), published by the Department of Environmental Affairs on 28 March 2008 in Government Gazette No. 30904;
- Regulations Relating to the Minimum Requirements of an Agreement Between the Member of the Executive Council and the Owner of a Private Property on which a Public School is Situated (1997);
- Policy on the Organisation, Roles and Responsibilities of Education Districts (09 Dec 2016);

- Space Planning Norms and Standards for Office Accommodation Used by Organs of State (Notice No. 1665 of 2005);
- Norms and Standards for Sport and Recreation Infrastructure Provision and Management, Volume 2 – Technical Specifications (September 2010);
- Norms and Standards for Public Schools that Provide Education with Specialised Focus on Talent, Including Sport, Performing Arts and Creative Arts;
- Draft National Sanitation Policy (Feb 2016);
- National Learner Transport Policy (June 2015);
- Education White Paper 6: Special Needs Education, Building an Inclusive Education and Training System (2001);
- Guidelines for Full services / Inclusive Schools (2010);
- White Paper on the Rights of Persons with Disabilities (09 March 2016)
- National School Safety Framework (2015);
- National School Nutrition Programme – A Guide for Secondary Schools (Jan 2006);
- Any Applicable Municipal By-laws;
- School Infrastructure Safety and Security Guidelines (2017); and
- Guidelines for Minimum Requirements of Implementing Agents in the Basic Education Sector (2018).

3.3.16. Framework for Infrastructure Delivery and Procurement Management (FIPDM)

This Framework was developed to guide and structure infrastructure delivery management (National Treasury, 2019:3). IDIP and IDMS were developed as a strategy to promote Infrastructure Procurement and Delivery Management in the Public sector. Various challenges were identified with the delivery of infrastructures, such as management skills, inefficient and ineffective systems and processes, and lack of appropriately skilled resources.

The Framework strives to ensure that value for money is achieved in the planning, design, and procurement of infrastructure projects and is primarily focused on decision-making points and the alignment of functions to achieve sound management processes. “It provides a range of contracting strategies and approaches to the delivery and execution of projects to improve project outcomes as well as making provision for innovative methods to respond to current maintenance challenges” (National Treasury, 2018:2). The Framework for Infrastructure Delivery and Procurement Management (2019), states that “Government’s Infrastructure Delivery Management System (IDMS) is defined as the management system that guides, directs and enables infrastructure delivery in the public sector” (National Treasury, 2019:3).

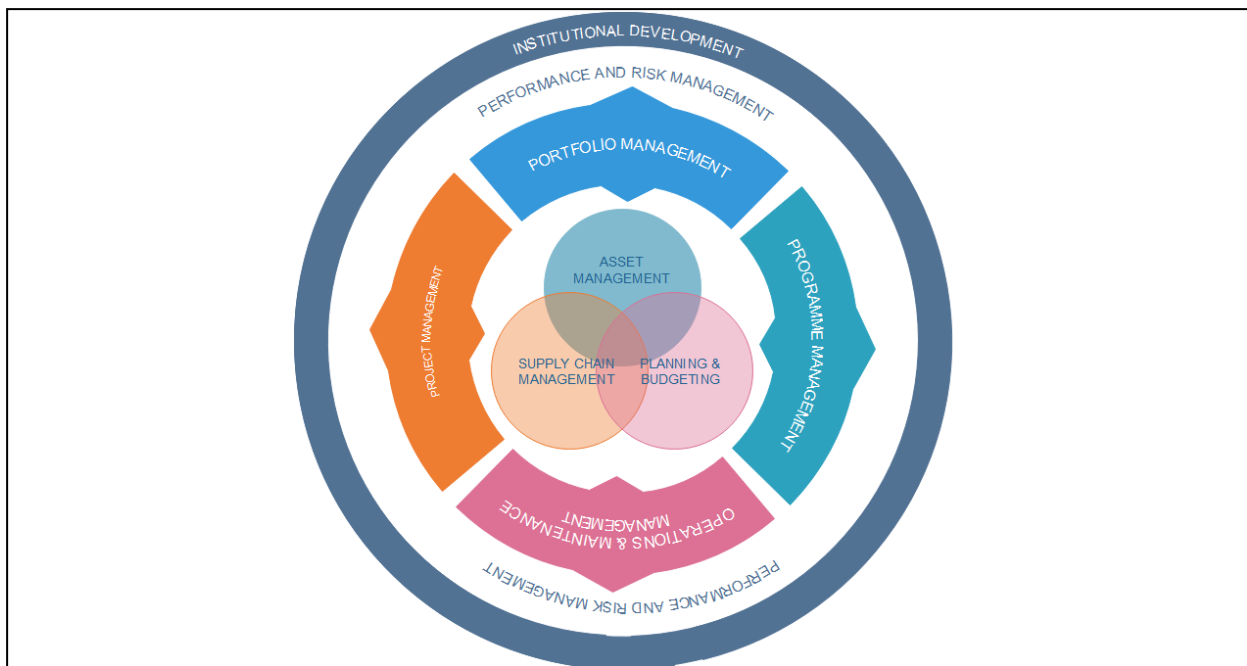


Figure 3-5: The IDMS Diagram
(Source: National Treasury, 2019)

According to the Framework, Figure 3-5 illustrates the different elements of the IDMS. The inner core represents the core legislative requirements of IDMS, and then the Infrastructure Delivery Management circle represents the portfolio, programme, operations and maintenance, and project management processes. Performance and risk management indicate that integrating the IDMS processes into the institutional system guides the effective implementation of IDMS (National Treasury, 2019). The Framework (FIDPM) applies to all state organs subject to the Public Finance Management Act and prescribes minimum requirements for implementing IDMS. It furthermore provides responsibilities in decision-making at control points, stages and gates. The Framework promotes the concept of value for money and optimal use of resources to achieve the outcome.

3.3.17. The Infrastructure Delivery Management System (IDMS)

The Infrastructure Delivery Programme (IDIP) was initiated to improve the planning and procurement of infrastructure development. Through this programme, the Infrastructure Delivery Management System (IDMS) was developed as a government management system for all stages of delivering, monitoring, and evaluating infrastructure. It comprises interrelating or interacting elements that establish processes that transform inputs into outputs. The IDMS aligns with the Medium Term Expenditure Framework (MTEF) and focuses on an outcomes approach. It promotes value for money and an efficient procurement and delivery management system that complies with relevant legislation. It includes a supply chain management system and can be

readily integrated into various systems. The IDMS comprises three core systems with forwarding and backward linkages (National Treasury RSA, 2012); a planning and budgeting system, a supply chain management system, and an asset management system. The IDMS speaks about four (4) Delivery Processes. These are explained in more detail in Figure 3-6:

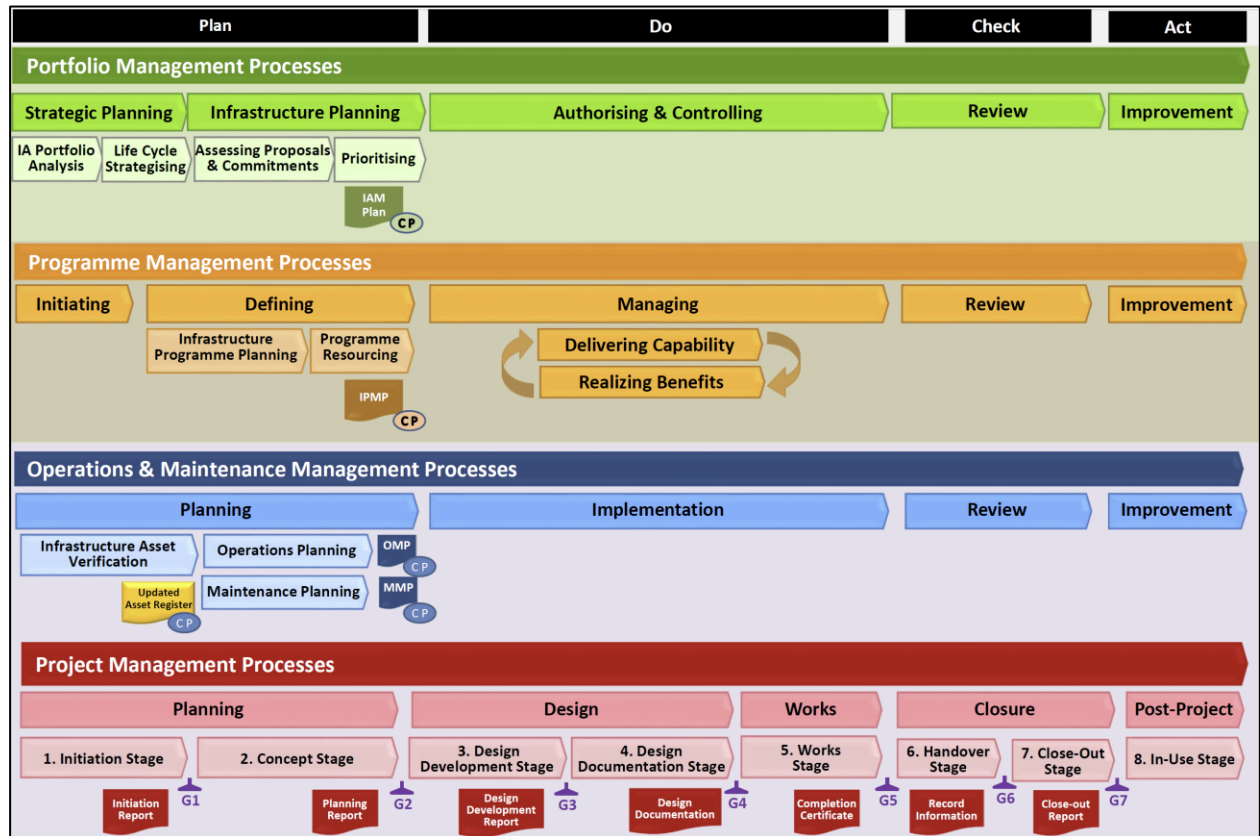


Figure 3-6: The IDM Process Diagram

(Source: National Treasury, 2019)

The Infrastructure Delivery Management process diagram in Figure 3-6 indicates the different portfolio, programme and project processes and includes operations and maintenance to plan, do, check, and act. It aligned the documentation required for each control point, stage and gate and the outputs required.

In terms of the Portfolio phase, this diagram establishes processes in managing a portfolio of infrastructure assets that include strategic planning to align the portfolio with the organisation's strategic objectives, infrastructure planning, authorising and controlling review and improvement. As part of this process, a department is to develop an Infrastructure Asset Management Plan (for ten years), which has to analyse the existing portfolio, review the objectives and various strategies and plans on local, provincial and national levels; it needs to assess proposals and current commitments as well as select and prioritise future projects. The infrastructure portfolio process

creates a link between the portfolio and programme processes as there should be an intelligent grouping of projects under carefully selected programmes and portfolios which provides for substantial improvement of inefficiencies by being able to, amongst others, consolidate and share resources, shared governance and control processes, focused benefits management, and stakeholder management.

The Programme phase initiates, defines, manages, reviews improve, and includes the programme resourcing and planning. Documentation required in these processes as control points consists of the Infrastructure Procurement Strategy (IPS), the Infrastructure Programme Management Plan, and the Infrastructure Programme Implementation Plan to clearly define what should be implemented when, how, where and with what resources. The critical obligation of a custodian in terms of the Government Immovable Asset Management Act (GIAMA) is that immovable assets must be kept operational and functional throughout their lifecycle to support efficient service delivery. Effective maintenance management must take place to achieve this. The Operations and Maintenance phase includes planning, implementation review, and improvement. Within this phase, the importance of maintaining assets is emphasised.

Individual infrastructure projects are scoped and managed within the greater programme and portfolio. Consequently, the typical project manager would report project performance to the programme or portfolio manager. The project management plans include the Project Execution Plan (PEP) for each IDMS Control Point. A typical example would include the progress of a classroom construction project on excavation, foundation, window high-top structure, roof high-top structure, and roof, among others, within the approved time, cost and quality parameters. The project process comprises various stages, each requiring an output of specific documentation linked to a gate approval, such as the initiation report, concept report, and design development report. It ends the project with a closeout report at stage 7.

3.4. International Legislation comparison

According to the World Population Review for 2022, South Africa is classified as a third-world country that is underdeveloped or underperforming and in great need of development. In terms of population, South Africa's population is ranked 24th, its growth rate 90th, and its density 161st. Tanzania's population is ranked 23rd, with a growth rate at 10th and density rated at 144th and Italy is ranked 25th in terms of population, with a growth rate ranked 212th and density of 73rd of all third-world countries (World Population Review, 2022).

3.4.1. Tanzania's Education Sector

The United Republic of Tanzania's government has set out School Construction and Maintenance Strategy, which provides principles for identifying where a new school should be built and the minimum standards for these facilities. The provision of school infrastructure facilities in Tanzania is guided by the following legislation, policies, and guidelines:

- The Education Policy of 2014 guides schools to have adequate and accessible suitable infrastructure that creates conducive learning and teaching environments for all groups and levels of education.
- The Education Act Cap 353 of 2002: Section 15 (1) (c) states that if a school has standard infrastructures and facilities of decent quality and adequate quantity and are regularly maintained, access should be granted for establishing the school.
- The School WASH Guidelines 2016: Compliance with the infrastructure requirements should consider the unique needs of pupils with disabilities and girls of menstruating age;
- Force Account Guidelines 2016: Set out mechanisms, procedures, roles and responsibilities for the construction of school facilities using the Force Account Method;
- ESDP 2016-2021: Ensure schools are adequately resourced with infrastructure, including gender-segregated toilets, facilities and equipment to be safe, inclusive and child-friendly;
- School Construction Guideline: For provisioning of sufficient and permanent buildings; and
- School Accreditation and Registration Guideline: all schools that meet the set of basic requirements in terms of infrastructure will be registered by the Commissioner for Education.

3.4.2. Italy's Education Sector

The National Operational Programme for Italy aims to provide a national strategy and promote and sustain innovative, eco-friendly school buildings (smart schools). It focused on ICT infrastructure and connectivity and guided that education infrastructure should be modular and flexible. Schools are framed as civic centres for the community, not just learners and educators. Furthermore, there is an explicit instruction that the number of laboratories for the different vocational tracks needs to be increased (OECD, 2017). The Italian government's legislation in the field of educational building discussed and analysed quality, technological innovation, multi-functionality, and resources. Effective school architecture, flexibility and adaptability of space, bioarchitecture, alternative energy sources and building automation as factors that ensure the well-being of users and allow for savings but also have a powerful educational impact are highly prioritised.

3.5. Chapter Conclusion

As a developing country, South Africa has numerous legislative requirements that impact education facilities, planning and design, and operation and maintenance after construction. Table 3-1 indicates the legislation, frameworks, policies and plans that inform the Education Infrastructure of South Africa:

Table 3-1: Legislation Conclusion

Category	Legislation	Policy	Guideline	Planning Implication	Applicable to
Constitution	The Constitution of the Republic of South Africa (2)	The National Development Plan	Draft National Spatial Development Framework	Supreme Law of South Africa Obligations imposed by the Constitution must be fulfilled. Therefore schools should be planned as part of communities and should be accommodated in all new developments as per the population requirements	The constitution applies to all spheres of government, including supportive institutions and all the people in South Africa
		Framework for Infrastructure Delivery and Procurement Management (FIPDM)	The Infrastructure Delivery Management System (IDMS)	The Infrastructure Delivery Programme (IDIP) was initiated to improve the planning and procurement of infrastructure development. The toolkit assists planners in determining the supply, demand and need for education facilities and provides guidelines on the planning of new school facilities	Applicable to all spheres of government
	Public Finance Management Act (2)		Capital Planning Guidelines The Infrastructure Delivery Management System (IDMS)	Regulate financial management to ensure that when planning and implementing education infrastructure, it is value for money	Applicable to schedule 2 and 3 public entities
Finances	Division of Revenue Act (4)	Framework for Infrastructure Delivery and Procurement Management (FIPDM)	The Infrastructure Delivery Management System (IDMS)	Equitable division of revenue to all spheres of government Provide conditions for affected grants. The Education Infrastructure Grant allows for the planning and implementation of new and replacement Schools, Upgrades and Additions, Maintenance and Repairs and Refurbishment, and Renovations and Rehabilitation of education facilities. It provides conditions for the plans of the Department within an MTEF period. These plans should reflect in the municipal IDPs and SDFs as it influences communities and is planned for in municipal jurisdiction	Applicable to all spheres of government
Infrastructure	Infrastructure Development Act (4)			Provide for the facilitation and coordination of public infrastructure development Ensure that infrastructure development is given priority Improve management of infrastructure through all life-cycle phases	Applicable to all spheres of government
				Ensure that the planning of new infrastructure is in line with development principles	
	Expropriation Act (2)			To implement an integrated strategic project	Applicable to all spheres of government

Category	Legislation	Policy	Guideline	Planning Implication	Applicable to
Education Facilities	South African Schools Act (4)	The Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure Judgment of the Regulations Relating to Minimum Norms and Standards for Public School Infrastructure	Action Plan 2014, towards the realisation of Schooling 2025	Provides a uniform system for the organisation, governance, and funding of schools; amends and repeals specific laws relating to schools; and provides for matters in addition to that. It promotes access, quality, and democratic governance in the schooling system. Planning of education infrastructure should be in line with this act to ensure the future viability	
Spatial Planning	Spatial Planning and Land Use Management Act (4)	The Integrated Urban Development Framework		Developmental and efficient spatial planning in the different spheres of government Promote socioeconomic growth Provide for the development of principles and norms, and standards Promote cooperative government and intergovernmental relations Redress past spatial and regulatory imbalances	Applicable to all spheres of government
Asset Management	Government Immovable Asset Management Act (3)			Promote uniformity and set minimum standards in respect of immovable asset management	Applicable to both national and provincial spheres of government
Contractor Development	Construction Industry Development Board Act (3)		The Infrastructure Delivery Management System (IDMS)	Provide for the establishment of CIDB for an integrated reconstruction strategy that focuses on the growth and development of the construction industry	
Other	Intergovernmental Relations Framework Act (1)			Establish a framework for all spheres of government to promote and facilitate intergovernmental relations Promote coherent government Promote the effective provision of service Monitor implementation of policy and legislation Facilitate the realisation of national priorities	Applicable to all spheres of government and all organs of state

LEGEND

Evaluation colour	Level of Support for Optimising the planning of educational facilities
1	Very Weak
2	Weak
3	Medium
4	Strong

(Source: Author's creation, 2022)

It is evident that most of the policies and legislation supports the optimal planning of education facilities and recognise the need for education facilities, the proper planning thereof, and in the end, value for money. In conclusion, there are more than sufficient acts, legislation, policies, and frameworks in South Africa that provide clear guidelines of what needs to be prioritised to address the inequitable and unequal distribution of education infrastructure, how to plan for this and how to implement it. This section investigated all legislation, acts, norms and standards, guidelines, and plans; however, possibly due to insufficient budget, the inequalities in South Africa are still significant.

After comparing South African, Tanzanian and Italian legislation, it was clear that South Africa has much more legislation, policies and plans than any of these comparable countries. Perhaps this is where the challenge lies in South Africa; to streamline these numerous policies and legislations to adhere to with limited funding available to support these required interventions. The policies and guidelines for education infrastructure in Tanzanian and Italian but mainly for Italy, are more innovative and focus on multi-functionality and bioarchitecture. Therefore it is recommended that the legislation, policies and guidelines in South Africa be reduced and revisited to cater for future initiatives and innovations and not just to address the backlog of inequality. Table 3-2 provides as a concluding remark of this chapter the link between the conclusion reached and the relevant objective in line with the research objectives and primary research questions of this study:

Table 3-2: Linking research objectives to chapter purpose and conclusion

Research Objectives	Primary research question	The conclusion reached within this chapter
Investigate the current legislation, regulations and standards for the provisioning of school infrastructure and the planning and design behind it;	How did planning theories, including development theories, sustainable development theories, and legislation, impact on education facilities planning?	The legislation regulations, policies and guidelines were analysed from an international level (Section 3.2) and a national level (Section 3.3) and a comparison were made with other countries that are 3rd world countries and ranked above and below South Africa in terms of population size (Section 3.4). From this analysis, it can be concluded that countless amounts of legislation impact the provisioning of education facilities; however, this was not the case with the countries' legislation analysed. The Norms and Standards (Section 3.3.3.1), as a critical piece of legislation that informs the prioritisation of education facilities, is due for revision as this legislation was taken to court. The case was won for the amendment of it. The current Norms and Standards have a high-cost implication for adherence to the set timeframes, which none of the provinces can meet with the current budget allocation; this results in this research determining factors that can affect better planning to ensure the sustainability of the facilities and recommends the approach of alternatives to address the backlogs identified to adhere to the legislative requirements.
To identify and forecast changing needs	How does legislation on a global, national, provincial and municipal level impact how and when education facilities are planned for?	In analysing all applicable legislation to determine the implication on all government spheres when planning education facilities, it can be concluded that various legislation guides an interactive approach of all spheres of government when planning for education infrastructure. Education facilities cannot be planned in isolation when it is located within a municipalities jurisdiction, as the provisioning of services is the responsibility of municipalities.

Research Objectives	Primary research question	The conclusion reached within this chapter
To improve on standards that will ensure that physical resources are planned successful and sustainable	Are there acceptable norms, standards, and guidelines to assist in the uniform planning of education facilities?	When planners formalise informal settlements, social infrastructure should be prioritised, population growth and movement directly impacts education facilities, and thus it becomes critical to identify these changing forecasts within a municipal sphere It became evident in this research that there is a lack of a comprehensive standard that guides the uniform planning of educational facilities; this research, therefore, made recommendations in Chapter 8 on how this can be addressed, as the Norms and Standards currently only provide minimum guidelines there is significant room left for improvement to formulate such a standard.

(Source: Author's creation, 2022)

Chapter 3 concluded the legislative investigation of this research. Chapter 4 investigated literature that informs the provisioning guidelines behind education facilities, the planning of new schools and identifying sites that will be ideal for constructing these facilities to ensure they remain viable and sustainable.

CHAPTER 4 SPATIAL PLANNING FOR EDUCATIONAL FACILITIES

4.1. Chapter Introduction

This chapter reflected on spatial planning principles pre-2013 and post-2013 and determined spatial planning for new schools and how to address the demand, supply and gap. It investigated alternative solutions and different suitable and efficient options in planning for new facilities. It investigated the planning of land provisioning behind new schools in urban and remote areas for Primary and Secondary Schools. The site requirements were analysed, and a needs and options analysis was determined. Figure 4-1 indicates the structure of this chapter:

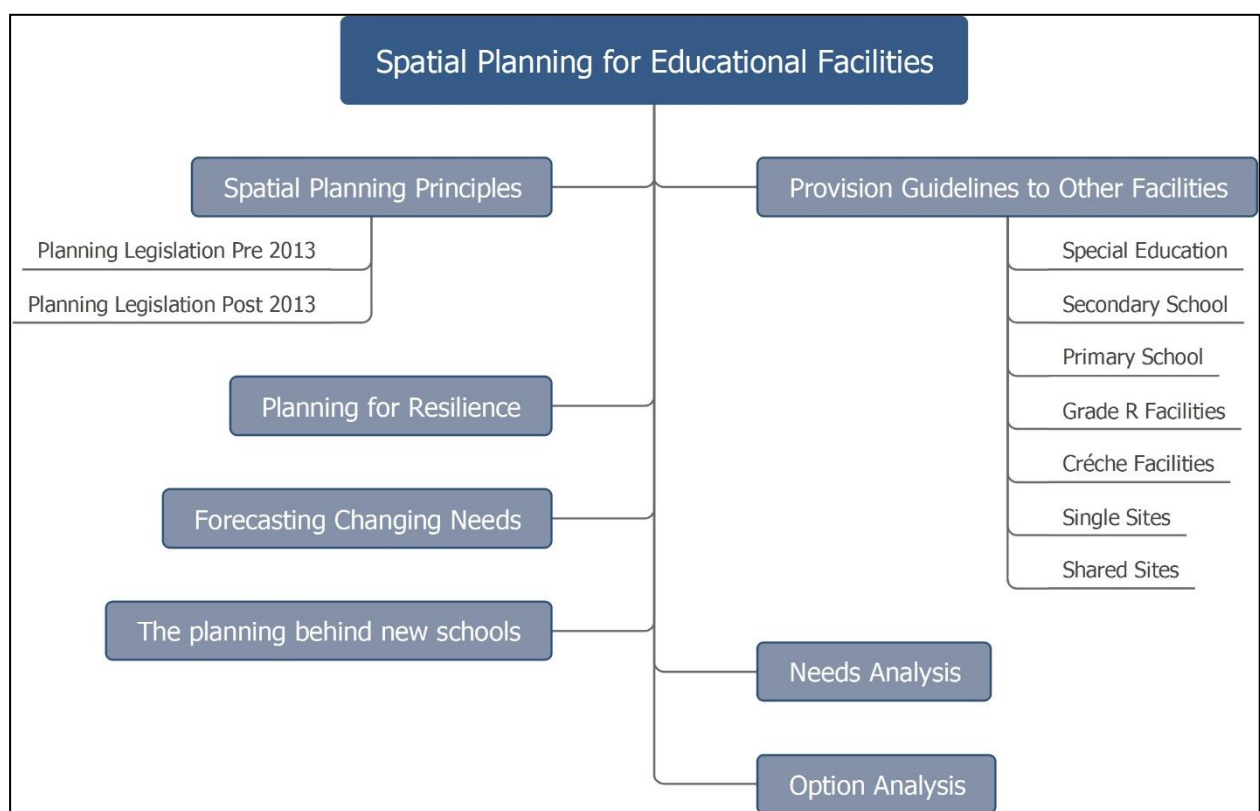


Figure 4-1: Chapter 4 Structure

(Source: Author's creation, 2022)

4.2. Spatial Planning Principles

The South African legislation passed several bills, policies, and acts to govern land development and spatial planning in South Africa. Figure 4-2 illustrates some of the land development and spatial planning legislation of the South African government:

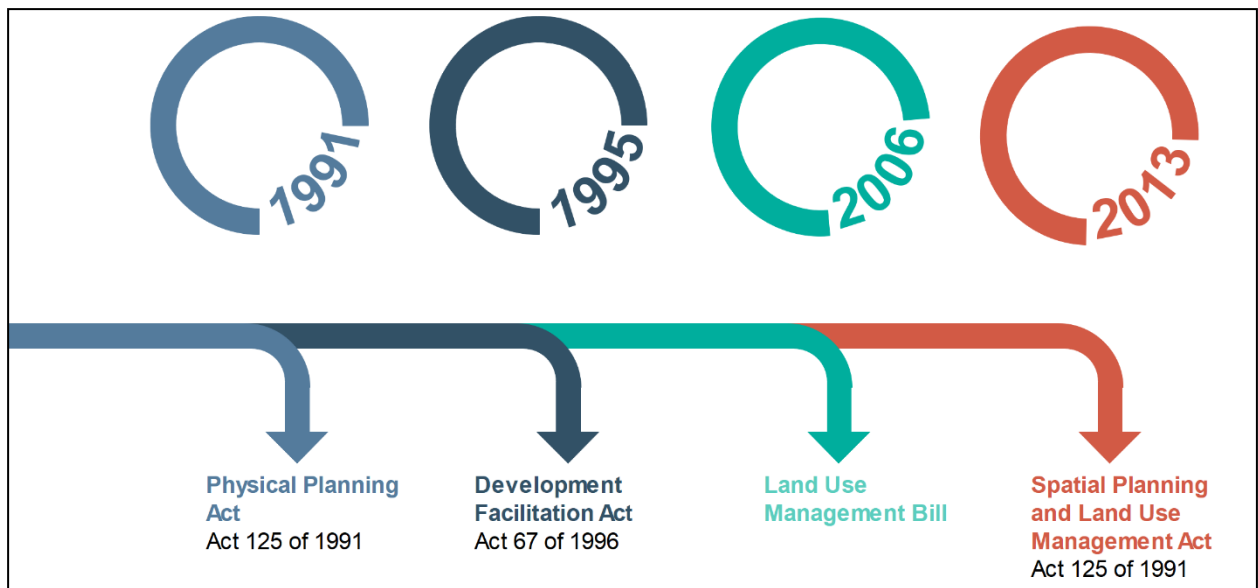


Figure 4-2: South African Land Development and Spatial Planning Legislation

(Source: South Africa, based on RSA 1991, 1995, 2013; DLA 2008)

Figure 4-2 illustrates four planning legislations that have been passed, and this section will be divided into two sections, a) all legislation that has been passed pre-2013 (historical background) and b) planning legislation passed in 2013 (primary land use and development legislation).

4.2.1. Planning Legislation Pre 2013

The Physical Planning Act 125 of 1991 was established by the South African Apartheid government for advantaged citizens to accumulate prime land. The Act provided “regional and urban structure plans” as these plans were recognised as top-down political strategies (RSA, 1991:4-14). Therefore, these plans identified the diverse land uses for the determined areas and that no new town planning scheme may be implemented in the determined areas without national approval. As this act has been identified as a form of land use management (LUM), there is no freedom to change the zoning on a land parcel if identified as an urban structure plan area.

The Development Facilitation Act (DFA) 67 of 1995 focus on the “land development principals, objectives and to formulate land development policies” (RSA, 1995). After the election of the newly democratic South African government, this act was conveyed to adjust the breach between the old apartheid and the newly democratic planning systems. The DFA (RSA, 1995: 8) identified to “promote a diverse combination of land uses” that includes “subdivision of land” of an individual’s property. The old act made no provision for combining different land uses. The new act promoted the idea of incorporating other land uses and subdivisions as an integrated approach to planning. This act also established suitable “land use control systems” for rural and

urban land development (South African, 1995: 16). DFA started to identify promoting sustainable planning approaches, which were insufficient. Then the legislation implemented the Land Use Management Bill of 2008.

The Land Use Management Bill of 2008 allowed LUM regulations to be identical, creating ethical land development and LUM in South Africa that includes establishing land-use schemes and tribunals (RSA, 2008). Throughout the Bill's mentioned purposes, public interests and participation are vital in land use management. According to the Land Use Management Bill (2008: 9-16), Chapter 3 stated the following Land Use Regulations:

- All municipalities must establish Land Use Committees at a National level and Provincial Land Use Tribunals at the provincial level responsible for considering and deciding if all lodged applications to the municipality are in terms of legislation. Therefore, these Committees and Tribunals perform their functions ethically without favouring them. With the construction of a new school in the area of jurisdiction of a municipality, formal correspondence should have been submitted to this committee.
- Land use restriction is an essential aspect of the LUM that restricts land use according to the "land use scheme, town planning scheme and subsection". That further identified the law of the land and can only be used according to the scheme. The implication was that if a new school was not planned in line with the land-use scheme, a land-use application was to be submitted to the land-use committee for approval.

Summarising the mentioned South African planning legislations clearly illustrated the evolution of LUM. Since the apartheid regime, with their structure plans (laws) of which land use was allowed in the demographic area, land change will be a legislation amendment. After the apartheid era, the legislation shifted to eradicate the previous imbalance and favoured developing land. Therefore, this land development movement allowed for the change of land use and subdivision of a property. Before the final planning act had been passed by the South African legislation Department of Agriculture and Land Affairs formulated the Land Use Management Bill to establish uniform LUM regulations and ethics. These LUM regulations started the planning committees, tribunals, and land-use restrictions.

4.2.2. Planning Legislation Post 2013

In 2001, South Africa conveyed a White paper on Spatial Planning and Land use Management. In 2013, the Spatial Planning and Land Use Management Act (SPLUMA) was passed as the primary town and spatial planning legislation in South Africa. South Africa (2013:2) proved that it

aimed to provide a “framework and specify the relationship between spatial planning and land use management” and incorporate other means of planning to integrate governmental spheres. Furthermore, this act also formulated spatial planning principles that will govern integrated and sustainable planning. The following section will identify the different spatial planning principles and investigate how they can contribute to overall sustainability and educational facility planning in South Africa.

4.2.2.1. Spatial Justice

Spatial justice is the intended and importance of spatial or physical features of justice or injustice that comprise the appropriate and equitable dissemination of socially valued spatial resources, which provides utilisation opportunities (Soja, 2009:2). Spatial justice is an important aspect that needs to be considered when planning for educational facilities to ensure the plans are not contributing to spatial injustice that excludes some of the public to utilise the educational facilities. Then SPLUMA developed the five development principles, and spatial justice is one of Section 7 (a) (i) states that spatial justice would address the previous spatial and development imbalances (RSA, 2013:18). Additionally, the spatial justice principle states the following to ensure the inclusion of the previous disadvantaged:

- The different spheres of state must establish spatial frameworks and policies, such as the Spatial Development Framework (SDF), Integrated Development Plan (IDP) and any spatial policies, and these documents will also identify the plan for educational facilities to address the imbalances; and
- Municipalities must establish spatial planning devices, such as the land use scheme for each municipality, based on their required needs. For educational facilities, the municipalities will formulate educational zoning that will be used for all educational facilities (RSA, 2013:18).

4.2.2.2. Spatial Sustainability

Spatial sustainability in the “spatial planning and land use management systems” required the endorsement of land development to be in line with the South African government’s economic, official and organisational capacity (RSA, 2013:18). Van den Bergh and Verbruggen (1999:68) explained that the spatial sustainability and environmental sustainability have over years primarily been neglected as it was not seen as being of that importance. SPLUMA saw the importance of spatial sustainability as it is one of the development principles, and the following spatial sustainability aspects will be relevant to educational facilities:

- Educational facilities must be planned and implemented in such a way that they uphold the environmental aspect, and that requires an EIA to be compiled;
- Promoting the planning of educational facilities on sites that are justifiable and limit the urban extension; and
- Educational facilities must be considered sustainable for all the existing and upcoming costs to all stakeholders for delivering educational infrastructure (RSA, 2013:18).

4.2.2.3. Efficiency

Efficiency has several different definitions, but the main conclusion drawn from these definitions is that efficiency means the state or value of being effective and obtaining the most out of the resources (Law Insider, 2022:2). Section 7 (c) (i) stated that the efficiency of land development is to enhance the use of present resources and infrastructure to its full potential before planning for new infrastructure (RSA, 2013:18). The following efficiency aspects will be relevant to educational facilities:

- First, use the current educational facilities and renovate these facilities before constructing new facilities;
- The decision-making process for educational facilities is designed to avoid negative economic, community and structural impacts; and
- The educational facilities process must effectively streamline the timeframes from planning to implementation (RSA, 2013:18).

4.2.2.4. Spatial Resilience

Section 7 (d) explained that spatial resilience is the flexibility of spatial strategies, guidelines and systems that will accommodate to safeguard the sustainable livelihood of societies that were negatively affected by the previous imbalances (RSA, 2013:18). Additionally, spatial resilience means that any situation will bounce back to its functional state of operation. In educational facilities, the resilience will utilise existing structures, renovate them, and reuse existing educational-zoned land before applying for new land.

4.2.2.5. Good Administration

The 'Breaking New Ground' plan (National Department of Housing 2004:6) defined the concept of sustainable human settlements as "well-managed entities in which economic growth and social development are in balance with the carrying capacity of the natural systems on which they

depend for their existence and result in sustainable development, wealth creation, poverty alleviation and equity”.

This definition includes the three areas of economic development, environmental limits and social justice, and good governance (Kemp *et al.*, 2005). Thus, a settlement should support local livelihoods, protect and enhance the natural environment and enable a fair and equal society to be sustainable. These concepts are also embodied in the Development Principles in section 7 of the Spatial Planning and Land Use Management Act (2013), namely spatial justice, spatial sustainability, spatial resilience, efficiency and good administration. Spatial planning in terms of managing education infrastructure provision.

The detailed planning of education infrastructure is not limited to the design of the facility to eradicate education infrastructure backlogs; it includes factors such as land-use planning, accessibility to the facility in terms of routes to be travelled and walking distance for the area that will be seen as the feeder zone, population, and location. It includes size norms and guidelines and a collaborative approach between the local, district, provincial and national spheres of government.

The planning and delivery of education facilities is not only the responsibility of the provincial education departments, and it is prudent that the respective role-players define and carry out specific roles and responsibilities. The key role-players to assume the roles and responsibilities above are listed in Table 4-1 below:

Table 4-1: Roles and Responsibilities of various key Role-Players

Key role-player	Role/contribution of the stakeholder to the programme/project
National Treasury	• Provide sufficient funding to provide adequate, accessible, quality education facilities and for their general upkeep and maintenance. • Set aside a predetermined portion of the education infrastructure grant (EIG) to carry out comprehensive baseline condition assessments every fifth year.
Department of Basic Education	• Prescribe minimum uniform norms and standards for school infrastructure • Set up mechanisms for monitoring and evaluating the effective implementation of the norms and standards. • Assist in reviewing the provincial education infrastructure plans • Assist the Provincial Education Departments with the planning and implementation of their infrastructure projects • Monitor implementation of provincial infrastructure projects, assessing their alignment with the provisions of the norms and standards. • Review the annual provincial education infrastructure reports on the implementation and degree of compliance with the norms and standards.
Northern Cape Department of Education	• Client department - plan, procure for and manage infrastructure delivery at the provincial level • Ensure that all the infrastructure projects are implemented in line with the provisions of the norms and standards • Ensure that education facilities are looked after and maintained • Facilitate the process of ensuring reporting compliance

Key role-player	Role/contribution of the stakeholder to the programme/project
Provincial Treasury	Monitor the effectiveness and efficiency of infrastructure delivery within set budgets.
Department Of Roads and Public Works	- Provide safe and passable access roads to education facilities; - As an implementing agent, to provide necessary resources (technical skills and systems), thereby enabling the timeous and cost-effective implementation of education infrastructure projects assigned to them in line with the provisions of the norms and standards. - To act as a custodian and assist with the maintenance of education facilities where they have been assigned such responsibility by a premier, per section 4(1) (c) of GIAMA.
Department of Water & Sanitation, Department of Post & Telecommunications, Local Municipalities and Eskom	- Provide basic utilities, with sufficient capacity and a reasonable degree of reliability, to education facilities. These basic services include: - water; - electricity; - sewerage; - telecommunications; - Internet connectivity; and - solid waste collection.
Department of Health:	- Provide healthcare facilities, especially clinics in the vicinity of the school and learner boarding facilities, assist with: - hygiene and health education to schools; and - conducting health testing of learners in various areas
Department of Human Settlements	- Liaise with the Education before developing a human settlement to ascertain the department's plans towards infrastructure development and ensure coordinated development. - To develop human settlements near existing schools and other social services.
Department of Sports Recreation, Arts & Culture:	Provide communal sports and recreational facilities in the vicinity of school facilities.
Department of Environmental Affairs:	- Receive and process environmental impact assessment (EIA) applications timeously. - Issue records of decisions timeously to the applicants where EIA applications were made.
Department of Labour:	- Receive and process applications for construction work permits timeously. - Issue construction work permits timeously to the applicants.
Third parties, donors, NGO, CBO, NPO and members of the community	- Acquaint themselves with the provisions of the norms and standards. - Prepare a formal submission seeking approval of a HOD, per the provisions of the norms and standards, before undertaking any construction activities on an education facility or development intended to provide basic education services. - Make sufficient funds available and remain responsible and accountable for all the funding arrangements required to complete the construction activities initiated by them in an education facility. - Comply with the norms and standards provisions when undertaking any construction activity on an education facility or development intended to provide basic education services.
Private property owners - providing facilities for providing basic education services	- Agree with the MEC before providing facilities for conducting basic education services. - Register independent schools, ensuring that the facility standards are not substandard to those in comparable public schools, as contemplated in the norms and standards. - Acquaint themselves with the provisions of the norms and standards. - Ensure that, at minimum, the education facilities provided meet the provisions of the norms and standards.
Implementing agent	Acquaint themselves with the provisions and requirements set out in the norms and standards and adhere to them when planning, designing and implementing education facilities.

Key role-player	Role/contribution of the stakeholder to the programme/project
	• Apply for the necessary approvals timeously to the relevant authorities: local municipalities, power supply authorities, environmental affairs and the Department of labour, to ensure timeous implementation of infrastructure projects. • Provide professional services and seek to provide complete and functional facilities timeously, within budget and to the expected quality standards.
Professional team	• Provide professional services and seek to provide complete and functional facilities timeously, within budget and to the expected quality standards.
Contractor	• Construction of required infrastructure in line with legislation
All affected local municipalities	• Inclusion of projects in SDF and IDP processes alignment in terms of DDM site inspection, if required • Inclusion of projects in SDF and IDP processes approval of building plans occupation certificate • site inspection
Schools including SGB and principal, educators, and learners	• Look after and maintain the facilities they are responsible for per the provisions of the maintenance guidelines, using the funds allocated to them per the national norms and standards for school funding • Report on the maintenance activities and utilisation of allocated funds for these activities as contemplated in Section 21 of SASA.
Communities	Social impact

(Source: Author's creation: 2022)

4.3. Planning for Resilience

Infrastructure is a long-term game as it is planned to last for an expected life span; everything that comes after the planned infrastructure is planned to consider the existing infrastructure. If a school is planned at a specific location to cater to an existing or future need, it will affect all future planning in that area; there will only be plans for upgrades, additions, maintenance and repairs and, in some cases, refurbishment. The provisioning of sustainable and stable infrastructure will ensure that the facility will remain relevant and utilised optimally. Therefore, the infrastructure we plan will last hundreds of years and shape the area and, ultimately, the education sector. Therefore it is essential to plan for maintenance and obsolescence, plan for change to build resilience, consider the bigger picture and look to the future.

When planning for resilience, it is essential to plan for maintenance. Technology becomes obsolescent, and the same goes for infrastructure; however, resilience is the capacity to respond to change positively. Strategies for responding to change should transform, maintain functional integrity, adapt and absorb. Resilience should diversify not just in size but also in levels of formality. The vision for strategic education infrastructure planning is to have irresistible schools that exceed the Norms and Standards expectations, are green infrastructure, energy-efficient, and accessible to all learners. The vision has weaknesses and risks, such as budget availability

and availability of resources such as building materials and capacity. There should, however, still be room for change and graceful failure, but the system should be adaptable and designed to be responsive. The strategic plan should deal with backlogs, achieve spatial justice and radical economic transformation, and be about more than just building infrastructure. Climate change should be considered as extreme heat and cold significantly impact infrastructure and disrupt it.

Coyle (2011:131) explained that a resilient community is achieved when the “barriers undermine sustainability programs and should be removed”. Regarding education infrastructure, the school property size configuration should be eliminated as it forces designs into boxes. An increased focus should be placed on bus schemes and enabling safe walking areas to integrate education facilities into the neighbourhoods. Coyle (2011:17) stated that a sustainable community serves multiple functions within a walkable or drivable context, and “their resilience extends to adaptive and durable buildings accommodative of changing uses to meet shifting market and societal demands.”

4.4. Forecasting Changing Needs

Understanding the future infrastructure needs of the province's growing population is critical: needs change over time, different communities need different things, and some areas may already be underprovided with school infrastructure, while others may be over-provided. A consistent issue relating to the provision of adequate school infrastructure is that population growth projections are either out of date or inconsistent. While age and socio-economic characteristics fluctuate, general trends are shared across different growth areas. One of the most practical steps the department can take is to ensure it is well-prepared to forecast future population numbers.

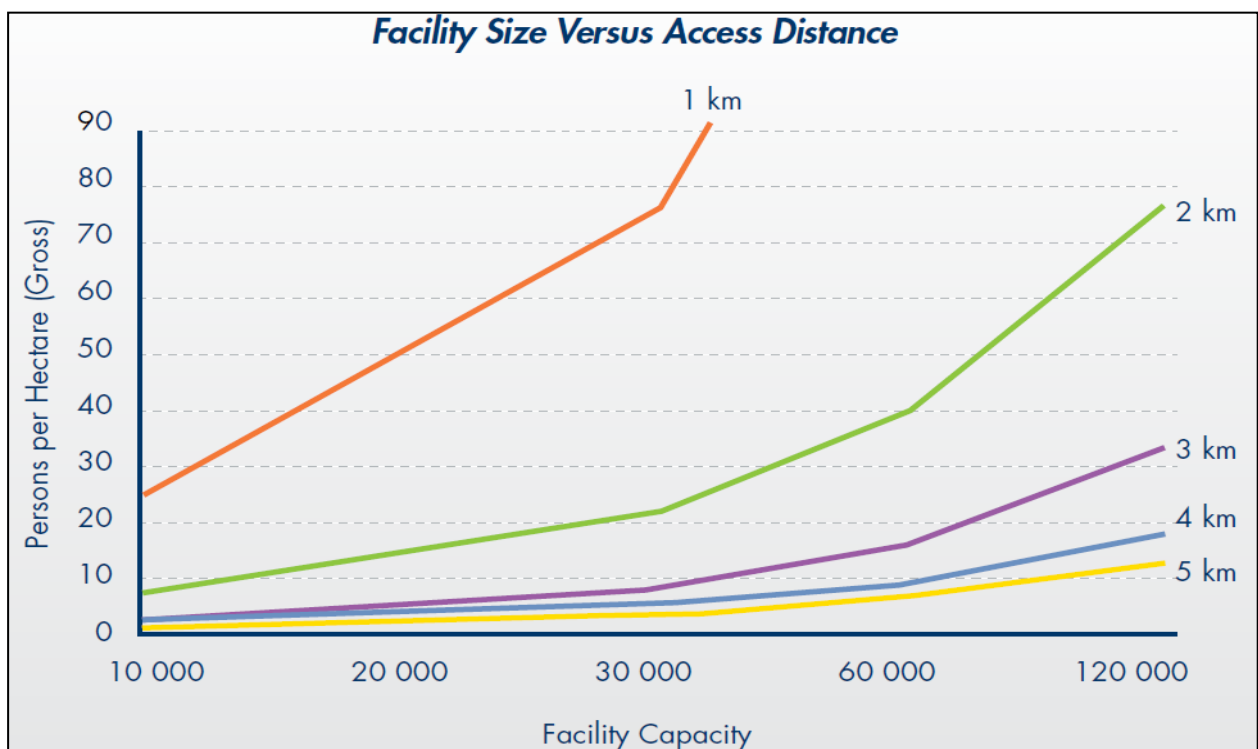
4.5. The Planning Behind New Schools in line with SPLUMA

According to the CSIR Guidelines for the Provision of Social Facilities in South African Settlements, “planning over the long term, access standards, threshold guidelines, and site sizes are increasingly important in ensuring that sufficient land has been reserved for essential facilities in terms of future growth and development without being wasteful and/ or encouraging the illegal use of underdeveloped land” (CSIR, 2012:8).

There is an undeviating link between the density of the residential development and the potential to ensure education facilities are provided as close as possible to residents and, in some cases, even to achieve walking access. Higher densities also imply that more extensive facilities are required if the maximum size for the facility type is not exceeded. Larger populations often mean

more extensive facilities need to be constructed, additional specialist services are required, and a better service level must be delivered. “Facility location planning standards, access guidelines and threshold norms are an essential element of strategic forward planning and are used to allocate and reserve land for particular uses and facilities and develop capital budget plans within a planning area.” (CSIR, 2012:8).

According to the Norms and Standards, there are limitations to school sizes, including the number of learners and classrooms, to provide a conducive learning environment. Mega Primary Schools are schools with an excess of 931 learners, and Mega Secondary Schools are schools with an excess of 1001 learners. Therefore, new schools are planned instead of creating challenging mega structures to maintain and operate. The population density and travel distance can determine a likely facility threshold (that relates to size). The guidelines are limited in terms of the enrolled within the catchment area of the community. Graph 4-1 illustrates the varying thresholds and densities, the relationship between the area being served (using access distances), and the provision's other aspects, namely threshold and population density levels.



Graph 4-1: Facility Size versus Access Distance

(Source: CSIR, 2012:8)

4.6. Planning of New Schools in Remote Areas

According to the CSIR Guidelines for the Provision of Social Facilities in South African Settlements, the walking distance for all types of settlements in remote villages can be up to 10km

(CSIR, 2012:51). Consider the following example, where four communities are designated A, B, C and D; Table 4-2 will illustrate the planning for a new Primary School between 4 communities.

Table 4-2: Population influence on school planning

Community	Population	Primary Learners (14% of the Population)	School (14% of the Population)	Classrooms Required	Secondary School Learners (8% of the Population)	Classrooms Required	Distance To Community A (Km)	Distance To Community (Km)	To C
A	1500	210		6	120	3	0	5	
B	500	70		2	40	1	7	2	
C	1000	140		4	80	2	5	0	
D	200	28		1	16	1	7	2	
Total	3200	448		13	256	7			

(Source: Author's creation, 2022 based on Construction Industry Development Board, 2006:26)

The size and location of the new infrastructure facilities will be aligned with the “scope, capital budgets and operational budgets for the provision of the school infrastructure” (CIDB & National Treasury, 2006:24). The total population is 3200 people. Demographic studies show that the smaller rural population are migrating to the town occupied by community A. The population growth is estimated at a rate of 2%; a long-term average is thus determined that in ten years, sixteen (16) classrooms will be required to address the total population for a Primary School, and ten (10) classrooms will be required to address the total population for a Secondary School. It is assumed that an existing five classroom Secondary School is located in Community A. Maintenance and refurbishment cost for this facility is recorded in the Asset Management Plan. The gap in the regional school services is summarised in Table 4-3:

Table 4-3: Regional School Services

Community	Period	Need For Primary Classrooms	Supply For Primary Classrooms	Gap	Need For Secondary Classrooms	Supply For Secondary Classrooms	Gap
A	Current	6	0	6	3	5	-
	Five Year	6	0	6	4	5	-
	Ten Year	7	0	7	4	5	-
B	Current	2	0	2	1	0	1
	Five Year	2	0	2	2	0	2
	Ten Year	3	0	3	2	0	2
C	Current	4	0	4	2	0	2
	Five Year	4	0	4	3	0	3
	Ten Year	5	0	5	3	0	3
D	Current	1	0	1	1	0	1
	Five Year	1	0	1	1	0	1
	Ten Year	1	0	1	1	0	1
Region Summary	Current	13	0	13	7	0	4
	Five Year	13	0	13	10	0	6
	Ten Year	16	0	16	10	0	6

(Source: Author's creation, 2022 based on Construction Industry Development Board, 2006:26)

A shortage of classrooms in secondary schools is identified during the five to ten-year period, and there is a significant gap in primary schools. According to CIDB (2006:24), “the ten-year forecast is particularly relevant as school infrastructure is expensive and time-consuming to provide – a typical project cycle of three years from definition to handover”. “Alternatives to the provision of a

Primary School within Community C and an expansion of the secondary school in community A are an expansion of the school at Community A to include Primary Learners and therefore be classified as a Combined School plus improvements in the road infrastructure” (CIDB & National Treasury, 2006:24). Twinning can also be recognised as an alternative solution to address schooling in all four communities, where the school base can be in Community A, where the Sports facilities and a hall will be located. In Community C, classrooms will be provided to address the gap for Community B, C and D and a school library; this will then enforce that these schools collaborate to utilise learning and additional spaces efficiently.

Each option for closing the gap should be appraised, and capital and operational costs must be allocated to the fiscal calendar over ten years. Options for improved road infrastructure must be planned cooperatively with the municipality and the Department of Roads and Public Works. All options must be aligned with the Norms and Standards.

4.7. Provision Guidelines to Other Facilities

Other facility provision guidelines that are applied to determine accessibility to schools infrastructure, thresholds that differentiate types of assets to be built and sizes of sites are as follows:

4.7.1. Special Education

Schools catering to special needs education for the physically and mentally challenged are provided on a regional/district level. As per education policy, learners with disabilities are catered for in mainstream schools where possible; however, these special education schools typically cater to learners requiring specialised care (CSIR, 2012:94). These special needs schools are needs-driven. According to the World Health Organisation, the estimate is that between 2.2% to 2.6% of learners are disabled or impaired. The site should ideally be able to accommodate single-storey buildings to increase the accessibility of all buildings. The preferable access is 20km – 25km; however, there is also a demand for residential or hostel facilities as these schools are provided at the regional or district level; therefore, learners from other towns within the region or district are accommodated at these facilities.

4.7.2. Secondary School

Secondary Schools are public or private schools that offer Grades 8 - 12 (age group 13 - 17) of the total population; approximately 8% are secondary school-going age. The ideal access distance for secondary schools is 5km and 10km for remote villages, the population threshold for a large secondary school is 12 500 people and 2 500 people for remote villages (CSIR, 2012:96).

According to the Norms and Standards, the site should have a minimum of 4.8ha (including sports fields). With secondary schools, facility sharing and clustering are recommended as various benefits to schools and communities are recognised in terms of shared facilities such as sports fields, halls and other facilities. For effectiveness, this minimum should be doubled. Sharing sports fields between schools and the community is strongly supported, but ideally, every school should have two sports fields. A secondary school may be clustered with the following:

- a library;
- a primary school;
- another secondary school;
- a community hall;
- a sport stadium;
- local sports fields;
- a swimming pool;
- urban agriculture;
- a primary health care centre;
- a worship centre.

According to the CSIR (2019) Guideline, “Residential densities are a critical factor in providing accessible facilities to communities”. The CSIR Guidelines refer to a dropout rate of approximately 30% of learners aged 16 to 18. After areas realise excellent attendance in this age group, it is stated that “well-located schools may need to expand to accommodate more learners and thus exceed the former National Department of Education norm.”

4.7.3. Primary School

Primary Schools are public or private schools that offer Grades R - 7 (age group 5 - 12) of the total population; approximately 14% are primary school-going age. The ideal access distance for primary schools is 2km, and 5km for remote villages, the population threshold for a large secondary school is 7 000 people and 1 000 people for remote villages (CSIR, 2012:96). According to the Norms and Standards, the site should have a minimum of 2.8ha (including sports fields). Facility sharing and clustering are recommended as various benefits to schools and communities are recognised in terms of shared facilities such as sports fields, halls and other facilities. For effectiveness, this minimum should be doubled. Sharing sports fields between schools and the community is strongly supported, but ideally, every school should have two sports fields. A primary school may be clustered with the following:

- a library;

- another primary school;
- a secondary school;
- a community hall;
- local sports fields;
- neighbourhood and district parks;
- a swimming pool;
- urban agriculture;
- a primary health care centre;
- a worship centre.

4.7.4. Grade R Early Childhood Development (ECD)

Grade R accommodates learners aged 5 - 6 years and requires a threshold of 7 000 people or 1 000 for remote areas with a 2km preferred and 5km maximum walking distance. The age profile of the community influences the demand, and the location factors are the same as for primary schools (CSIR, 2012:101). In terms of its location, it is essential to avoid areas with high levels of traffic and socially unacceptable behaviours in the near vicinity.

4.7.5. Crèche Early Childhood Development (ECD)

According to the CSIR (2012:102), a crèche is a facility that caters for more than six children and can include a crèche, nursery school, day-care centre, after-care and play school. A small crèche has a capacity of 35 children younger than five years of age and between 35 – 100 children younger than five years for an enormous crèche. The demand is highly dependent on the age structure of the community but requires a population of 2 400 to 3 000 people, and higher-income areas may require fewer facilities.

The access distance is 2km, and the site size varies with a minimum of 0.02 ha, which can accommodate 100 learners. The facility size should consist of an indoor play area (1.5m² per child) and an outdoor play area (2m² per child). If there is no outside space, 1m² should be added per child to the indoor area. Crèches can be accommodated close to open public areas such as parks to increase the outdoor play area. In terms of its location, it is essential to avoid areas with high levels of traffic and socially unacceptable behaviours in the near vicinity. If land permits, the facility can be combined with a primary school.

4.7.6. Single sites

When identifying a site according to the Norms and Standards, new schools must not be located adjacent to cemeteries, business centres, railway stations, taxi ranks, sewage treatment plants, public hostels, busy roads, bottle stores and shebeens. The minimum size, provided that the area to be utilised can accommodate the school buildings as well as sports grounds, is indicated in Table 4-4 as follows:

Table 4-4: Minimum site size

School:	Size:
ECD Centre	0.02 ha (100 children)
Primary school:	2.8 ha
Secondary school:	4.8 ha

(Source: CSIR, 2012)

4.7.7. Shared sites

Sports facilities may be shared between primary schools as well as between a school (primary or secondary) and the community, with the necessary community consent; the sizes of the shared sites are indicated in Table 4-5:

Table 4-5: Shared sites

Two primary schools with shared sports grounds:		Schools sharing community sports facilities:	
Primary school #1:	1.4 ha	Primary school:	1.4 ha
Sports ground:	2.0 ha	Secondary school:	2.6 ha
Primary school #2:	1.4 ha	Sports ground:	2.0 ha
TOTAL	4.8 ha (instead of 5.6 ha)	TOTAL	6.0 ha (instead of 7.6 ha)

(Source: CSIR, 2012)

4.8. Needs Analysis

“Community involvement is a very important element embedded in South African legislation and the emerging social value system of South Africa” (CIDB, 2006). This approach is linked to Section 2.5.3, Transactive Approach. To determine the site for a new school, there should be an element of community involvement in the planning phase to assess their needs and expectations to assist in establishing an ideal location and suitable site for the school. As the community will be the end-user of the facility, the involvement is a powerful element to utilise from the offset of the project. The buy-in from the community through addressing their needs and expectations can ensure that the facility is better looked after as there will be a sense of ownership, which has proven to reduce vandalism and theft at schools. These expectations are not limited to the completion and ultimate utilisation of a new school. Still, they can include a demand for quality, work opportunities, value for money, investing in the community, innovative solutions and service

delivery. The planning should consider the quality and quantity of the identified need; in the end, education facilities depend on communities; without learners, there is no need for these facilities.

Norms and Standards, strategic objectives, policy mandates and demographic profiles, population growth trends and density should be analysed. According to (CIDB, 2006:24), “land use, the density of development and rate of growth contribute to the composition of the urban form and the analysis of this information and in particular changes in the use, will provide valuable information for infrastructure planning changes in demand and utilisation”. Demographic needs-based planning considers population migration based on future service delivery needs and desired service levels per the Norms and Standards. If this process is done correctly, the planning can progress from a list-based approach to where new schools should be constructed to an integrated planning approach that is future needs-based.

Geographic Information Systems (GIS) is a fundamental success factor in planning for new schools as it can geographically map out all the statistics, population growth, household growth and wealth of information related to spatial development and location. Based on the information, identify and locate the best possible location for a new school that increases accessibility, adheres to the norms and standards and where land is available.

4.9. Option Analysis

The options analysis sets out the range of technical, legal and financial options for meeting the education infrastructure need. The options analysis allows choosing a preferred choice from the available options. Each option needs to be interrogated under each of the following categories:

- Option Description
- Financial implication
- Risk analysis
- BEE and socio-economic aspects
- Service delivery arrangements
- Management issues
- Technical analysis
- Legal analysis
- Human resource analysis

According to the Capital Planning Guidelines (National Treasury, 2018:18), principles should be considered when identifying the preferred option. The principles such as “all feasible options

should be evaluated”, “the preferred option should achieve value for money”, or the alternative is crucial to a project’s success are implemented. According to the Capital Planning Guidelines (2018:18), “a scenario which sets out the base case (the ‘do nothing scenario’) where the current situation is sustained with minimal operating and maintenance investments and basic efficiency improvements”.

Advantages and disadvantages and preliminary quantification of each option's costs and benefits relative to the project's objectives are compared. The department will source similar options where feasible by testing the market to ensure a range of matching prospects. This comparison should develop a shortlist of 1 to 2 preferred options, which will be assessed in detail.

Each shortlisted option will be assessed separately by the processes described in the stages below. The information below must be assembled first to enable the Financial and Economic analysis. An options analysis is a statistical technique based on the idea that changes will affect the cost and benefit of future investment. The organisation must abide by the original decision if it cannot change it. However, by creating an option for a decision in the future or a change of decision because of a change in circumstances, the organisation can pursue an investment that seems better and more profitable (National Treasury, 2018:5).

One of the prime purposes of suitability analysis is to provide a clear picture of a department and the environment in which it operates. The department would develop plans that build upon strengths, overcome weaknesses, and take advantage of the opportunities while minimising or circumventing its threats – sometimes called “strategic fit” or “suitability”. Specific questions need to be asked about any option; for example, how far does it overcome the difficulties (weaknesses and threats) identified in the strategic analysis? Does it exploit the department’s strengths and environmental opportunities? Does it fit with the department’s objectives?

An assessment of the viability of any plan is concerned with whether it can be economically implemented. For example, the scale of the proposed changes needs to be achievable in resource terms.

Alongside the analysis of suitability and feasibility is the third measure, acceptability. Acceptability can be a problematic area since it is strongly related to people’s expectations, and therefore, the issue of “acceptable to whom” requires the analysis to be thought through carefully. Some questions that could help identify the likely consequence of any plan are: What will be the rate of return or cost/benefit for the department? Will any proposed change be acceptable to the general expectations within the department? Will the function of any department, group or individual

change significantly? Will the department's relationship with outside stakeholders need to change? Will the plan be acceptable in the department's environment? Will the proposed plan fit existing systems, or will it require significant changes?

Measures of equity would monitor the extent to which the department has achieved and maintained comparable equitable services across race groups, regions, and urban and rural areas. It would require the institution to analyse the beneficiaries and equity, measured against standards or on a comparative basis. Measures of efficiency seek to reflect how resources are translated into service delivery. Therefore, it is measured by input/output or output/input ratio.

One of the benefits of assessing suitability is understanding the underlying rationale behind a particular type of plan. However, within the broad types of plans, there are likely to be different specific plans that the department would follow. The evaluation process typically requires narrowing various options before detailed assessments can be undertaken; this is not to suggest that the possibilities eliminated at this stage will not be given further consideration. There are many methods for screening options; however, three contrasting approaches could be considered: scoring methods, decision trees, and scenarios. Before assessing options, the department would define upfront the screening criteria used.

4.10. Chapter conclusion

It can be concluded that detailed planning of education infrastructure is not limited to the design of the facility to eradicate education infrastructure backlogs; it includes factors such as land-use planning as indicated in Section 4.5, accessibility to the facility in terms of routes to be travelled and walking distance for the area that will be seen as the feeder zone, population and location as indicated in Section 4.6. It included size norms and guidelines and a collaborative approach between the local, district, provincial and national government spheres, as elaborated in Section 4.7. Infrastructure is a long-term game as it is planned to last for an expected life span; everything that comes after the planned infrastructure is planned to consider the existing infrastructure. The provisioning of sustainable and stable infrastructure will ensure that the facility will remain relevant and utilised optimally.

This chapter mainly focussed on planning optimally and sustainably for new facilities to ensure that education facilities are resilient and cater for the need of the community that they will serve. It provides the provisioning guidelines for school facilities in Section 4.7. Table 4-6 provides as a concluding remark of this chapter the link between the conclusion reached and the relevant objective in line with the research objectives and primary research questions of this study:

Table 4-6: Linking research objectives to chapter purpose and conclusion

Research Objectives	Primary research question	The conclusion reached within this chapter
To determine the role and function of planning in Education Infrastructure	What spatial principles are applicable when planning optimally for education facilities?	This chapter determined the role and function of planners in planning education facilities; it identified the spatial principles to ensure that facilities are planned optimally, especially in remote areas where the viability of schools depends on the area's population (Section 4.7).
To investigate the ideal locations of school infrastructure	What is the ideal location for school infrastructure?	This chapter investigated the ideal location of school infrastructure, and it can be concluded that the ideal location should be where the people are; this is the case when planning for a new facility. Planning new education facilities should also be in line with housing developments and growth patterns of residential areas. It should not be done in isolation from the existing schools within the vicinity. Where practically possible, the expansion of existing schools should be prioritised before the construction of new schools (Section 4.7)
To identify and forecast changing needs	What services can education infrastructure be combined with to improve integrated planning?	The change in and movement of a population affects education facilities. Infrastructure is not something that you can pick up and move along with the people. Therefore the population migration, the change in a particular area, and the development and economic growth within the vicinity should be considered before any new education facilities are constructed (Section 4.4).

(Source: Author's creation, 2022)

The following chapter analysed guidelines and literature that will guide the optimal utilisation of existing facilities, to achieve the most benefit from the facility, how to determine the gap in terms of infrastructure requirements by analysing the supply and demand, analyse the maintenance requirement to uplift the condition of existing facilities to prolong the life span.

CHAPTER 5 LAND USE AND DEMOGRAPHICS CONCERNING EDUCATIONAL FACILITY PLANNING AND PROVISIONING

5.1. Chapter introduction

This chapter focussed on the increasing demand due to various factors, such as an increase in population and its effects on land use planning and Education Facilities within the South African context. The chapter further investigated the different processes and methods to determine the relationship between planning, budgeting, and prioritisation. It identified relationships between public facilities, budgeting, and facilities prioritisation to outline the need concerning infrastructure planning and provision.

The previous section identified and explained the different development theories that evolved over the decades in South Africa and how these development theories affected South African citizens' livelihoods. Nevertheless, most of the previous development theories manifested inequalities in South Africa between several different classes and then racial segregation until the end of the Apartheid era in South Africa. Some of these development theories were utilised to plan and implement the urban cities of South Africa. This chapter investigated cost-effectiveness analysis, gap analysis, life cycle costing and the importance of upkeep and maintaining the existing facilities. It forecasted changing needs and applied planning information from local and district municipalities. Figure 5-1 indicates the structure of this chapter:

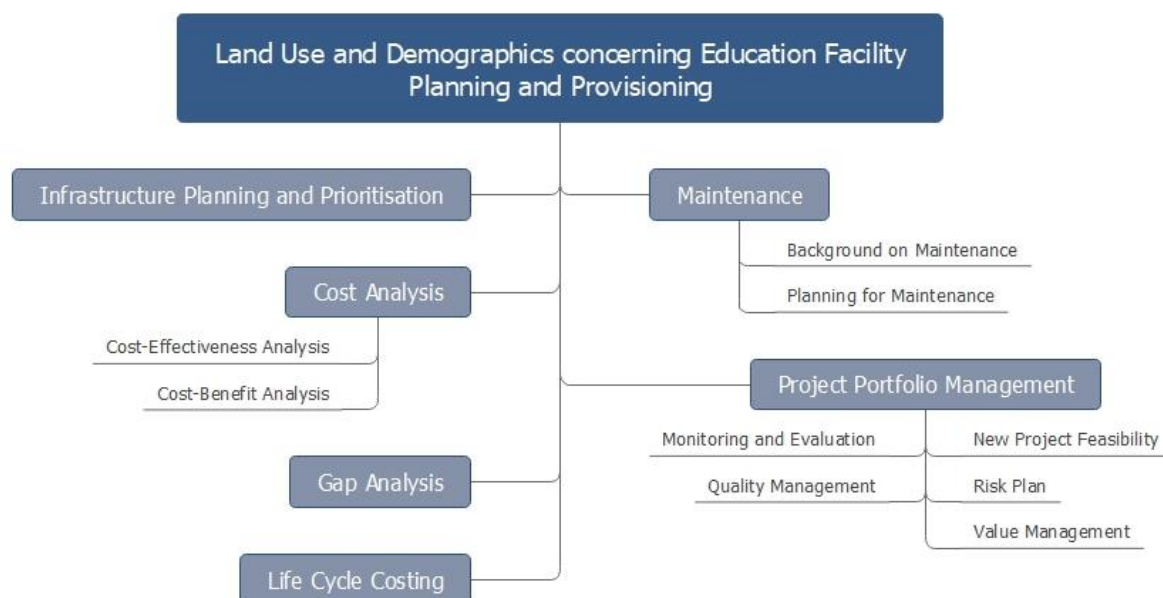


Figure 5-1: Chapter 5 Structure
(Source: Author's creation, 2022)

5.2. Infrastructure Planning and Prioritisation

Prioritisation of projects can be done through several processes; however, within the Norms and Standards required for prioritisation to take place, this can be done by utilising the Standard Prioritisation Matrix (SPM) to determine the ranking or order of priority of infrastructure projects that will be utilised at all times for this purpose. The priority ranking and apportionment of available infrastructure should be prioritised in the following order: general upkeep and maintenance interventions; upgrades and additions; total replacements except for inappropriate structures; and new facilities. The ranking of projects or programmes should be based on the department's condition assessments, including the NEIMS assessments or EFMS Systems. The four elements that should inform the outcomes of the project prioritisation process are:

- The type of the facility;
- The current condition of the facility, including building materials utilised; and
- The adequacy of the facility components.

The prioritisation should furthermore consider the following:

- Firstly prioritisation is done by attending to the Regulations Relating to Minimum Uniform Norms and Standards.
- Secondly, projects from previous financial years that were not executed due to financial restraints should be reviewed and prioritised for completion.
- Thirdly, district-specific, and directorate-specific plans should be considered as this mainly affects the operational functions of the school.
- Fourthly, reports from stakeholders with specific mandates to do investigations like District Municipalities testing water quality at schools and the Department of Labour looking at Health and Safety challenges, as well as Departments like Economic Affairs and Sport Arts and Culture doing projects at schools like mobile libraries and sports facilities.
- Fifthly, the provincial and sector stakeholders' plans include Integrated Development Planning meetings with District and Local authorities and other sector stakeholders.

The critical demand for infrastructure is identified by manipulating various data sets, such as the objectives in the Norms and Standards and by identifying schools requiring basic safety infrastructure. The current backlog of "must-do" projects requires resources that often exceed what a department can provide. Taking the current need for appropriate school infrastructure into account, if planning is not effective and value for money, it is a threat to the School Infrastructure Delivery Programme in its entirety. Appropriate prioritisation of a project strategy is key to

identifying the right project at the right time for the right school in a collective effort toward achieving the Department's strategic objectives.

5.3. Cost Analysis

The Cost-effectiveness analysis is generally used as an alternative to a Cost-Benefit Analysis (CBA), a methodology utilised to analyse the economic viability and establish the most efficient use of resources. A cost-effectiveness analysis measures the effectiveness of alternative projects in the case of education infrastructure; it can measure the options of building a new facility, such as a classroom or repairing an existing classroom, where the only difference will be the lifespan of the classroom (Jenkins et al., 2015:71).

5.3.1. Cost-Efficient and Cost-Benefit Analysis

As stated in the problem statement, one of the main challenges within the education sector is the lack of school buildings. There are no sufficient classrooms, and the structures are in deplorable condition. Addressing the challenging investment in school infrastructure is critical; however, due to limited budgets, a system should be in place to ensure that what is spent is done efficiently. Jenkins et al. (2015:70) developed a model for “measuring the cost-effectiveness of expenditures on both new school classrooms and classroom repair.” The model “measures the potential gains (measured by the relative change in an index of effectiveness) that might be obtained if an incremental cost-effectiveness criterion was used to select the location of additional investment expenditures in building new schools and to repair the existing stock of school classrooms.”

According to Jenkins (2009:3), the decision-makers may need to compute marginal cost-effectiveness when there are only limited funds for school infrastructure (including Classrooms in this instance), so it is essential “to have a system and a criterion to allocate the budget efficiently”.

This analysis aims to find the most efficient strategy for selecting the location for constructing social infrastructures, such as Classrooms within school locations in rural areas. It is thus proposed to develop a model for allocating budget resources to education infrastructure in provinces. This model assists in identifying the most efficient strategy for selecting the location for constructing classroom infrastructure at educational facilities in urban and rural areas.

According to Jenkins et al. (2009:4), “to determine the cost-effectiveness (CE ratio, the present value of costs is divided by the present value of effectiveness”. In a cost-effectiveness analysis, the alternative projects are compared by the incremental cost-effectiveness ratio of the projects. For example, if there are two alternative policies labelled “I” and “J”. The incremental cost-

effectiveness ratio of alternative “i” relative to the alternative “j” is estimated as indicated in Equation 5-1, where “C” stands for the cost, and “E” stands for the effectiveness of each alternative.

$$CE = \frac{PV(\text{Costs})}{PV(\text{Effectiveness})} \quad \text{and} \quad CE_{ij} = \frac{C_i - C_j}{E_i - E_j}$$

Equation 5-1: Cost-Effectiveness Analysis

(Source: Jenkins et al., 2009:4)

Jenkins et al. (2009:14) describe the process indicated in Equation 5-2 as follows:

- Determine a measure for the effectiveness of alternative projects.
- A numerical measure to determine the effectiveness of an additional classroom is sufficient for the cost-effectiveness analysis of school construction projects.
- Adding a classroom to a school district or learner-classroom ratio (LCR) enhances a safe and sustainable learning environment for all learners in the school district.
- The change in the learner-to-classroom ratio (L/C or LCR) concerning an increase in the number of erected classrooms is used for deriving a numerical measure of effectiveness or units of education quality enhancement (EQE).
- Calculate the effect of adding one classroom in a school district on (L/C) for the district.
- If there is a change in classrooms adding the following equation calculates the changes in LCR, this can be estimated as the derivative of LCR concerning the number of available Classrooms.

$$\frac{\partial LCR}{\partial C} = \frac{\partial}{\partial C} \left(\frac{L}{C} \right) = \frac{L}{C^2}$$

L = number of learners in a school (district)

C = number of classrooms in a school (district)

Equation 5-2: Change in LCR to a change in classrooms

(Source: Jenkins et al., 2009:6)

To calculate the safety effects of building a Classroom on the safety enhancement of learning for all students in the school district, equation (2) should be multiplied by the number of learners in the school district. In many countries, there is a different rate of return in rural areas compared to urban areas. The additional classroom effectiveness in rural areas is believed to be more significant. The Cost-effectiveness Analysis when replacing asbestos schools with safer and healthier schools is expected to benefit the surrounding communities. This model assists the planning process in improving the strategy for capital budgeting for constructing replacement and

new schools. The CEA approach assists with comparing the incremental cost-effectiveness ratio (ICER) of the various school projects to prioritise the most cost-effective projects for development, noting their strategic importance.

5.3.2. Cost-Benefit Analysis

The Capital Planning Guidelines stipulate that “a CBA identifies and monetises every direct impact and predicts the timing over the same horizon as the asset’s economic life; this is best presented as an economic (value) flow on a timeline, quantifying the economic costs and benefits on an annual basis. These values are then discounted back to their present values using a social discount rate” (National Treasury, 2018:9).

The Capital Planning Guidelines stipulate that “Every preferred option will be subject to this approach. The result will then be a comparison of every option with the base case “do-nothing” scenario and a ranking of the different options according to their net welfare benefit to society. The result of a CBA is best reported in the form of an Economical Net Present Value (ENPV) which is the costs subtracted from the benefits, or Benefit-Cost Ratio (BCR), the ratio of the benefits over the costs. A project that will benefit the country will have an ENPV larger than zero and a BCR larger than one” (National Treasury, 2018:9). The systematic approach of a cost-benefit analysis is to weigh project costs and benefits to determine whether to go ahead and involves determining the benefits of a course of action and comparing these with its expenses. To compare the costs, benefits and risks of all projects determined, the outcome should then consider the lowest cost, lowest risk-balanced projects within the available budget; the following outcomes should be indicated in Table 5-1:

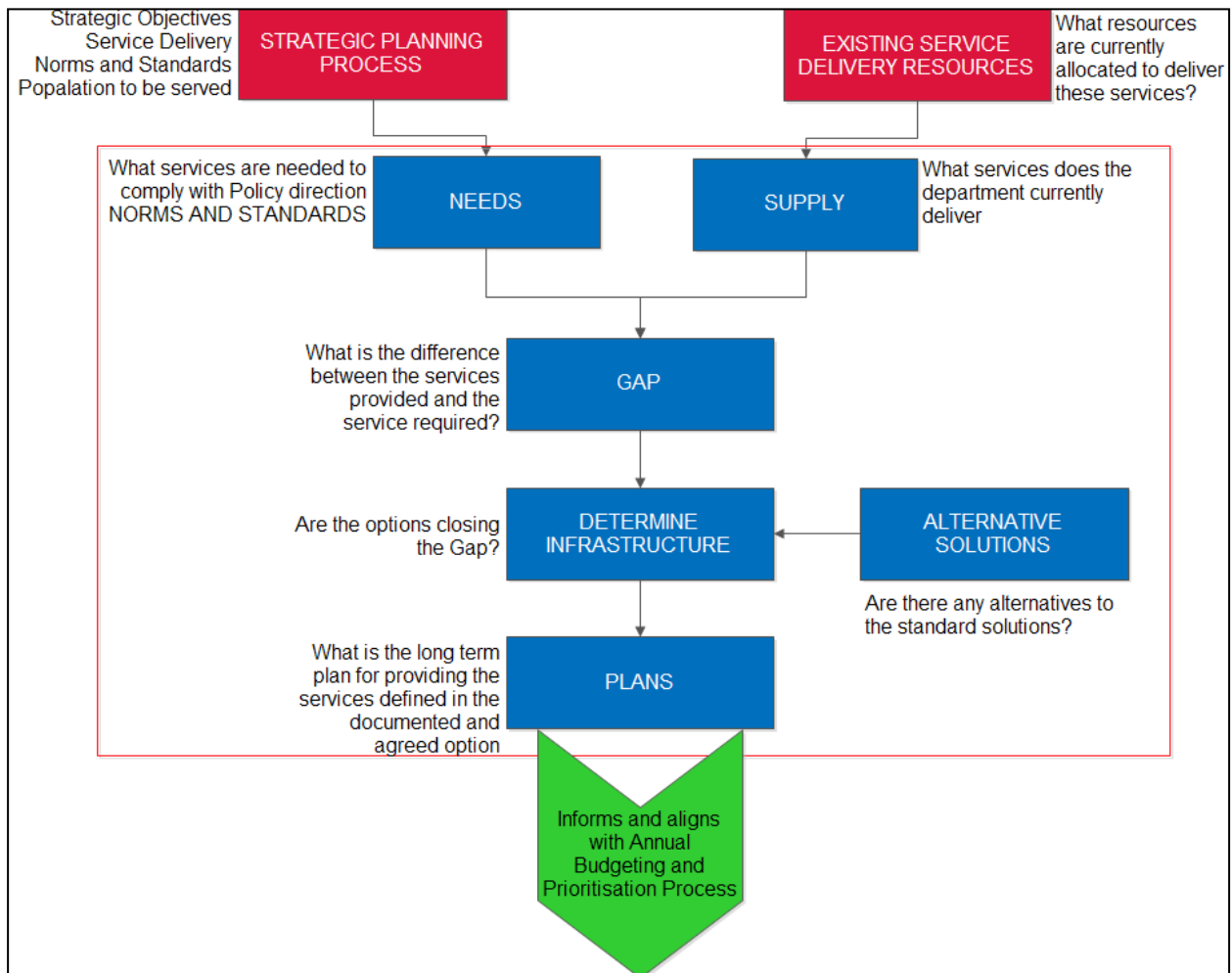
Table 5-1: Levels of Outcomes

OUTCOME	DESCRIPTION	RETURN ON INVESTMENT	RISK
Optimum outcomes	These projects garner a high return on investment (ROI) with low risks, such as the erection of classrooms at a school with overcrowding	High	Low
Early Outcomes	These projects garner a fast ROI with a typically high risk, such as constructing a new or offshoot school meant to alleviate overcrowding at an extremely overcrowded school. The risk is that it is difficult to control the social-political factor of who attends that new school and who is left behind at the old school	High	High
Easy Outcomes	These projects garner a low ROI with low risks, such as converting an existing classroom block into an administration office. The risk could be that the school would want a standard Administration Block like other schools and thus become disgruntled.	Low	Low
Hard Outcomes	These projects garner high ROI with typically high risks, such as a full-service school built to alleviate various risks that fall outside the risks associated with the non-provision of prioritised infrastructure. Building an Administration Block because a school or its community has exerted undue pressure; therefore, the project is re-prioritised and included at the expense of another project. Intelligent prioritisation should aim to achieve optimum outcomes and effectively balance the issues that may arise within early and easy outcomes. Complex outcomes generally should be avoided whilst prioritising projects.	Low	High

(Source: Author’s creation, 2022)

5.4. Gap Analysis

A gap analysis is a process or technique that examines the current situation, the future optimal need to be reached, and the tasks to be completed to close these gaps (Maxted et al., 2008:1019). The gap analysis process or technique will compare the existing assets (combined with their functional performance rating and utilisation rating) and the optimal asset requirements set out in the Norms and Standards (DBE, 2013). Graph 5-1 indicates the close relationship between planning, budgeting, and prioritisation as part of gap analysis.



Graph 5-1: Gap Analysis Generic planning processes.

(Source: IDM toolkit, 2012:22)

Two main aspects are the strategic planning process and existing service delivery resources based on educational facilities delivery. Graph 5-1 demonstrates that two main aspects can determine the educational facility gap by investigating the needs that align with norms and standards and the supply of which educational facilities have already been delivered. The gap is recognised through analysing the needs and supply, and the following step is determining the

required infrastructure to close the educational facility gap. The last step, as illustrated in Graph 5-1, is plans where the department must formulate plans to provide the determined infrastructure, which can be seen as a long-term plan.

Important to understand that the planning of educational facilities delivery is not a once-off process nor occurs only every five years. SPLUMA (2013:28) stated that planning is an ongoing process that must be revised annually due to budget or reprioritising. Educational facilities delivery planning is reviewed annually because the original plan and long-term budget are informed annually by the revisions resulting from the budgeting and prioritisation processes and the actual performance inputs (see Graph 5-1). These revisions defer the planned timeframes for delivery and will require a review of the plan. In addition, the outcomes of the past year's delivery programme need to be fed into the planning process annually. A feasibility study or an EIA may have stopped or indefinitely delayed a planned project, and the effect on the rest of the plan needs to be assessed each year. These are some aspects that influence the planning process of educational facilities delivery.

Integrated educational facilities delivery planning requires that when planning for a new or expanded facility, the human capacity, equipment and tools, and the facility (the infrastructure) should be designed together as the integrated method of planning. The gap analysis generic planning processes (see Graph 5-1) provide a good baseline for the Department's current and future infrastructure planning. Managing infrastructure in a transparent, effective, and reliable manner will assist the Department in meeting its requirements for good governance and assisting it with effective service delivery. The Department of National Treasury (2012:10) identified the following objectives of portfolio planning include the following:

- It ensures good governance over the infrastructure portfolio.
- Reliable infrastructure levels of services
- Management of infrastructure risks.
- It optimises infrastructure decision-making.
- It improved infrastructure management procedures and systems.

The objectives are identified to carry out a Gap Analysis (the "future state"). The main objective is to bring all Ordinary Public Schools to optimal functionality according to the Norms and Standards. However, specific objectives must be set to establish efficient and effective management of the various Infrastructure Delivery Programmes implemented by the government over the prescribed Medium Term Expenditure Framework (MTEF) three-year planning period (National Treasury, 2012:10).

In consultation with the custodian and other stakeholders, the user department must consider alternative immovable asset options to close the gap. When considering the options as a primary consideration, it is determined whether the utilisation of existing assets cannot be improved before new assets are built. Upkeep, upgrades, additions, and improvements should be identified and included in the project list with appropriate actions and prioritisation. When the user does not utilise the assets and no other use can be found within the department, the asset is surrendered to the custodian (Government Immovable Asset Management Act (South Africa), 2007:12). The asset portfolio usually has different functionality, condition, and utilisation levels. They are categorised in line with existing policies prescribed in Norms and Standards. These regulations provide a definitive path for planning and delivery geared towards eradicating backlogs and providing new infrastructure to provide enabling learning environments for all learners.

These efforts include providing or upgrading basic services to schools and eradicating inappropriate structures, which constitutes a first-line intervention toward achieving the goals and strategic objectives of the Department. The following key milestones have been set in the Norms and Standards (DBE, 2013):

- **First-Line Priority** (November 2016) – According to Section 4 (3) (a) (b) of the Norms and Standards, “schools built entirely from materials such as asbestos, metal and wood, as well as all those schools that do not have access to any form of power supply, water supply or sanitation must be prioritised and complied with, within three years from the date of publication of the Regulations” (DBE, 2013:7-8).
- **Second-Line Priority** (November 2020) – All Public schools must have adequate classrooms, electricity, water, sanitation, electronic connectivity, perimeter security and admin facilities, and ECD facilities and access for the differently-abled learners in the province (DBE, 2013:7-8).
- **Third-Line Priority** (November 2023) – Supportive educational spaces are required to achieve the Third Line Priority according to the Norms and Standards for Public School Infrastructure. All Public schools must have access to libraries, media centres, computer centres, laboratories for science, technology and life sciences, school halls and/or multi-purpose classrooms and overcrowding in schools must be addressed (DBE, 2013:7-8).
- **Fourth-Line Priority** (by 31 December 2030) - Supportive educational spaces are required to achieve the Fourth Line Priority (17-Year Timeframe) according to the Norms and Standards for Public School Infrastructure. All Public schools must be adequately accessible and identified. Schools must have sports and recreation facilities, caretaker and security facilities, nutrition centres, and storage (DBE, 2013:7-8).

In terms of The Regulations Relating to Minimum Uniform Norms and Standards for Public School Infrastructure, all schools should comply with the following:

- Accessibility: Fully accessible, including ramps, handrails, space for manoeuvrability, parking spaces and toilets for the disabled, adequate notice boards, signage and other aids necessary;
- New schools must not be adjacent to cemeteries, business centres, railway stations, taxi ranks, sewage treatment plants, public hostels, busy roads, bottle stores and shebeens;
- Classrooms to be provided at 40 learners per classroom for grades 1-12 and 30 learners per classroom for grade R;
- Ablution facilities are to be provided in line with the Norms and Standards.

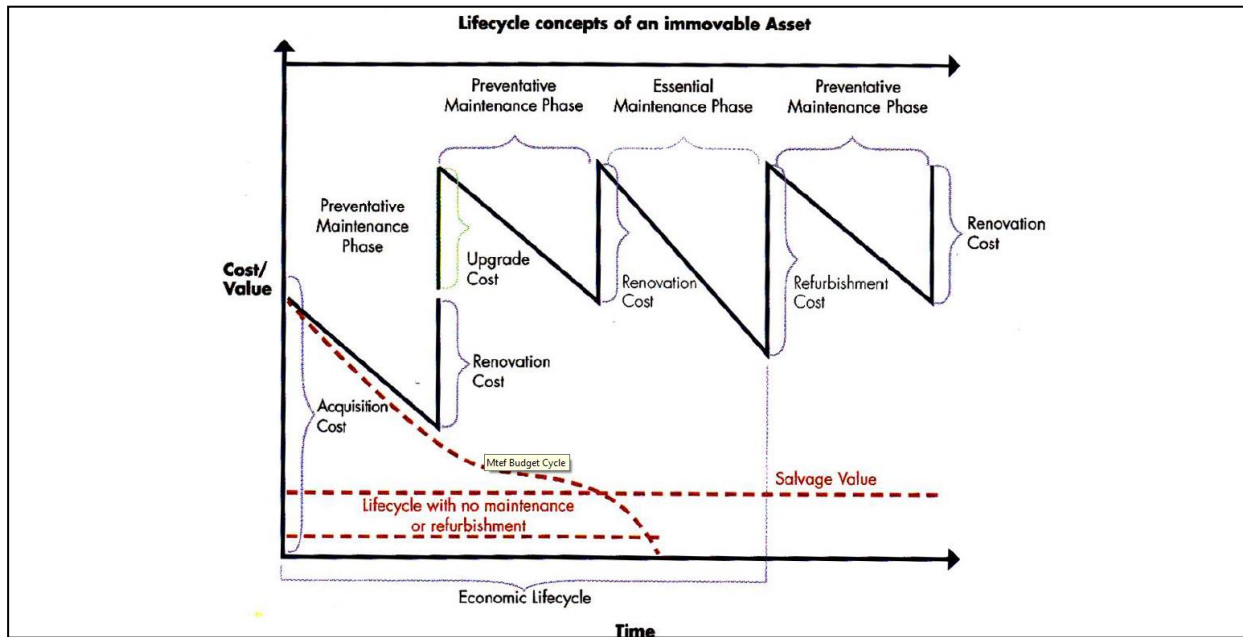
After determining the objectives, the current situation should be analysed by gathering the correct information utilising:

- A full technical condition assessment.
- NEIMS Assessments for all projects that were completed;
- A yearly snap survey by which the District Managers compile a list of needs at their schools in collaboration with the respective schools' principals.
- An ongoing asset verification exercise.

5.5. Life Cycle Costing

Adeli et al. (2005:184) stated, "Life-cycle cost is the total cost of a structure during its lifetime". The lifecycle cost of a structure includes the design cost, the construction cost, the operational cost, the cost of maintaining the structure throughout its lifespan and then the demolishing of the structure. Adeli et al. (2005:184) indicated that "three major costs during the life of a structure are the initial design/build cost, the operating cost, and the maintenance cost." When analysing the life cycle costing of assets, alternative solutions can be assessed to ensure that the overall cost of the asset is optimised. The life expectancy and maintenance requirements are influenced by the building material used in the structure. According to Adeli (2005:184), concrete can crack as it loses its strength over time and is affected by changes in weather, and if maintained and repaired, the initial strength may not be achieved. The joints are the most at risk for corrosion or rust in steel structures, especially if exposed. Life cycle costs may be viewed in terms of the life cycle itself, and costs may be associated with the life cycle of the infrastructure, providing the function of time and costs incurred. Best practice has shown that life cycle costing should include an assessment of the following, as indicated in Graph 5-2:

- Planning costs – costs associated with developing the infrastructure solution to a stage ready for acquisition (feasibilities, EIA and, Geo-Tech reports)
- Construction costs – costs associated with the initial acquisition of the infrastructure (construction cost and commissioning)
- Operational and maintenance costs – recurrent expenditure on a day-to-day basis (utilities and maintenance)



Graph 5-2: Asset Life Cycle.

(Source: IDM toolkit – CIDB, 2012:30)

The red dotted line in Graph 5-2 indicates that the lifespan of immovable assets is shortened due to a lack of preventative maintenance, hence the department's emphasis on maintenance. Annualised asset cost (AAC) or Equivalent annual cost (EAC) is described as the cost of maintaining and operating an asset over its assumed lifespan, which can be determined using the following formula as indicated in Equation 5-3:

$$\frac{r \frac{NPV}{1} - (1+r)}{(-Nth \text{ Power})}$$

NPV = Net Present Value of the Asset

r = Rate per period (4% of the asset value is utilised for the maintenance)

n = Number of periods (anticipated lifespan)

Equation 5-3: Equation for Analysed Asset Cost (ACC)

This formula is utilised for capital budgeting to show the net present value of an asset as a series of identical cash flows over the length of the required investment in the asset.

5.6. A Background on Maintenance

According to the Facility Maintenance Guidelines for Public Schools, “all facilities have a life cycle starting with an initial strategic vision in response to an expression of need, moving through project planning, briefing and design, construction, commissioning, operation and maintenance” (DBE, 2012:10). The life of facilities is generally extended through several renovation and redevelopment projects to eventual closure, decommissioning and deconstruction.

The Infrastructure Delivery Management System (IDMS) has been developed through the Infrastructure Delivery Improvement Programme (IDIP) for planning, budgeting, procurement, delivery, maintenance, operation, monitoring and evaluation of infrastructure. It comprises interrelating or interacting elements that establish processes that transform inputs into outputs. The South African Schools Act states (1996:28), “the governing body of a public school must administer and control the school's property, and buildings and grounds occupied by the school, including school hostels, if applicable”. Maintenance can be performed on a facility's infrastructure to keep it in its original optimal operational condition through its expected life span. Maintenance, therefore, can be described as keeping something in good condition. This process includes the actual work, including the technical, mechanical, and practical tasks. The question can then be asked on why we carry out maintenance work in our teaching and learning facilities, and some of the reasons for this include:

- To ensure the safety and security of learners and educators.
- Constructing facilities is expensive and, therefore, needs to be looked after.
- They must be in good condition to deliver quality education.
- The condition of our facilities influences the attendance and achievement levels of learners and educators.
- The condition of buildings deteriorates because of usage and contact with the environment.
- The condition of buildings deteriorates due to vandalism
- Maintenance reduces risks by preventing failures, damage to facilities, and even loss of life.
- The facilities must be used for many years.

The key factors that will allow the mobilisation of the maintenance programme at schools are as follow:

- Sufficient funds will ensure that the programme is managed effectively and efficiently.

- Personnel to administer the maintenance programme includes all stakeholders, such as school governing bodies, Principals and Provincial Infrastructure personnel.
- Essential resources to implement the programme include the availability of capable artisans in the private sector who can implement the maintenance interventions required at schools.

According to the National Immovable Asset Maintenance Management Strategy (November 2015;10), Maintenance can be defined into two main categories Corrective and Preventative Maintenance:

- **Corrective maintenance** is implemented to correct, repair, or restore failed infrastructure. Corrective Maintenance can be classified as planned or unplanned maintenance. Planned maintenance is when the maintenance is scheduled on the MTEF project List where the failure's implications are not critical or affect the facility's operations. Unplanned maintenance is mainly due to the integral factor involved in the maintenance where the failure can interrupt the facility's operation (Department of Public Works and Construction Industry Development Board, 2015:10).
- **Preventative maintenance** is maintenance that is planned for and is carried out over pre-determined intervals in line with the maintenance plan and is intended to restore or repair the facility to increase its lifespan; this maintenance is in line with optimizing the life cycle of the facility (Department of Public Works and Construction Industry Development Board, 2015:11). Preventative maintenance can be interval-based or condition-based as follows:
 - **Interval-based** maintenance actions are periodic, planned and scheduled. The interval-based maintenance is affected by the condition monitoring process. Frequency is dependent on many variables, including operator skills and knowledge.
 - **Condition-based:** This type of maintenance comprises servicing and maintenance actions based on analysis and experience and is subject to inspections, testing and monitoring

Maintenance categories are necessary for improved maintenance management. Categories assist with monitoring and control, identifying recurring problems and addressing the source of the problem. With the information, it is more accessible to budget and plan for retaining or restoring buildings, equipment, machines or systems to the specified operational condition and achieve the maximum useful life of assets.

5.7. Planning For Maintenance

According to the Department of Public Works (2015:1) within the National Infrastructure Asset Maintenance Management (NIAMM) (Department of Public Works and Construction Industry Development Board, 2015:1), “the South African government has identified the maintenance of infrastructure as a priority”. The increasing focus on maintenance is also evident as the maintenance expenditure must be prioritised and divided according to the DORA budget allocation and the MTEF cycle for the 2022/23 MTEF period the condition for maintenance allocation is 60% (Minister of Finance, 2022:131). Due to not enough being spent on infrastructure maintenance, the maintenance deficit is ever increasing, which is the main reason the current infrastructure within South Africa is failing or poorly maintained.

The key to planning for maintenance is efficient information management, and regular inspections assist in better decision-making when prioritizing. Prioritisation determines maintenance for a specific financial year within the annual budget allocation. The priorities take the following into account:

- Life cycle costing analysis
- Condition assessments
- The risk of deferred or delayed maintenance is the negative impact/consequence and likelihood of such a consequence if maintenance is deferred.
- Occupational health and safety
- Security of premises
- Statutory requirements
- Vandalism
- Increased operating costs
- Loss of revenue
- Disruption of the utilisation of a building
- Policy decisions
- Trends derived from call centre reports
- Trends from condition monitoring reports
- Maintenance performance

5.7.1. Maintenance Planning Horizons

As cited in (Vanier, 2001:10), “Gordon and Shore (1998) have suggested three planning horizons to illustrate the conflicting nature of long-term decision-making for asset managers: operational,

tactical, and strategic". The timeframes linked to these maintenance horizons are two years for the operational planning horizon, two to five years for the tactical planning horizon and five years and beyond for the strategic planning horizon.

Any proponent of life cycle analysis understands these deterrents to long-term planning; -- remedies in the short term may not be the most economical in the long term. Combined with conflicting political and administrative agendas and rapidly changing targets and plans for each organisation, planning for the strategic horizon is difficult. It is often intuitively understood how the gap between the need based on demographic projections and existing supply will lead to identifying new or disposal projects. It is often more challenging to understand how the planning process will lead to determining maintenance or refurbishment projects which often leads to a desire to separate maintenance and refurbishment projects from the planning of new build projects.

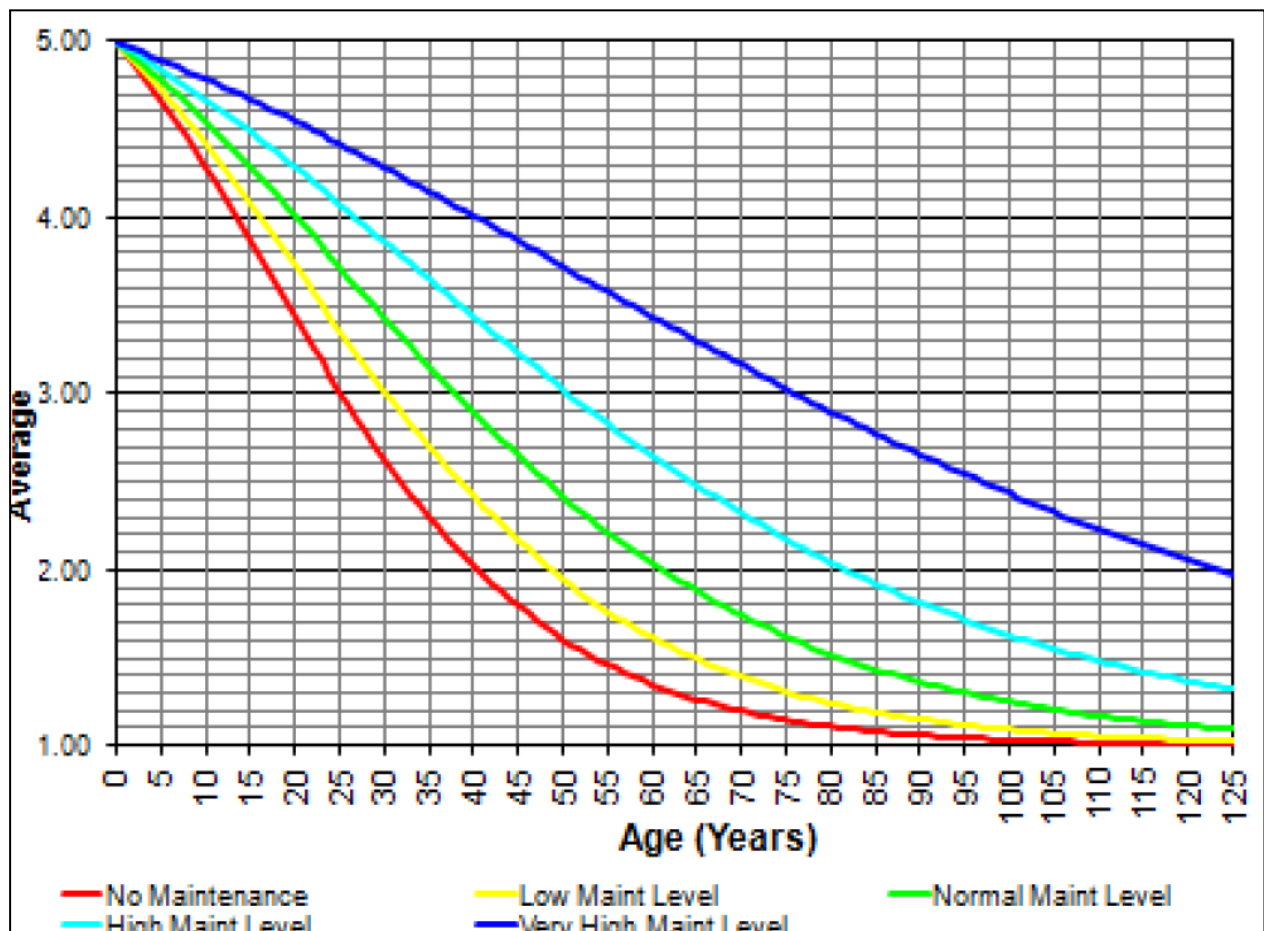
However, the physical resource planner can only make the correct planning decisions when all assets, existing or potential, are considered, both on the needs and supply side. This approach becomes essential once the prioritisation process starts and the potential impact of prioritising one project (be it a new build or maintenance) is considered on all other projects in the basket.

The only difference between costing a new build and a maintenance project is that a new build project cost is estimated, whereas, in maintenance planning, the costs to maintain the functionality is obtained from the Asset Register. The needs and supply side of the process remain precisely the same. The quantitative and qualitative extents of the required maintenance for the department provide severe challenges in optimising the implementation and management of individual maintenance projects. Therefore the department addresses maintenance at schools as a standalone all-inclusive programme. To assist the decision-making process (Vanier, 2001:5) describes the six "What's" of asset management as follows:

- What are the existing assets?
- What are the assets worth?
- What is deferred maintenance?
- What is its condition?
- What is the remaining service life?
- What should be prioritised to be fixed first?

Graph 5-3 indicates that when no maintenance is done on a facility, the facility will deteriorate before its life cycle is over. The facility's life cycle can extend beyond its planned lifespan with

increased maintenance. Therefore with planned maintenance every five years, the condition will improve, and the remaining service life will extend.



Graph 5-3: Maintenance's impact on an asset's life cycle.

(Source: Vanier, 2001:5)

5.8. Applying Information from Local Authorities

Attending Local and District Municipality planning meetings and participating in the development of the Integrated Development Frameworks (IDP), Spatial Development Frameworks (SDF), and Land Use Management Schemes (LUMS) of municipalities can be very beneficial to the department. It can determine which areas have been identified as significant growth areas where the growth patterns in these areas are influenced by the influx of persons to the district or local municipality. Information on current and future growth areas, housing developments, and basic services is provided. The department can identify the need for infrastructure in the current growth areas and prioritises future projects accordingly.

The demand for new school infrastructure is also determined by social infrastructure such as housing; in this instance, new schools will be planned. The planning and implementation of new schools can be determined through the rigorous interrogation of migratory statistics, the development plans of local municipalities, and the determination of the current gaps in available infrastructure.

5.9. Project Portfolio Management

According to the IDM toolkit developed by the National Treasury (2012:20), 'Infrastructure Portfolio Management is a component of an organisation's service delivery procedures. It combines management practices applied to infrastructure to develop, implement, monitor, and control prioritised work lists based on long-term plans, available budgets and an organisation's management capacity. Therefore well, managed infrastructure portfolios assist public organisations in delivering their mandated services effectively, efficiently and reliably.

Portfolio Management links an organisation's strategic service delivery plan with the infrastructure it will require to deliver those services efficiently, effectively and reasonably (CIDB, 2012: 20). The IDM toolkit highlights that the asset register is key to portfolio management activities. All assets must be recorded sufficiently to enable effective planning and decision-making. The Asset Register must, amongst other requirements, reflect the condition and record any work carried out on each asset, at least annually' (CIDB, 2012:21). Therefore, the organisation must implement preventative maintenance on all assets instead of reactionary, resulting in emergency repair works.

The asset is obtained at an initial acquisition cost. Regular use of the asset leads to wear and tear, requiring preventative maintenance to ensure the asset remains above the minimum level of performance needed. After an initial period, preventative maintenance can no longer ensure the minimum performance, and the asset requires renovation/rehabilitation. The renovation restores the asset to its original condition. Preventative maintenance now continues. It may be upgraded or extended during the asset's life, increasing its value. The asset could be renovated/rehabilitated many times. However, systems supporting the asset can be expected to fail. The asset now requires major rehabilitation/refurbishment, which may involve a significant overhaul or replacement of these systems or components. Once refurbishment has been completed, a new economic life cycle begins.

For a new project, a feasibility study is usually conducted to justify an infrastructure investment; however, even though feasibility reports are a requirement and "despite the vital importance of

feasibility studies in supporting decisions related to public spending on infrastructure projects, there are no attempts to evaluate such studies after construction of facilities” (Hyari et al., 2009:66). To improve the new project feasibility studies, it is proposed that there are peer reviews of the feasibility studies to ensure that the feasibility studies are appropriately prepared, that the proposed projects are planned optimally, and that all options were investigated to ensure that the project is planned for resilience. Hyari et al. (2009:75) recommended that pre and post-feasibilities be conducted as various factors and assumptions are used when compiling a feasibility report. A post-feasibility report will include actual data. Therefore, it can be analysed if the best-preferred option was implemented or if any alternative approaches would have been implemented had the actual data been known. These post-feasibility studies will then inform future projects of the same scope and nature to improve the planning process.

Hyari et al. (2009:75) recommended multistage feasibility where the outcome “will be either the project is feasible and should be advanced to the design and construction phases, or it is not feasible”. Implementing a three-stage feasibility report can resolve the possibility of implementing a project that is not feasible. The first stage will consist of a conceptual feasibility report that will provide a scope and initial evaluation with estimates for cost based on previous data and estimates. If the conceptual feasibility report indicates the outcome as feasible, a pre-feasibility report can be conducted with preliminary designs, estimates and analysis. Lastly, the final feasibility report will refine the pre-feasibility report, including the detailed designs, costs and estimates. The project's social, economic and environmental considerations and risk management strategy should form part of this report, and all alternative options with their benefits should have been discussed. The feasibility reports should determine the sustainability and required performance throughout the asset's intended lifespan and are interrogated during this process. The feasibility reports are interlinked with project proposals, whereby the actual project is vetted.

Chapman and Cooper (1983:238) defined risk as the “exposure to the possibility of economic or financial loss or gains, physical damage, or injury, or delay as a consequence of the uncertainty associated with pursuing a course of action.” According to Dey (2002:14), risk management should be approached systematically through identification, analysis and responses. In infrastructure, there are significant factors that can influence the time and cost overrun of the project; one of these is technical risks such as scope and design changes, and other significant risks are financial, economic and political risks (Dey, 2002:21).

Marion (2017:14-15) stated that within the risk management process, resiliency is “the capacity of an organisation to recognise threats and hazards and make adjustments that will improve future protection efforts and risk reduction measures.” Due to their potential negative impact on the achievement of the outputs and outcomes of the programme, risks must be identified and monitored closely. Risk plans, therefore, have to highlight the risks associated with the programme or project and provide an analysis of potential risks that need to be managed and describe how they will be managed.

One of the most significant risks is delivering value for money and value management; according to Norton and McElligott (1995:2), Value Management (VM) has been a development in project management that can significantly increase the effectiveness of construction expenditure. Kelly et al. (2015:13) stated that value management is a methodology for improving organisational decision-making; it increases effectiveness and efficiency and is function oriented. The definition of “value management is the name given to a process in which the functional benefits of a project are made explicit and appraised consistent with a value system determined by the client.” Kelly et al. (2015:14) evolved this definition to clarify that value management is a value study intervention and came to the following definition value management is a value study (or series of value studies) to enhance organisational decision making and performance by “increasing effectiveness and efficiency through a formal, structured, value-based management methodology involving key stakeholders. At the project level, VM is the name given to a value study in which the purposeful benefits of a project are made explicit and appraised in alignment with a value system determined by the client”.

The Department of National Treasury (2019:25) describes “value for money as the optimal use of resources to achieve intended outcomes” and as an “optimum combination of whole life costs and quality to meet user’s requirements”. Planning, designing and executing infrastructure projects, tracking projects, and monitoring performance in line with the control framework ensures that any infrastructure acquired offers value for money. The concepts and issues surrounding value for money must be understood as the associated threats and opportunities.

Not only is value for money based on the minimum purchase price, but also the maximum efficiency and effectiveness of the purchase. Value for money explores people’s perceptions of whether resources have been well used to impact specific outcomes. Value for money is best assessed by testing the estimated cost for an infrastructure project against market-related cost benchmarks. These benchmarks are compiled from an analysis of tendering exercises for similar infrastructure.

Best value for money is defined as the most advantageous combination of cost (consideration of the whole life cost), quality (meeting a specification which is fit for purpose and sufficient to meet the customer's requirements) and sustainability (economic, social and environmental, benefits in support of the Programme for Government). According to the HM Treasury Green Book (2020:123), the contributory factors should be reviewed to determine the need for optimism bias. There should be an interaction between risk and contingency optimism bias. The main factors that can reduce the adjustment are the complete identification of stakeholder engagement, clearly defining the project scope, accurate costing, risk identification, mitigation and management (HM Treasury, 2022:123). The reasons for failure to provide value for money are, therefore, most prevalent in the planning and implementation phases:

- Planning phase – If the data is insufficient, when decisions on the viability of the project are made, mistakes can be made, and projects that are not needed can be implemented. Inaccurate project estimates can lead to strategic misrepresentation - behaviour that deliberately underestimates costs and benefits for strategic advantage when project viability is chosen. It is a tendency for appraisers to be over-optimistic about crucial project parameters, including capital costs, operating costs, work duration and benefits delivery.
- Implementation phase – Implementation sits between the bookends of economy and effectiveness in the results chain framework. It must be executed efficiently to maintain the value-for-money proposition formulated at the project's outset. The critical question is what proactive action can be taken during implementation (efficiency) to minimise gaps concerning achieved and projected results, irrespective of whether or not optimism bias and strategic misrepresentation is present when a decision is taken to implement a project.

Efficiencies during planning and implementation can be facilitated through culture changes. Strategy, skilful planning and management of the delivery process are vital to making appropriate decisions regarding available options and prevailing circumstances to achieve optimal outcomes.

Project outcomes can be improved by embracing some principles in designing an infrastructure procurement and delivery management system that adopts a strategic approach to procurement. Emphasising engagement and alignment with community stakeholders' comprehensive economic and social benefits is vital to avoid suboptimal solutions and unnecessary delays (Bielenberg et al., 2020:4). A system that governs value for money throughout the project cycle in a systematic manner and that puts in place rigorous project selection processes. It should differentiate between the different procurement types, which pose challenges and require different skill sets and standardised delivery to enable risks to be proactively managed and responsibilities to be

established. Build relationships of trust and understanding with the private sector. Establish “reliable data-gathering systems on which to base day-to-day oversight and long-term planning. Develop strong public-sector capabilities across the planning, delivery, and operations value chain and “increase transparency through the disclosure of information which is subjected to internal and external scrutiny” (National Treasury, 2012:22).

Lee et al. (2014:66) stated that “the purpose of project quality management is to achieve the conditions of products or services that meet or exceed the customer’s requirements and expectations”. The SIPDM defines quality as the “totality of features and characteristics of a product or service that bears on the ability of the product or service to satisfy stated or implied needs” (National Treasury RSA, 2012). Quality management for capital projects will generally be the “hands-on” responsibility of the Contractor, and Quality Monitoring will generally be the “hands-on” responsibility of the professional service providers. Quality management for an infrastructure programme will be primarily addressed by ensuring that construction outputs are delivered, and the building industry norms and standards are applied. Such norms and standards include, but are not limited, to the following:

- National Building Regulations
- JBCC and other relevant contract documentation
- CIDB grading of contractors
- Agency agreements and IPIPs
- SA Institute of Architect’s Client/Architect Agreement
- Norms and quality standards as provided by DBE, Treasury and DRPW.

According to (The Presidency Republic of South Africa, 2012:5), monitoring aims “to provide managers, decision-makers and other stakeholders with consistent feedback on progress in implementation and results and early indicators of problems that need to be corrected. It usually reports on actual performance against what was planned or expected”. Evaluation is a periodic exercise that strives for credible and valuable information on specific questions to guide decision-making. Government-wide monitoring and evaluation require detailed knowledge and interactions between planning, budgeting and implementation. The Infrastructure Reporting Model (IRM) is a project-level monitoring and reporting (M&R) tool. The Education Facility Management System (EFMS) is a critical success factor; all active projects are to be uploaded onto the system, where all documentation, photos and milestones can be captured. The Education Infrastructure Grant frameworks, contained in the Division of Revenue Act, require the department to provide reports

on aggregate spending on infrastructure based on the prescribed reporting format as it has been designed and prescribed for reporting.

DoE reports progress on infrastructure projects to the Department of Treasury. The Provincial Treasury monitors progress on reporting projects, checks data quality, and approves the IRM data file. If the quality of the submitted IRM data file is poor, Provincial Treasury must send it back to the department to make the necessary corrections. National Treasury has developed the Provincial Infrastructure Reporting Model (PIRM) to assist Provincial Treasuries and National Departments in analysing the infrastructure data submitted by provincial departments.

The focus of monitoring and evaluation is strategically aligned with the department's objective and is based on relevance, performance and success and sustainable results that benefit the target groups. Decision-making is linked to interventions at the department's various levels. Monitoring and evaluation will provide critical assessments demonstrating whether programmes or projects have satisfied a target group's needs and addressed the priorities. Monitoring and evaluation are used to support accountability at different management levels within the department, i.e., the accountability of school representatives, Senior Management at headquarters or Accounting officers. The learning that has occurred through monitoring applies particularly to ongoing programmes or projects. Mistakes have been made, and insights have been gained during the programme or project implementation. Effective monitoring has detected early signs of potential problems and success areas in some cases. Monitoring and evaluation must contribute to the department's mission to improve decision-making, ensure responsibility to target groups in general, and maximise the benefits of learning from experience.

5.10. Chapter Conclusion

This chapter analysed infrastructure planning for existing education facilities within a South African concept. It evaluated the term cost-effectiveness as there are limited budgets to ensure that the backlogs are met within the country. It can be concluded that a system should be in place to ensure that what is spent is done efficiently. The importance of maintaining the existing facilities and implementing life cycle management was investigated, and it is clear that there are risks and high-cost implications involved if facilities are not maintained. With prioritisation for maintenance, upgrades and additions or new facilities, value management is required to ensure that planning, design and execution of infrastructure projects, tracking projects, and monitoring performance offers value for money and is of quality. Table 5-2 provides as a concluding remark of this chapter the link between the conclusion reached and the relevant objective in line with the research objectives and primary research questions of this study:

Table 5-2: Linking research objectives to chapter purpose and conclusion

Research Objectives	Primary research question	The conclusion reached within this chapter
To improve on standards that will ensure that physical resources are planned successful and sustainable	Are there acceptable norms, standards, and guidelines to assist in the uniform planning of education facilities?	This chapter identified the importance of planning and prioritising education facilities, whether new, replaced, upgraded or additions. It again identified a gap in standards that will ensure that education facilities are planned successfully and sustainably for them to remain relevant for the coming years. This chapter, as a guideline, identified that it is necessary to consider cost-benefit or cost-efficient analysis when determining the required infrastructure. The required infrastructure can be determined through a gap analysis that includes identifying the supply and the needs. This gap analysis was later utilised in Chapter 6 as part of the empirical research to conduct a gap analysis on the Northern Cape.

(Source: Author's creation, 2022)

Determining the gap through analysing the supply and demand was discussed as the tools utilised in Chapter 6 for the case study area. This gap analysis is imperative to know what you have, what you need and what is required in the end. It will assist in one of the main challenges within the education sector, which was identified as the lack of school buildings and possible ways to address them. The literature review concluded that there are insufficient classrooms and ablution facilities, and the structures are deplorable; this was further investigated and confirmed for the Northern Cape in Chapter 6.

CHAPTER 6 EDUCATION INFRASTRUCTURE ANALYSES: A CASE STUDY OF THE NORTHERN CAPE PROVINCE

6.1. Introduction

This chapter analysed the needs and current asset base of the Northern Cape Province. It determined the strengths and weaknesses of the current infrastructure, the gap between the existing infrastructure and the required infrastructure, and presented research findings at a micro-level. It reflects on the Northern Cape case study to inform the local approach to planning educational facilities and asses base assessments. Figure 6-1 indicates the structure of this chapter:

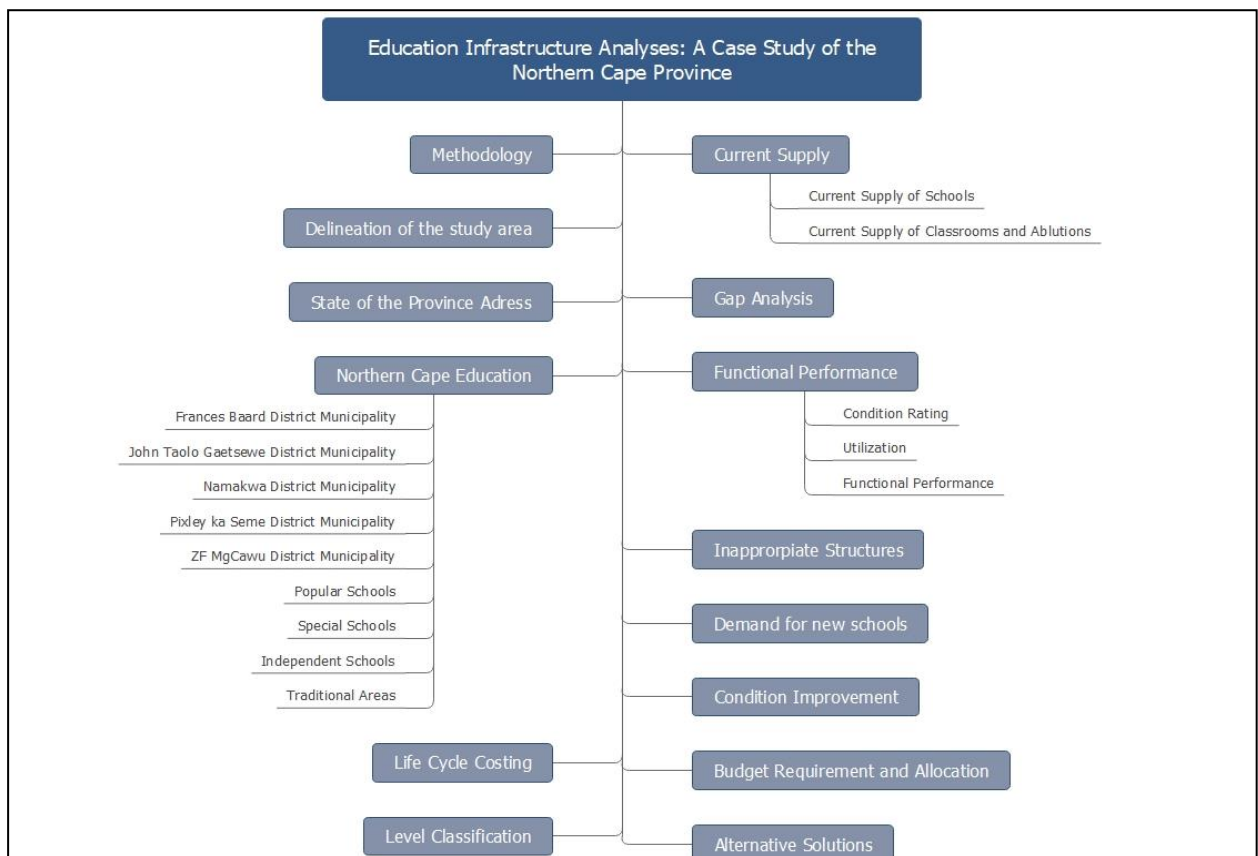


Figure 6-1: Chapter 6 Structure
(Source: Author's creation, 2022)

6.2. Methodology

The empirical study adopted a qualitative approach of analysing several different literature and reports to conduct this study of optimising the planning of educational facilities: Reflecting on the integration of asset base assessment and land use planning. In light of the research aim,

objectives and questions described in the previous sections, it is evident that this research requires an approach that considers both theories and practices relating to recent planning and environmental reform. The chosen research design ensured that data was collected, analysed and interpreted to answer the stated research questions (Bryman, 2012:45; Yin, 2009:24).

The empirical investigation considered the asset base of the Northern Cape educational facilities. The asset base assessment was informed by data from the NCDoE to reflect on the provision of education facilities from a spatial perspective. A comprehensive range of data sources was used to conduct the research, including NEIMS Survey data, Education Management Information System (EMIS) data, and Condition Assessments from the Department of Roads and Public Works (DRPW) StatsSA, records maintained by the Department on the provincial audit of infrastructure. The analysis first considered the existing asset base of the Northern Cape Province to determine the current supply of school infrastructure within the province, the functional performance, condition and utilisation of each of the facilities to identify aspects relating to the life cycle costing infrastructure needs. It then focussed on the demand for physical resources, the demand through communities, local and district municipalities (Integrated Development Plans), and new developments.

An options analysis was conducted to determine a range of options (financial, technical and design) for needed education infrastructure, departing from the gap between the supply and demand and analysing the cost-benefit of alternative building technologies against standard infrastructure solutions. Furthermore, the study considered maintaining these physical resources. The life of facilities is generally extended through several renovation and redevelopment projects to eventual closure, decommissioning and deconstruction.

6.2.1. Data Sources

6.2.1.1. Primary Data Sources

The primary data source used was the Norms and Standards for Public School Infrastructure, which determined that there are accepted norms, standards, and guidelines to assist in the uniform planning of education facilities.

6.2.1.2. Secondary Data Sources

Development theories, planning theories, legislation, policies and frameworks were analysed to identify the implication on education facilities and the planning, design and prioritisation thereof. The empirical investigation considered the asset base of the Northern Cape educational facilities.

The asset base assessment was informed by data from the NCDoe to reflect on the provision of education facilities from a spatial perspective. A comprehensive range of data sources was used to conduct the research, including NEIMS Survey data, Education Management Information System (EMIS) data, and Condition Assessments from the Department of Roads and Public Works (DRPW) StatsSA, records maintained by the Department on the provincial audit of infrastructure. Supplementary data was captured from the district offices and schools within the province to inform the asset base assessment further.

6.3. Personal Observation

Site visits were conducted to comprehend the quantitative data collected for this research. The objective of the site visit was to gain insight into the current state of Northern Cape's Education Facility. The site selection was made from January 2018 to July 2022 on education facilities where infrastructure projects reached practical completion throughout the Northern Cape Province; an amount of 205 (36,8%) Northern Cape education facilities were visited, and these schools were in all five districts and included rural and urban schools. Table 6-1 provides the site visit statistics from 2018 to 2022:

Table 6-1: Site Visit Statistics

DISTRICT MUNICIPALITY	2018	2019	2020	2021	2022	Grand Total
Frances Baard District Municipality	4		20	16	2	42
John Taolo Gaetsewe District Municipality	4		8	29		41
Namakwa District Municipality	13	12	5	9	1	40
Pixley Ka Seme District Municipality	5	6	6	9	15	41
ZF MgCawu District Municipality	7	2	23	9		41
Grand Total	33	20	62	72	18	205

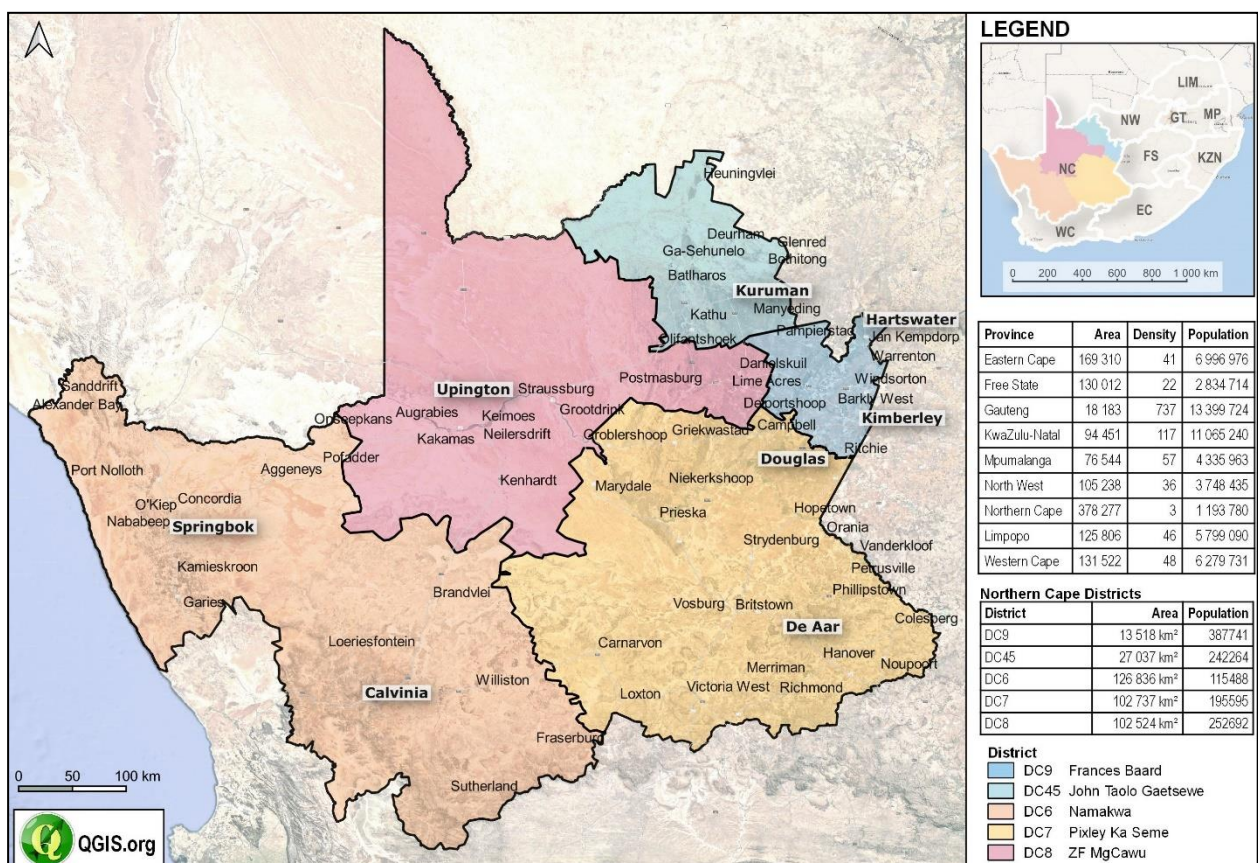
(Source: Author's creation, 2022)

6.4. Delineation of the study area - Northern Cape as a province

The Northern Cape Province is a unique part of the globe. It is unique primarily due to its rich endowment of natural, cultural, economic and human resources. As a consequence, our province has become an international economic, scientific and environmental focal area, as is demonstrated by, among other things, the designation of the Square Kilometre Array (SKA, now referred to as the SRAO) project, UNESCO's registration of both the Richtersveld Botanical and Landscape as well as the ǀKhomani Cultural Landscape World Heritage Sites, and the growing investors' interest in the Gamagara Development Corridor. The international focus and the need to utilise the province's resource base to grow the provincial and national economies pose a considerable challenge to the Northern Cape people. The core of the challenge is implementing

innovative and best-practice strategies to create a ‘developmental state’ as advocated by the South African Constitution while simultaneously giving effect to our international obligations pertaining to social, economic, and environmental sustainability.

The Northern Cape is the most extensive province within South Africa, located in the north-western corner. The province accounts for 30,5% of the total landmass of South Africa. It only accommodates 2,1% of the entire South African population as per Provincial Mid-Year Estimates 2016 conducted by Stats SA (2018), “The province was formed on 27 April 1994 after the split from the Cape Province. It is demarcated into five districts and twenty-six local municipalities. The province shares borders with four other provinces: Western Cape, Eastern Cape, Free State and North West. It also shares borders with the states of Namibia and Botswana, respectively.” Map 6-1 indicates the Northern Cape, its position in South Africa and its districts:

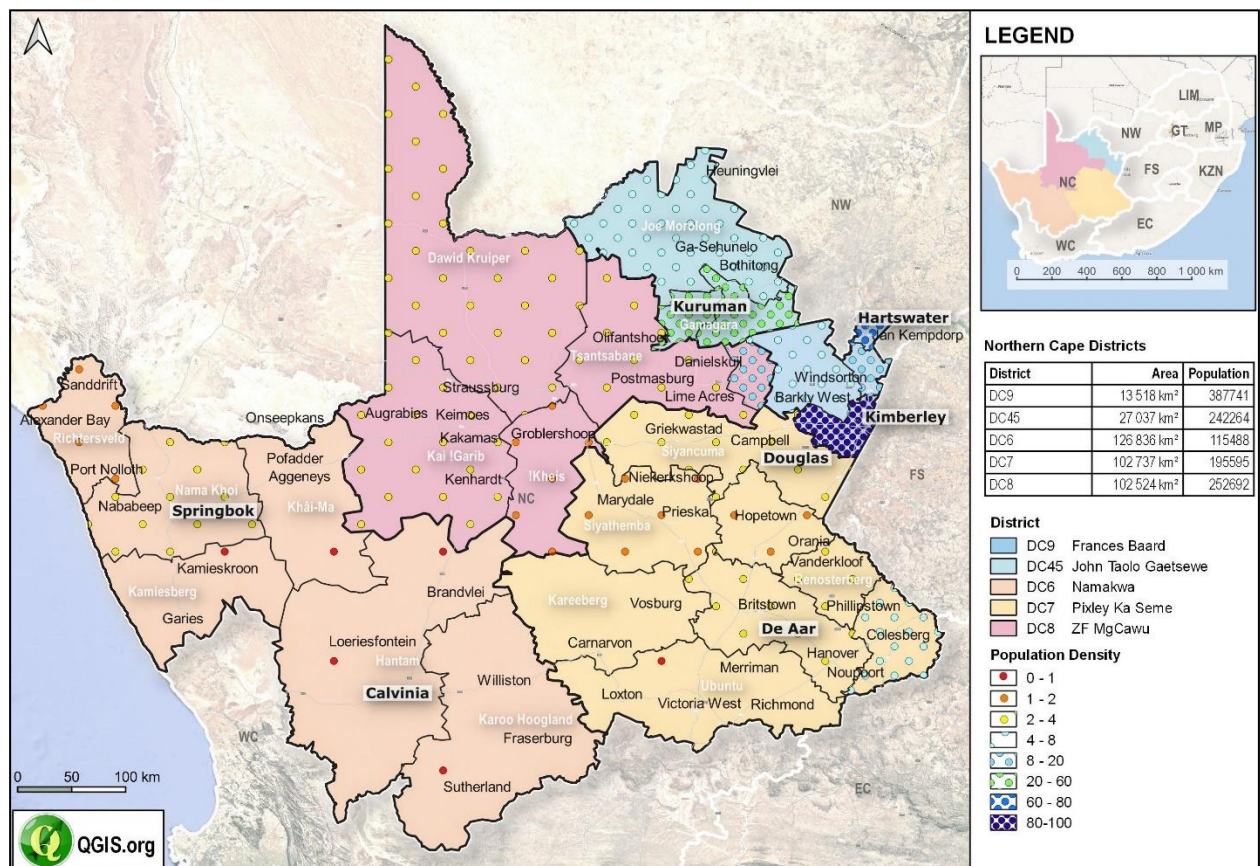


Map 6-1: Northern Cape Location in South Africa

Source: Wells, (2022)

According to Stats SA (2018), the local municipalities with the highest number of households are Sol Plaatje, Magareng, Ga-Segonyana and Gamagara Local Municipalities. These municipalities

are located in the North-East of the province. Municipalities to the south of the province have a very low population density, as indicated in Map 6-2:



Map 6-2: Northern Cape Population Density

(Source: Wells, 2022)

Table 6-2: Extract of Distribution of population by age in 5-year age groups and sex is applicable to determine the number of learners attending school in terms of school-going age.

Table 6-2: Extract of Distribution of population by age in 5-year age groups and sex

GROUP	MALE	FEMALE	TOTAL	SEX RATIO
0-4	58 575	59 089	117 664	99
5-9	53 535	54 139	107 674	99
10-14	55 042	51 168	106 210	108
15-19	59 767	57 261	117 028	104

Source: (Stats SA, 2018:15)

According to the CS 2016 data, the aged 5-24 attend school. Attendance is mainly (58,1%) in primary and 35.5% in secondary school. The remaining portion comprises Pre-School (2.6%), Technical Vocational Education and Training (1.9%), and various higher education facilities. The

highest level of education for persons aged 20 years and older indicated that 8% had no school-going, 13,7% had an incomplete primary education, 5.9% had primary education, 36,8% had an incomplete secondary education, and only 27,7% completed their secondary education with the remaining balance of 7.8% that completed some higher education.

According to (Stats SA, 2018), 81,7% of the Northern Cape population was born in the province and is still residing within the province. Therefore only 17,3% of the population migrated to other provinces, of which Western Cape and Gauteng are the highest. The Northern Cape accommodates 1 193 781 (CS 2016) citizens, a 4% growth from Census 2011, where the population was 1 145 861. Brief statistics about Northern Cape Province, which has an influence on future planning for schools- and learner needs, are as follows:

Table 6-3: Statistical Information of the Northern Cape

INDICATOR	NORTHERN CAPE	FRANCES BAARD	JOHN TAOLO GAETSEWE	NAMAKWA	PIXLEY SEME	KA ZF MGCAWU
POPULATION	1 193 780	387 741	242 264	115 488	195 595	252 692
POPULATION DENSITY	13.186	43.55	15.8	1.05	2.15	3.38
POPULATION GROWTH 2011- 2016	48 002	5 828	17 466	-353	9243	15 818
HOUSING NEEDS (SHACKS)	5 294	548	183	12	1779	2772

Source: (Stats SA, 2018)

6.5. State of the Province Address (SOPA)

The Northern Cape Premier, Dr Zamani Saul, within the State of the Province Address for 2021 (SOPA) of the Northern Cape, stated that in terms of the transfer of the Early Childhood Development (ECD) function, the Department of Social Development to the DoE (Premier Zamani Saul, 2021). The Premier of the Northern Cape signed the proclamation in August 2021 to transfer the administration, powers, and functions from the Department of Social Development to the DoE. According to the Proclamation (Premier of the Northern Cape, 2021), this transfer was effective from 1 April 2022.

The Premier reported that a draft feasibility study had been developed to establish the provincial government-owned Construction Company. Linked to the establishment of the Provincial Construction company is the work for the remodelling of the Department of Roads and Public

Works; the remodelling is meant to put the planning and implementation of all infrastructure projects under one department (Premier Zamani Saul, 2021).

Within the State of the Province Address (SOPA) by the Premier of the Northern Cape, Dr Zamani Saul, on Legislature 27 February 2020, it was stated that the choices and investments over the next five years would “be based on an understanding between government, labour, business and civil society” (Premier Zamani Saul, 2020). Dr Zamani Saul stated that as per his maiden State of the Province Address, he made specific announcements regarding the change of approach to encourage growth and strengthen our capacity regarding infrastructure delivery in the province.

The SOPA on 24 February 2022, Dr Zamani Saul stated that “the people of Upington have spoken and specifically the community of Rainbow regarding the increased risk at Carlton van Heerden High School as a result of the asbestos structures. To this end, the design for the replacement school was completed, and the project was allocated to the Department of Roads and Public Works late last year for procurement” (Premier Zamani Saul, 2022). As stated in the SOPA, the school has been prioritised in the NCDoe’s approved 2022/23 MTEF Project List for a Level 8 Secondary School replacement of asbestos structures. This school was classified as an entirely inappropriate structure and has been prioritised due to health and safety risks to learners and educators caused by the asbestos structure and the structural challenges identified.

“We are investigating the possibility of establishing a Northern Cape Construction Company to help build RDP houses and roads. A multi-sectoral task team has been set up to look at the modalities of the State-owned Construction Company, which we envisage will be established and operational towards the second half of next year. Through these interventions, we envisage a 30% reduction in government spending on outsourced infrastructure construction as tangible initiatives aimed at de-tenderisation” (Dr Zamani Saul, 2019).

In his State of the Province speech, Dr Zumani Saul stated that “substantive progress has been made “in terms of “the re-modelling of the Department of Roads & Public Works to become the Department of Roads and Infrastructure- with the sole mandate of implementing Infrastructure projects.” (Premier Zamani Saul, 2022) The key objectives of remodelling NC DRPW are to improve the effectiveness and efficiency of implementing infrastructure development, maintenance and facilities management in the Province and to ensure prudent and effective management of state-owned land in the Province. The remodelled DRPW will serve as a training institution for the mass production of Artisans and train and up-skill people, focusing on six (6) designated groups, including youth, emerging businesses, women, cooperatives, people living

with disabilities and Military Veterans. It will serve as an incubator for small businesses in the Province and assist emerging contractors and SMMEs in the construction industry. The key objectives of the envisaged Construction Company are to improve the effectiveness and efficiency of implementing infrastructure development, maintenance and facilities management in the Province, reduce government spending on outsourced infrastructure construction projects, and reduce tenderisation of government works. It will Implement 30% of the Northern Cape Provincial Government's infrastructure projects, initially focusing on building RDP/Low-cost houses for the Department of Human Settlements, low-volume roads, clinics, recreational facilities, and other social infrastructure

The mandate of the Department of Roads and Public Works, according to the Assignment of Powers and Functions to the Executive Council of 11 May 2009, states, "the Department of Roads and Public Works was deemed a custodianship of provincial fixed assets, construction and maintenance of provincial of properties and the coordination of functions of the Department of Transport, Roads and Public Works", DRPW further extracts its legislative delegation from the Government Immovable Asset Management Act of 2007 (GIAMA), thus is allocated the role of custodian and manager of provincial government immovable assets, excluding those envisaged by the Mineral and Petroleum Resources Development Act of 2002 (The Presidency, 2007). DRPW contributes to the provincial goal of job creation, enterprise development and poverty alleviation.

The remodelling of DRPW aims to capacitate DRPW with capable professionals from the built environment to ensure delivery, to create an implementing arm through the creation of a Construction Company, to offer better remuneration for the professionals housed in the Construction Company for flexibility allowances and offer fringe benefits and allowances that are similar to mining companies. It aims to create a new Chief Directorate that will focus on securing funding for DRPW new projects and maintenance and Provincial Infrastructure strategic projects (BFI, SIPs, CIP, MIG and others).

6.6. Northern Cape Education Sector

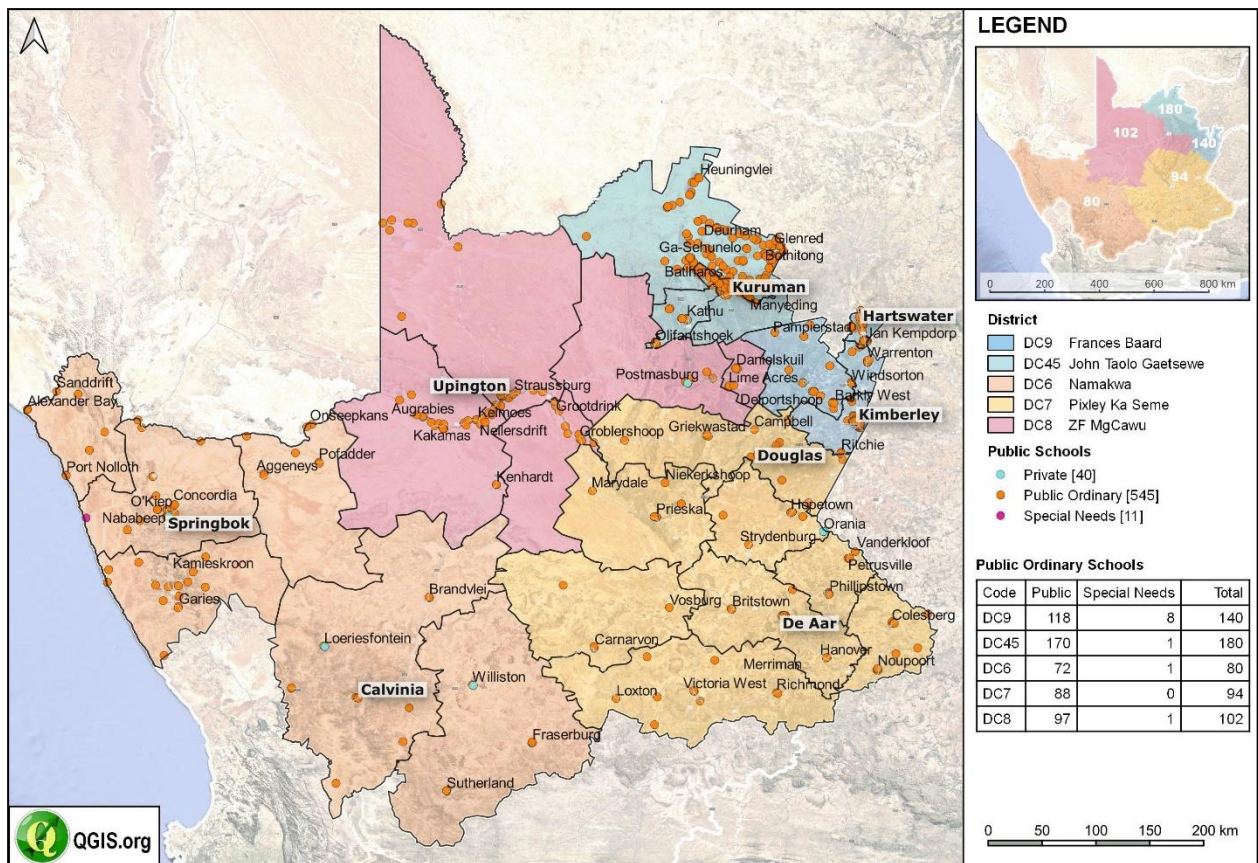
In the Northern Cape, there are 310561 learners in 596 Public, Independent and SNE Schools; there was a 0.14% decrease in Learner Enrolment (PrGrR-12) and a 0.12% increase (Gr1-12) in Public Ordinary and SNE Schools from 2021 to 2022. An average of 29.3 Learners per Educator (Public ordinary and SNE schools) and 521.1 Learners per School (Public ordinary and SNE Schools), Table 6-4 provides more information on each district with the total number of learners and educators for 2022:

Table 6-4: Schools distribution per District Municipality

Sector	Type	Learners	% of District and Provincial Total	Educators	% of District and Provincial Total	Schools	% of District and Provincial Total	L: E RATIO	L:S RATIO
FRANCES BAARD	PRIVATE ORDINARY SCHOOL	3276	3,3	223	6,3	14	10,0	14,7	234,0
	PUBLIC ORDINARY SCHOOL	95516	95,9	3145	88,6	118	84,3	30,4	809,5
	PUBLIC SNE	835	0,8	182	5,1	8	5,7	4,6	104,4
TOTAL		99627	32,1	3550		140		28,1	711,6
JOHN TAOLO GAETSEWE	PRIVATE ORDINARY SCHOOL	2707	3,3	127	4,4	9	5,0	21,3	300,8
	PUBLIC ORDINARY SCHOOL	80356	96,5	2729	95,1	170	94,4	29,4	472,7
	PUBLIC SNE	172	0,2	13	0,5	1	0,6	13,2	172,0
TOTAL		83235	26,8	2869		180		29,0	462,4
NAMAKWA	PRIVATE ORDINARY SCHOOL	394	1,8	25	2,9	7	8,8	15,8	56,3
	PUBLIC ORDINARY SCHOOL	21396	97,3	814	95,1	72	90,0	26,3	297,2
	PUBLIC SNE	195	0,9	17	2,0	1	1,3	11,5	195,0
TOTAL		21985	7,1	856		80		25,7	274,8
PIXLEY KA SEME	PRIVATE ORDINARY SCHOOL	604	1,3	13	0,8	6	6,4	46,5	100,7
	PUBLIC ORDINARY SCHOOL	46158	98,7	1579	99,2	88	93,6	29,2	524,5
TOTAL		46762	15,1	1592		94		29,4	497,5
ZF MGCAWU	PRIVATE ORDINARY SCHOOL	170	0,3	21	1,2	4	3,9	8,1	42,5
	PUBLIC ORDINARY SCHOOL	58743	99,6	1718	98,7	97	95,1	34,2	605,6
	PUBLIC SNE	39	0,1	2	0,1	1	1,0	19,5	39,0
TOTAL		58952		1741		102		33,9	578,0
NORTHERN CAPE PROVINCE	PRIVATE ORDINARY SCHOOL	7151	2,3	409	3,9	40	6,7	17,5	178,8
	PUBLIC ORDINARY SCHOOL	302169	97,3	9985	94,1	545	91,4	30,3	554,4
	PUBLIC SNE	1241	0,4	214	2,0	11	1,8	5,8	112,8
TOTAL		310561		10608		596		29,3	521,1

(Source: NCDoe, 2022)

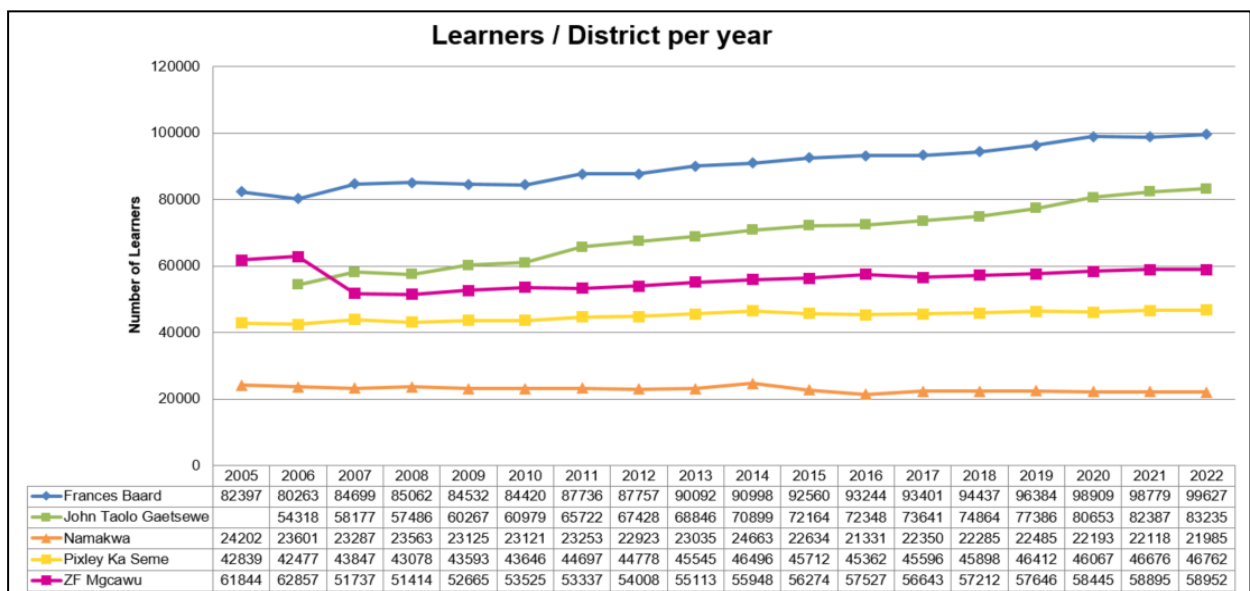
The total distribution of the Public Ordinary, Special and Independent schools within the Northern Cape is indicated in Map 6-3:



Map 6-3: Distribution of Schools in the Northern Cape.

(Source: Wells, 2022)

The total number of schools varies for each District Municipality with John Taolo Gaetsewe; the following graph indicates the learner history per district.



Graph 6-1: Learner Enrolment in Northern Cape EMIS Snap Survey History

(Source: Author's creation, 2022)

Graph 6-1 indicates the enrolment in the Northern Cape over the last 17 years. Migration from 2005 to 2011 happened between John Taolo Gaetsewe and ZF MgCawu; this is due to the demarcation of the John Taolo Gaetsewe District Municipality; therefore, learner numbers for John Taolo Gaetsewe of 2005 are not available as the Municipality only established in 2006. Table 6-5 indicates the learner growth or decline per District Municipality:

Table 6-5: Learner Growth or Decline per District Municipality

DISTRICT MUNICIPALITY	GROWTH OR DECLINE IN THE NUMBER OF LEARNERS FROM 2021 TO 2022	OR INCREASE OR DECREASE %	GROWTH OR DECLINE IN THE NUMBER OF LEARNERS - 10 YEARS	INCREASE OR DECREASE %	GROWTH OR DECLINE IN THE NUMBER OF LEARNERS -15 YEARS	INCREASE OR DECREASE %
FRANCES BAARD	848	0,86%	9535	10,58%	14565	17,12%
JOHN TAOLO GAETSEWE	848	1,03%	14389	20,90%	25749	44,79%
NAMAKWA	-133	-0,60%	-1050	-4,56%	-1578	-6,70%
PIXLEY KA SEME	86	0,18%	1217	2,67%	3684	8,55%
ZF MGCAWU	57	0,10%	3839	6,97%	7538	14,66%
AVERAGE	1706	0,55%	27930	9,88%	49958	19,17%

(Source: Author's creation, 2022)

On average, the South African population grows 1.19% per annum in terms of natural growth; Frances Baard's learner numbers average over the last 15 years grew 17.12%, which is more or less in line with annual average population growth as illustrated in Table 6-6:

Table 6-6: Annual Average Population and Learner Growth

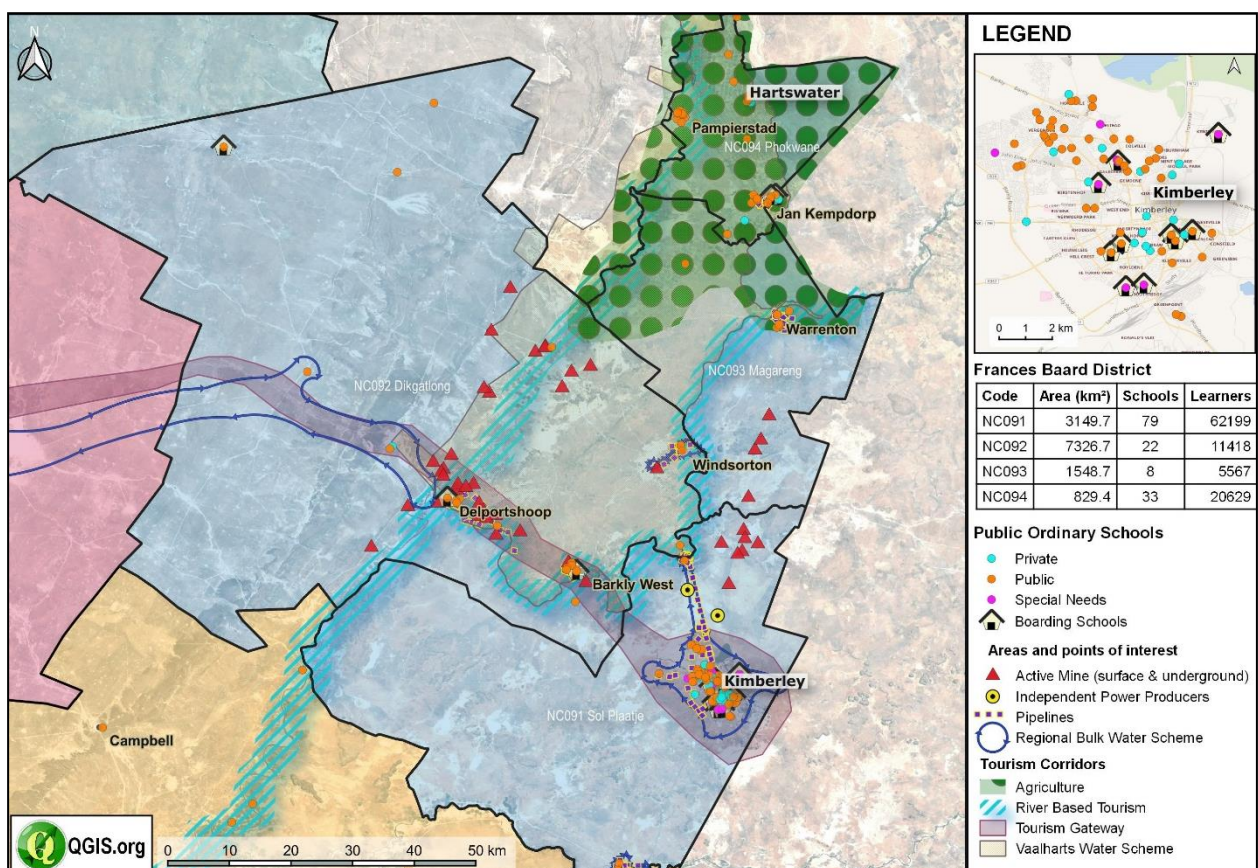
ANNUAL AVERAGE POPULATION GROWTH	1.19%	% AVERAGE GROWTH IN LEARNER NUMBERS	0.55%
DISTRICT MUNICIPALITIES	% GROWTH IN LEARNER NUMBERS		
FRANCES BAARD	0,86%		
JOHN TAOLO GAETSEWE	1,03%		
NAMAKWA	-0,60%		
PIXLEY KA SEME	0,18%		
ZF MGCAWU	0,10%		

(Source: Author's creation, 2022)

From Table 6-6, it is clear that in John Taolo Gaetsewe District, there is above-average growth in learner numbers; in Pixley Ka Seme Districts, there is meagre % growth; and in Namakwa, there is a decline in learner numbers; this analysis and explanations thereof follow per district:

6.6.1. Frances Baard District Municipality

The learner enrolment numbers in Frances Baard DM have increased over the last ten years by 10.58% and increased yearly in the past 15 years by 17.12%. Learner numbers increased from 2021 to the 2022 academic year, with 848 learners. From Map 6-4, extensive agriculture along the Vaal River towards Barkly West and Jan Kempdorp contributes to food security. As Kimberley is the capital of the Northern Cape, most work opportunities (Provincial Health Care Centre and the establishment of the new Sol Plaatje University) are within this District Municipality. Therefore, a continued influx of population affects this area, which increases the number of learners in the schools annually. Migration patterns from other provinces, mainly North-West, affect this district's population growth.



Map 6-4: Distribution of Schools in the Frances Baard

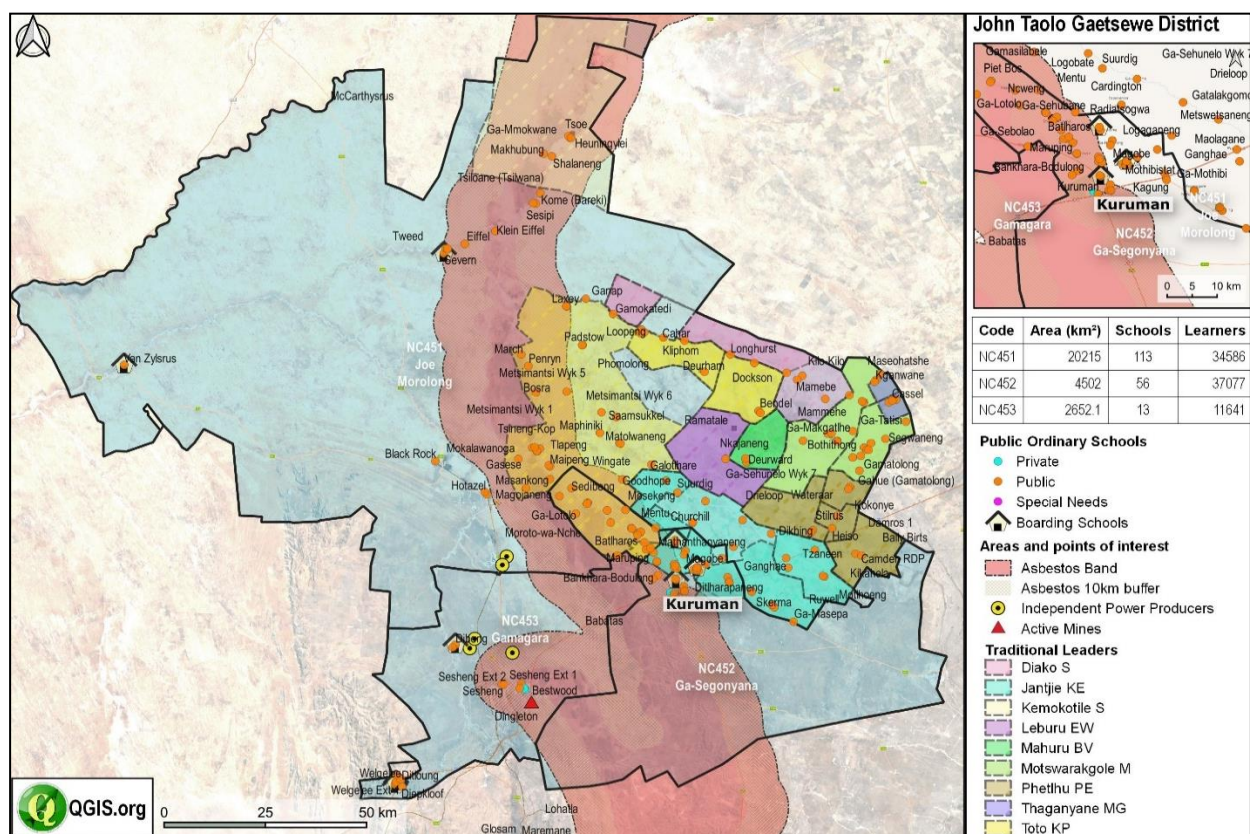
Source: Wells (2022)

6.6.2. John Taolo Gaetsewe District Municipality

The learner enrolment numbers in John Taolo Gaetsewe DM. have increased over the past ten years by 20.90% and in the last 15 years by 44.79%. Learner growth 2021 to 2022 academic year was an increase of 848. Interestingly, the above graph indicates that in 2009, the learner numbers

dropped to more than 10 000 and recovered during 2011 to a regular growth pattern. Was it not for Demarcation boundary changes (within the Kathu area) between John Taolo Gaetsewe and ZF MgCawu, learner enrolment would have been above 60%. Comparing the results with Frances Baard (identified as the NC Province's central hub), the largest learner enrolment occurs within John Taolo Gaetsewe DM. and highlights the importance of infrastructure development projects. This district municipality's increase in learner enrolment contributed to establishing several mining sites over the years.

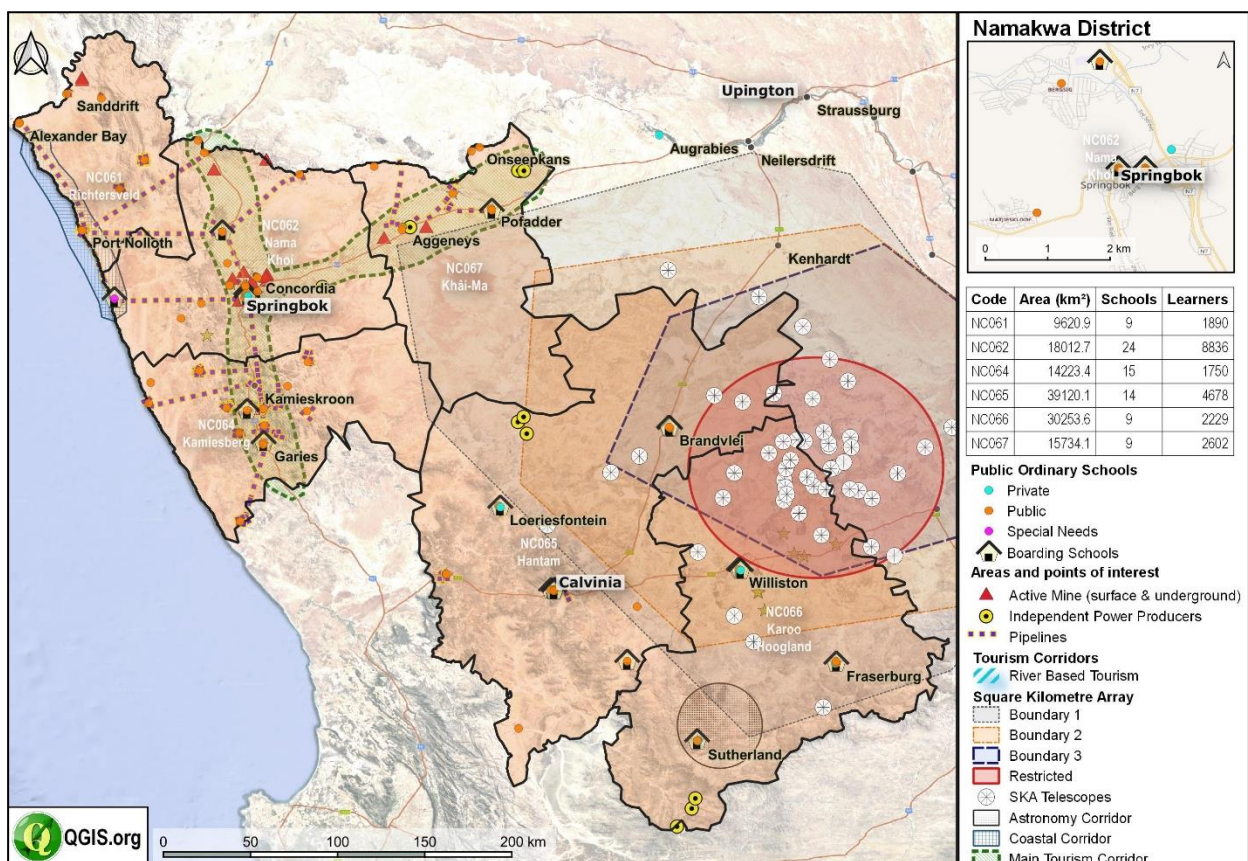
The positive outcome further highlights good physical resource planning, contributing to overall service delivery needs and the social development of communities. These communities have many rural areas with limited access to and from schools. A challenge exists to provide infrastructure project planning and challenges like learner transport and time spending to commute to and from school. Innovative teamwork and interactive communication with role players are essential. Map 6-5 indicates the John Taolo Gaetsewe District Municipality with all its Local Municipalities and traditional areas:



Map 6-5: Distribution of Schools in the John Taolo Gaetsewe
(Source: Wells, 2022)

6.6.3. Namakwa District Municipality

The learner enrolment numbers in Namakwa DM. have declined over the last ten years by 4.56% and the past 15 years by 4.56% and declines yearly. Learners declined from the 2021 to 2022 academic year with 133 learners. Migration to urban areas explains the constant learner numbers decline within Namakwa District Municipality, but environmental- and climate change significantly influenced learner enrolment statistics over the past 15 years. As a result, population density is the lowest within Namakwa District, meaning about one person per square kilometre. However, the Nama Khoi Local Municipality – Springbok area is three persons per square kilometre, leaving the remaining areas much less than one person per square kilometre. A declining trend lends itself to innovative future planning and decision-making. Less emphasis on new Infrastructure projects and more on property management and maintenance will be of value. SKA (Square Kilometre Array) operates within Namakwa District Municipality and could address some of the above challenges. Here is an opportunity to develop and implement distance learning technology, specifically Maths and Science and share the outcome through media wherever needed. Map 6-6 indicates the Namakwa District Municipality with all its Local Municipalities:

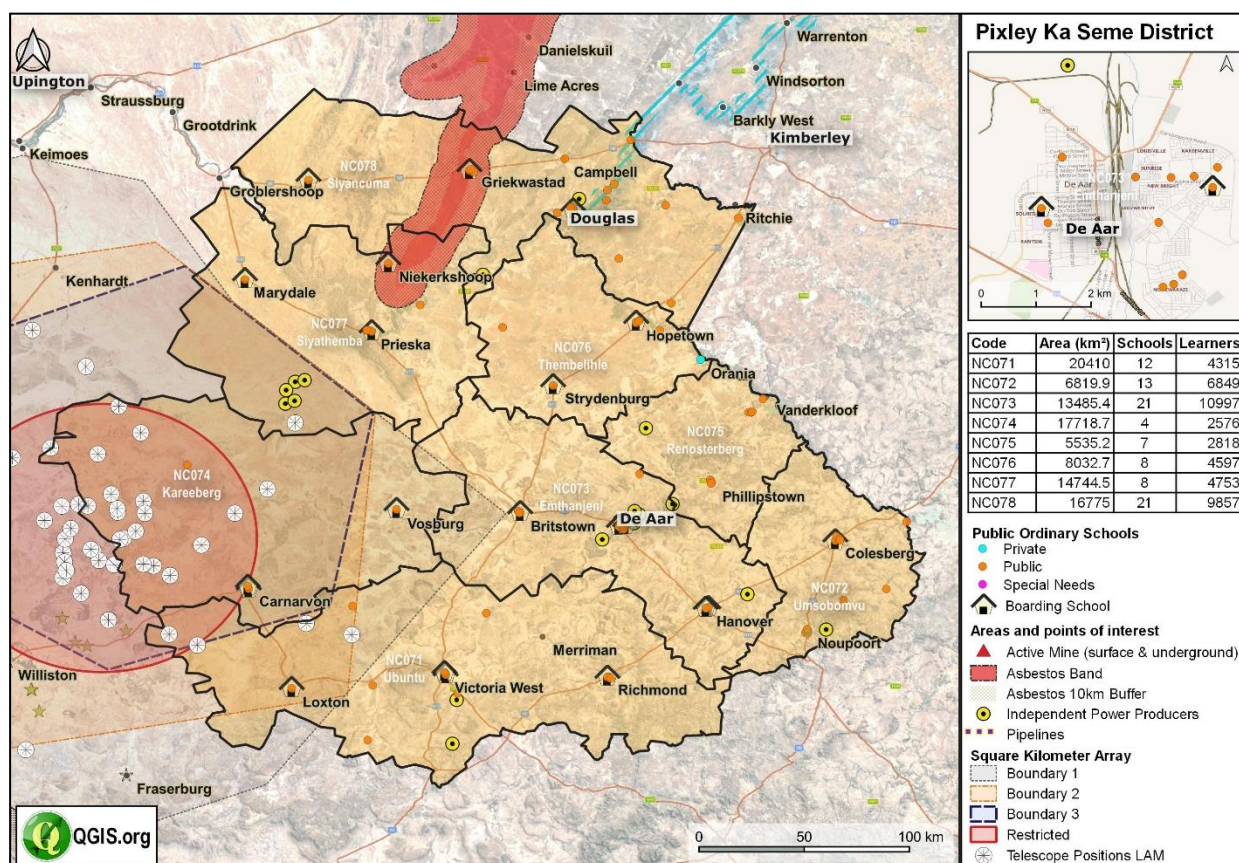


Map 6-6: Distribution of Schools in the Namakwa

(Source: Wells, 2022)

6.6.4. Pixley Ka Seme District Municipality

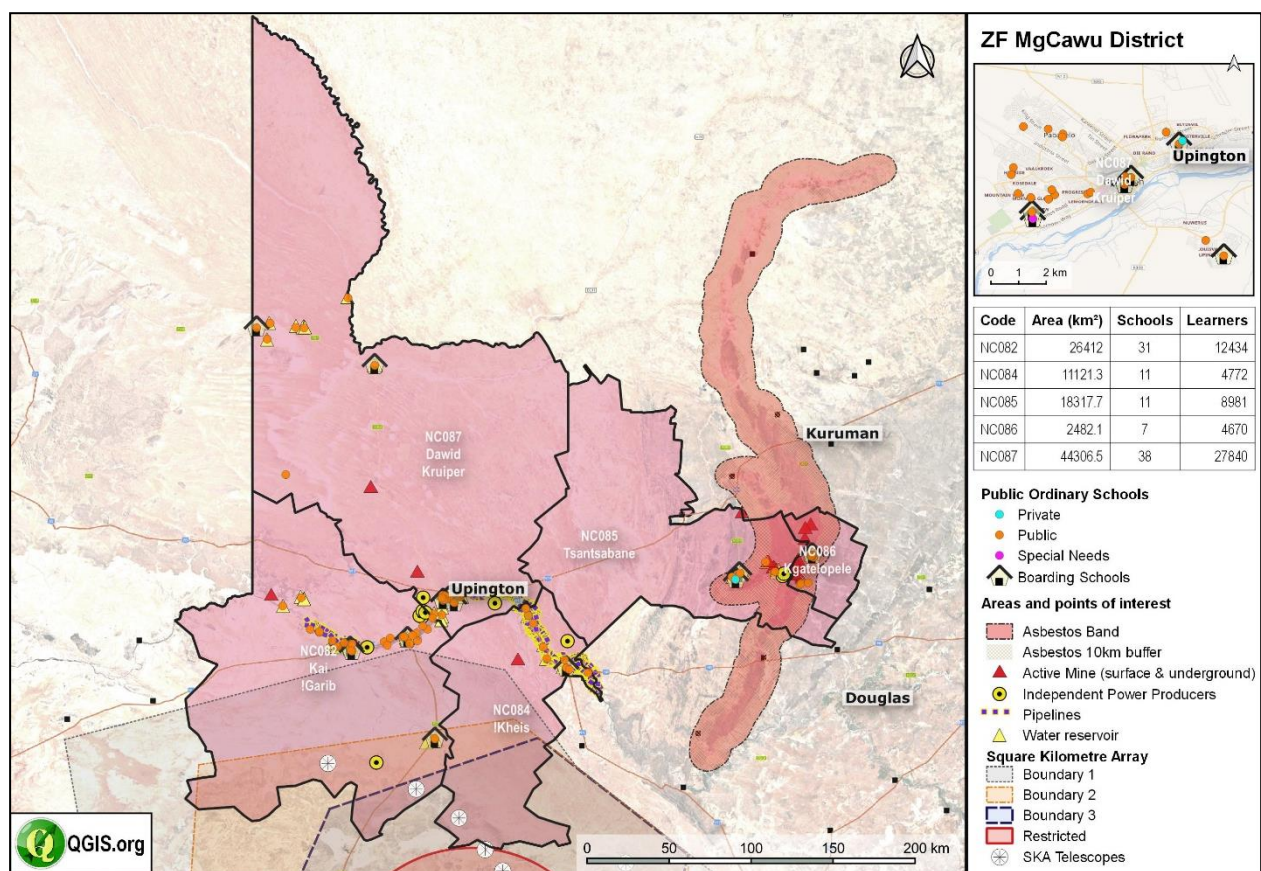
The learner enrolment numbers in Pixley Ka Seme District Municipality have increased over the last ten years by 2.67% and by the last 15 years by 8.55% and fluctuated both decreases and increases over this period. Learner enrolment increased from the 2021 to 2022 academic year with 86 learners. Lessons learned from Namakwa DM, with a history of constant decline over the past 15 years, now allow for mitigation planning and innovative ways to encourage economic growth and the recovery of learner enrolment growth within the Pixley Ka Seme District Municipality. Intervention from the Public sector, specifically within the energy technology domain, will be very positive. For the past eight years, extensive alternative energy development has occurred within the Pixley Ka Seme DM., especially within the Emthanjeni Local Municipality (De Aar area). It lends itself towards international research outcome applications where electricity was replaced with solar at schools. Less emphasis will thus be on new Infrastructure buildings, but more on developing long-term energy solutions schools for the Province. Map 6-7 indicates the Pixley Ka Seme District Municipality with all its Local Municipalities:



Map 6-7: Distribution of Schools in the Pixley Ka Seme
(Source: Wells, 2022)

6.6.5. ZF MgCawu District Municipality

The learner enrolment numbers at ZF MgCawu District Municipality have increased over the last ten years by 6.97% and 14.66% over the last 15 years. Learner enrolment increased from the 2021 to 2022 academic year with 57 learners. The migration patterns between John Taolo Gaetsewe and ZF MgCawu between 2006 and 2011 affected these figures. Mining and Agricultural development along the Orange River contribute extensively toward economic growth and food security. Regarding Physical Resource planning, the Department has the opportunity to develop Agriculture- and Mining related technology schools within the ZF MgCawu District Municipality to attract migration and population growth to the Northern Cape. Map 6-8 indicates the ZF MgCawu District Municipality with all its Local Municipalities:



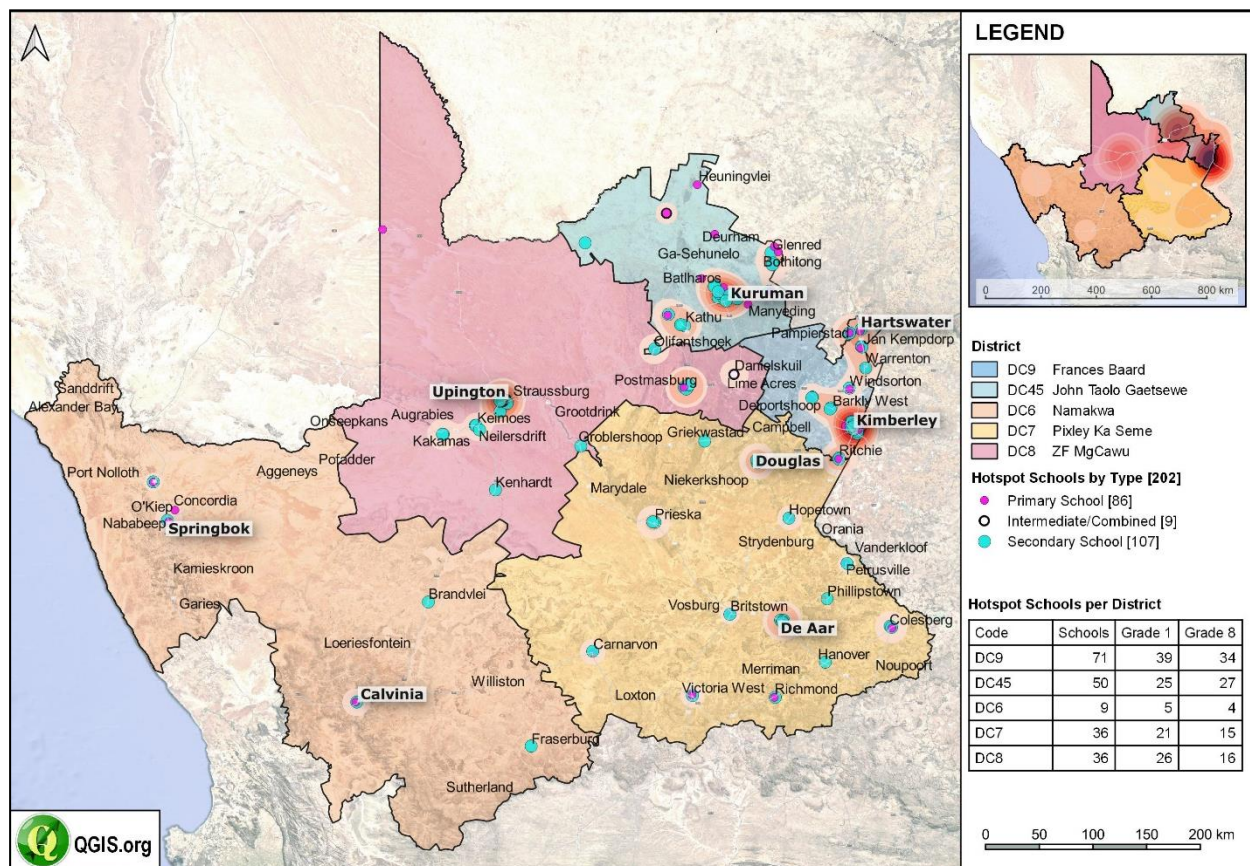
Map 6-8: Distribution of Schools in the ZF MgCawu

(Source: Wells, 2022)

6.6.6. Popular Schools [Hotspot Schools]

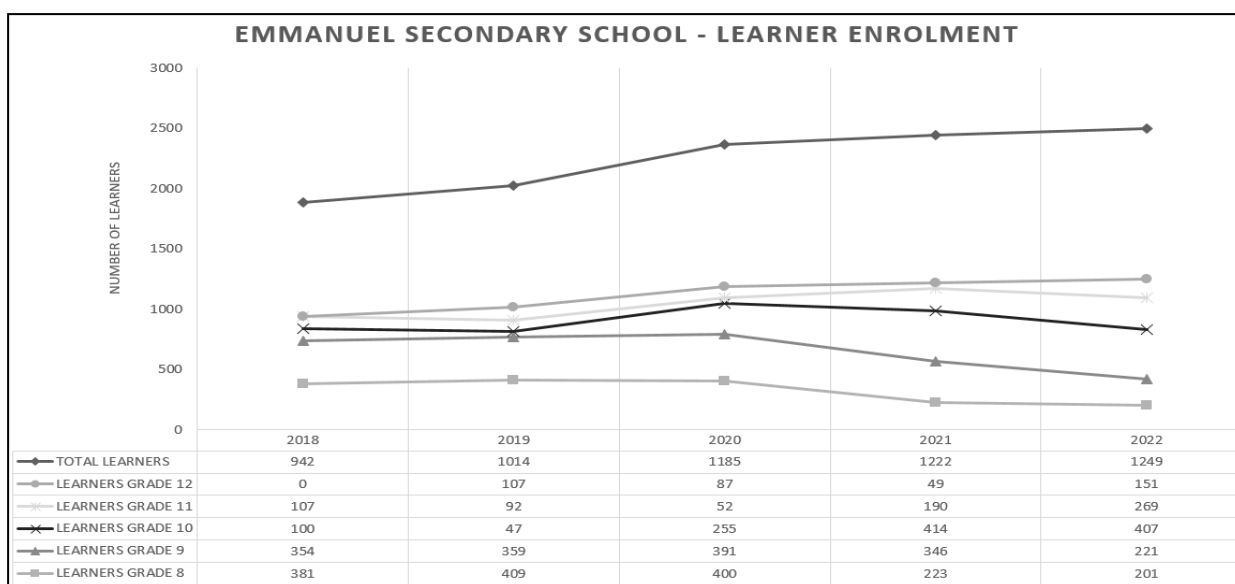
The school choice phenomena in learner enrolment where schools have more than 100 Grade 1 or 100 Grade 8 learners, as the entry grades for Primary and Secondary schools are analysed

geospatial. The spatial demand and supply relationships are evident in Map 6-9, and these schools are located in urban areas with a few exceptions for schools in rural areas:



Map 6-9: Popular "Hotspot" Schools
(Source: Wells, 2022)

For example, according to the map, Emmanuel Secondary School in Kimberley has been recognised as a hotspot school, and Graph 6-2 shows more than 200 grade 8 learners and more than 1000 learners from Grades 8 - 12. Graph 6-2 demonstrates that the grade 8 learner's enrolment since 2018 increased to 2019 and then had a slight decrease in 2020, then a significant decline in 2021 and then to 2022. However, the total learner enrolment in the school increased annually due to the progression of learners to the next grade. A decline in the learner intake for Grade 8 over the last five academic years can be observed; however, the school can still be classified as a popular school (Hotspot school) in 2022.



Graph 6-2: Emmanuel Secondary School Learner enrolment

(Source: Northern Cape EMIS Data)

6.6.7. Special Schools

According to the Guidelines to Ensure Quality Education and Support in Special Schools and Special School Resource Centres, historically, quality education and support inequity were most evident in the “Special Needs sector” (DBE, 2014:4). Special Schools or the Special Needs Sector cater for learners requiring more intensive and specialised forms of support to develop to their full potential. The Northern Cape has 11 Special Needs Schools Apart, whereas most of the Special Needs School for the Northern Cape Province is hosted within Sol Plaatje Local Municipality (DBE, 2001:19).

6.6.8. Independent Schools

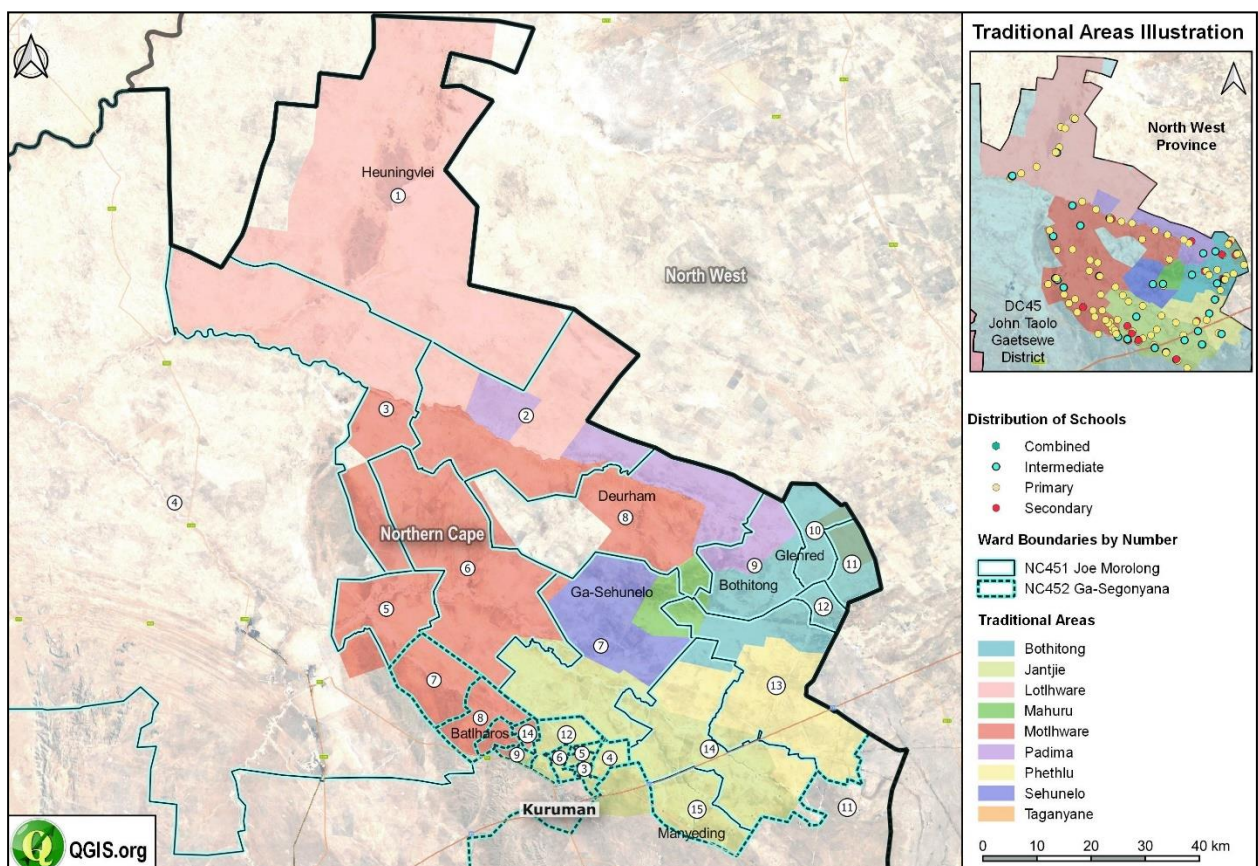
Section 29(3) of the South African Constitution provides “the right to establish and maintain independent schools”. At their own expense, they do not discriminate based on race, must be registered and maintain or exceed the standards of public educational institutions. Section 29(4) of the South African Constitution allows the state to subsidise independent educational institutions (RSA, 1996). The Northern Cape also house 41 independent schools.

6.6.9. Traditional Areas

The Republic of South Africa (2013) recognises that some parts of our urban and rural areas are excluded from the benefits of spatial development planning and land use management systems and recognises that informal and traditional land use development processes are poorly integrated into formal systems and that spatial planning is insufficiently strengthened and

supported by infrastructural investment. It is, however, recommended from an NCDoe view “to establish a Traditional Land Task Team with traditional authorities that will facilitate the demarcation and servicing of sites on traditional land prior to allocation of sites and potential release of land” (John Taolo Gaetsewe District Municipality, 2019:11).

Map 6-10 indicates the traditional areas within the Northern Cape, the main challenge with traditional land is that it is traditionally owned and that interaction with the traditional authorities is required when constructing or acquiring new land.



Map 6-10: Traditional Areas Illustration
(Source: Wells, 2022)

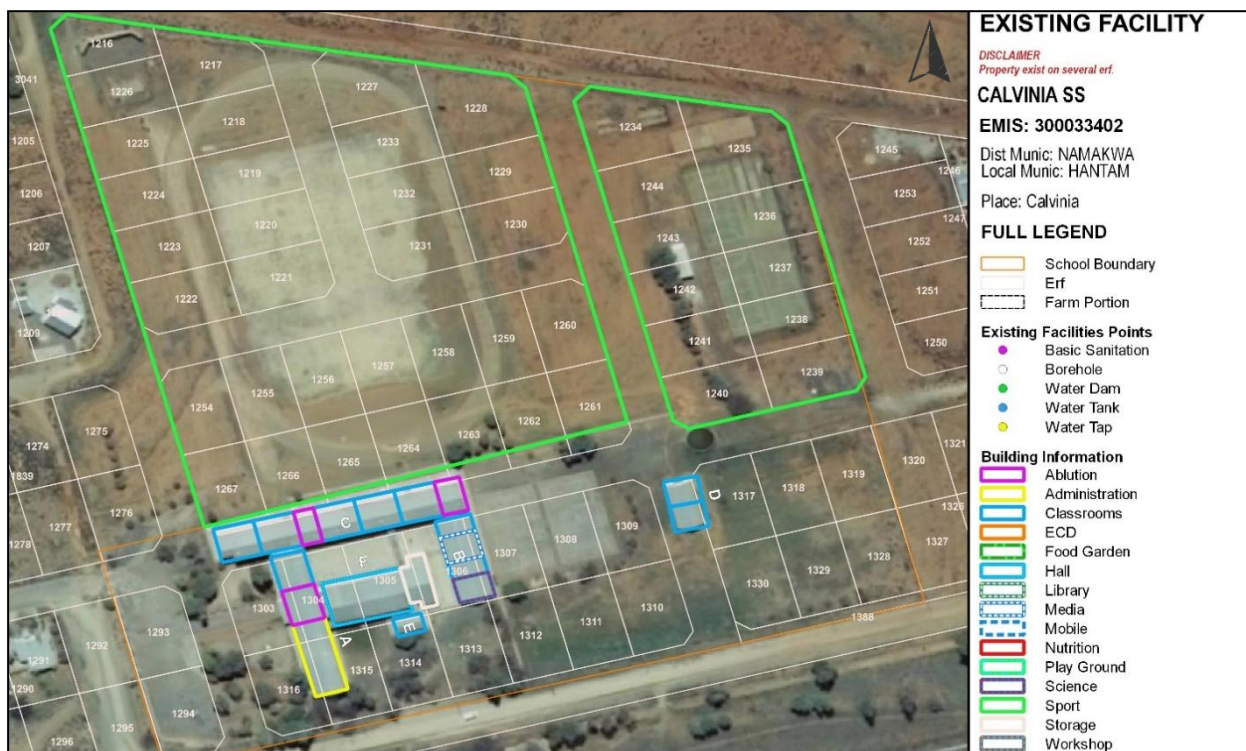
6.7. Learner Transport

The supply of Infrastructure is not just the alignment to the Norms and Standards and the utilisation analyses into facilities planning programmes and projects as it requires a level of interrogation which is aligned to the likely growth, or not, of the areas in which these schools are located as well as information about the proximity of other schools which could accommodate learners if school closures were to occur. Also significant at this level of analysis is an assessment of travel distances, learner transport policies, and policies around the accommodation of learners

in hostels. The Northern Cape is a fast province, and providing school infrastructure within walking distance (5km) of all learners is impossible. Therefore, the Department utilises Learner Transport to provide equitable access to quality education.

6.8. Existing Asset Base for Education Facilities

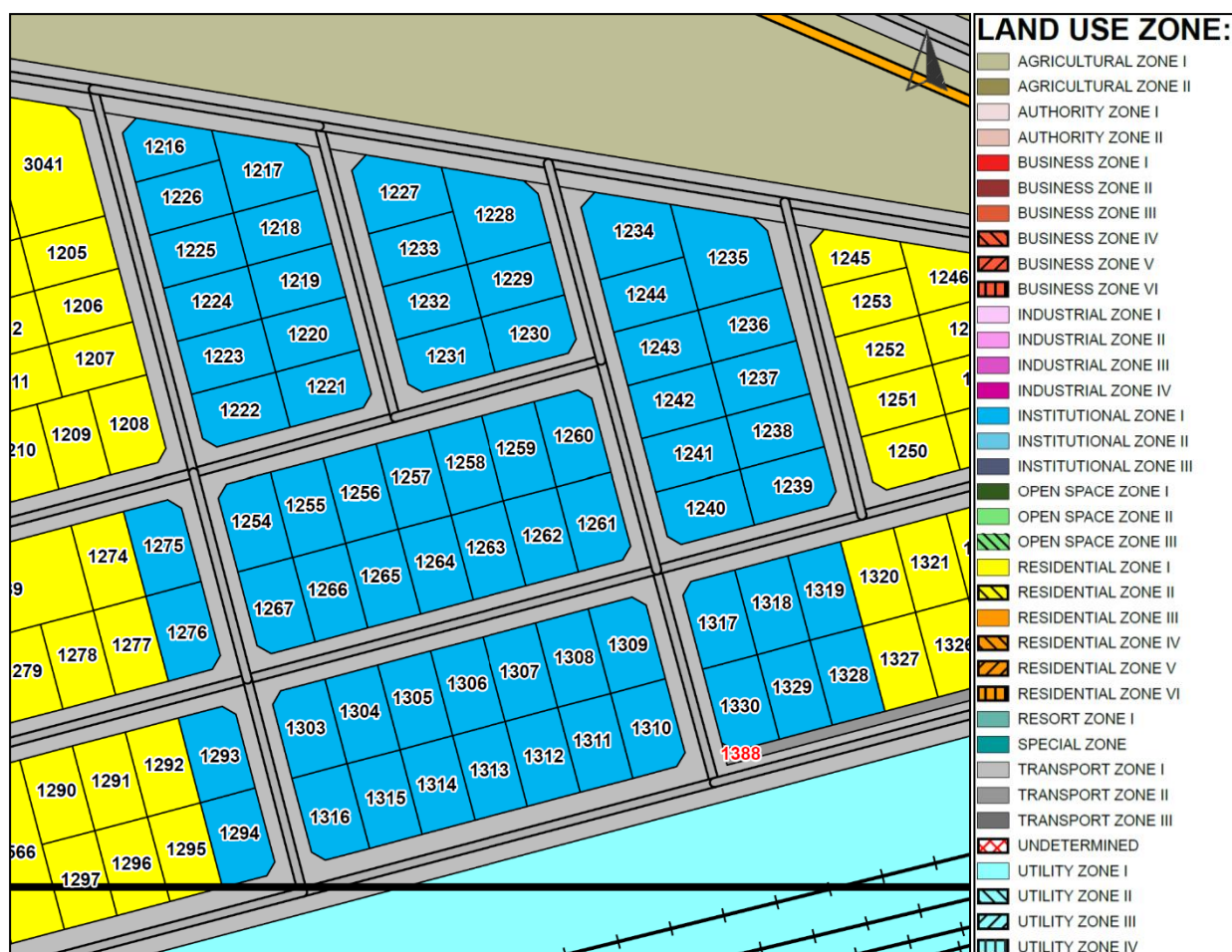
The current portfolio of assets for the department adds up to 1187 assets; as the Northern Cape only has 596 schools, including independent and leased schools, it is evident that there are schools that fall on multiple properties. The implication for the local and provincial government spheres is that rates and taxes are not issued or paid correctly. Hoërskool Calvinia in Namakwa District Municipality, as indicated on Map 6-11, currently falls on 71 properties and is recommended for consolidation.



Map 6-11: Hoërskool Calvinia Properties

Source: Wells (2022)

Map 6-12 indicates that the current zoning of the affected properties is Institutional Zone I, and the land use for Educational Purposes. Therefore, the land use map is accurate regarding zoning and land use. However, several roads are not in existence as the facilities were constructed on the whole area, emphasising the need for these properties to be consolidated.



Map 6-12: Hoërskool Calvinia Land Use Map

Source: Hantam Local Municipality (2022)

According to the Land Use Management Scheme (Hantam Local Municipality, 2022:71-72), the development controls are set out in Table 6-7.

Table 6-7: Development Controls

Development Controls	Zoning Scheme	Current Reality	Compliant Aligned
Zoning	Institutional Zone 1	Institutional Zone 1	Yes
Height	No restriction	Two storeys	Yes
Coverage	All Land Uses: 50%	5% of the Total area However, the largest portion of the buildings fall on an area that is indicated as a road Erf 1304-7, and 1315 are mainly constructed on	Yes
Building lines	Street: 4 m Rear: 4 m Side: 4 m	Erf 1304-7 and 1315 are mainly constructed in building lines	Not Compliant

(Source: Hantam Local Municipality, 2022)

The following figures indicate the current land use of these properties; from these figures, it is clear that the facilities were constructed over them.



Figure 6-2: Drone Photo of Hoërskool Calvinia School
(Source: Author's creation, 2022)

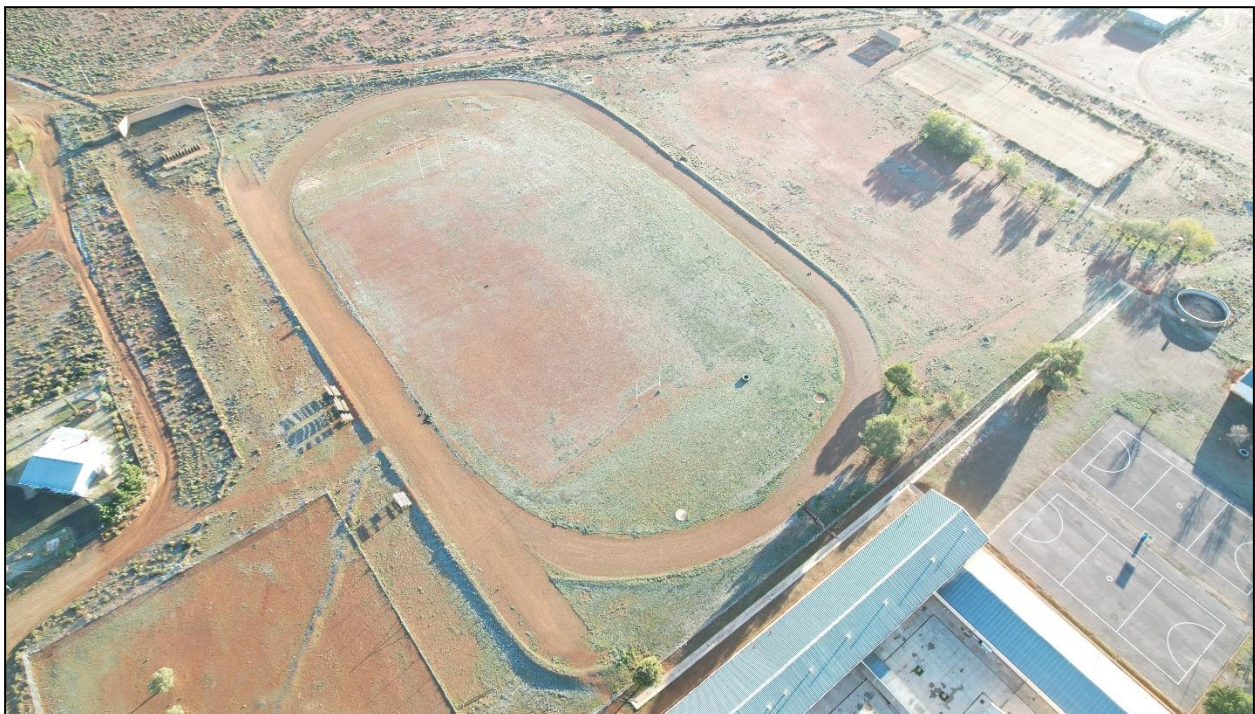


Figure 6-3: Drone Photo of Hoërskool Calvinia Sports Facilities
(Source: Author's creation, 2022)



Figure 6-4: Drone Photo of Hoërskool Calvinia school

(Source: Author's creation, 2022)

The case of Hoërskool Calvinia is not the only case; there are various other land use challenges in terms of the asset base of the NCDoE. The asset register of the Department includes all facilities, vacant land and residences as informed by the Department of Roads and Public Works asset register. According to the GIAMA, the custodianship of all immovable assets lies with the Department of Public Works (The Presidency, 2007).

Table 6-8: Asset Register Summary

DISTRICT	NUMBER ASSETS	OF	MUNICIPAL VALUATION	MARKET-RELATED VALUATION
FRANCES BAARD	224	R	631 241 500	R 1 539 041 002
JOHN TAOLO GAETSEWE	258	R	204 622 600	R 53 929 000
NAMAKWA	256	R	239 737 100	R 258 042 480
PIXLEY KA SEME	237	R	317 309 182	R 146 404 070
ZF MGCAWU	212	R	281 475 100	R 164 968 500
TOTAL	1187	R	1 674 385 482	R 2 189 385 052

(Source: Northern Cape Department of Roads and Public Works, 2022)

The case of Hoërskool Calvinia is not the only case; there are various other land use challenges in terms of the asset base of the NCDoE. The asset register of the Department includes all

facilities, vacant land and residences as informed by the Department of Roads and Public Works asset register. According to the GIAMA, the custodianship of all immovable assets lies with the Department of Public Works (The Presidency, 2007).

Table 6-8 above indicates that the Frances Baard District has the highest values of assets in terms of Market valuation and the fourth-highest number of assets. This high value is because these schools are in more urban areas and are comparatively larger. Pixley Ka Seme District Municipality has the second-highest number of assets, yet the value is the second-lowest. This number of assets is because schools in the area are comparatively smaller due to the rural location of many schools in this district.

The alignment of verifiable information on the asset register and the infrastructure database has formed the basis for quantifying the current values of assets in the province. However, the Department established that the valuations on the asset register are outdated. Therefore values were calculated by the number of different infrastructure buildings considering their current condition and then added to the property value as indicated on the asset register provided by DRPW. Table 6-9 provides a summary of facilities:

Table 6-9: Summary of the Value of Education Facilities

District	Number Of Facilities	Capital Cost	Current Value	Replacement	Annualise Asset Cost
Frances Baard	151	R 1 889 656 473	R 5 970 051 814		R 790 787 114
John Taolo Gaetsewe	185	R 1 292 182 798	R 4 924 699 311		R 319 710 762
Namakwa	85	R 524 554 671	R 1 991 746 416		R 158 715 279
Pixley Ka Seme	102	R 855 285 000	R 3 421 145 050		R 297 220 202
ZF MgCawu	108	R 866 711 891	R 3 417 710 556		R 451 441 942
Grand Total	631	R 5 428 390 832	R 19 725 353 146		R 2 017 875 299

(Source: Northern Cape Department of Roads and Public Works, 2022)

From table 6-7, it is clear that the figures as indicated in the Asset Register, which amounts to R1,6 billion, are outdated as the calculations of the current asset value done by the Department indicate that the value of the assets is R5,4 billion. Most of the Department's assets are used for school (educational) purposes. However, there are numerous other land uses, such as Sports grounds and Hostels. Land not utilised for its intended purpose per the current zoning should be rezoned accordingly and in line with SPLUMA and the Land Use Management Schemes of the relevant Municipalities. The land-use profile of the NCDoe's Assets is indicated in Table 6-10:

Table 6-10: Land use of Assets

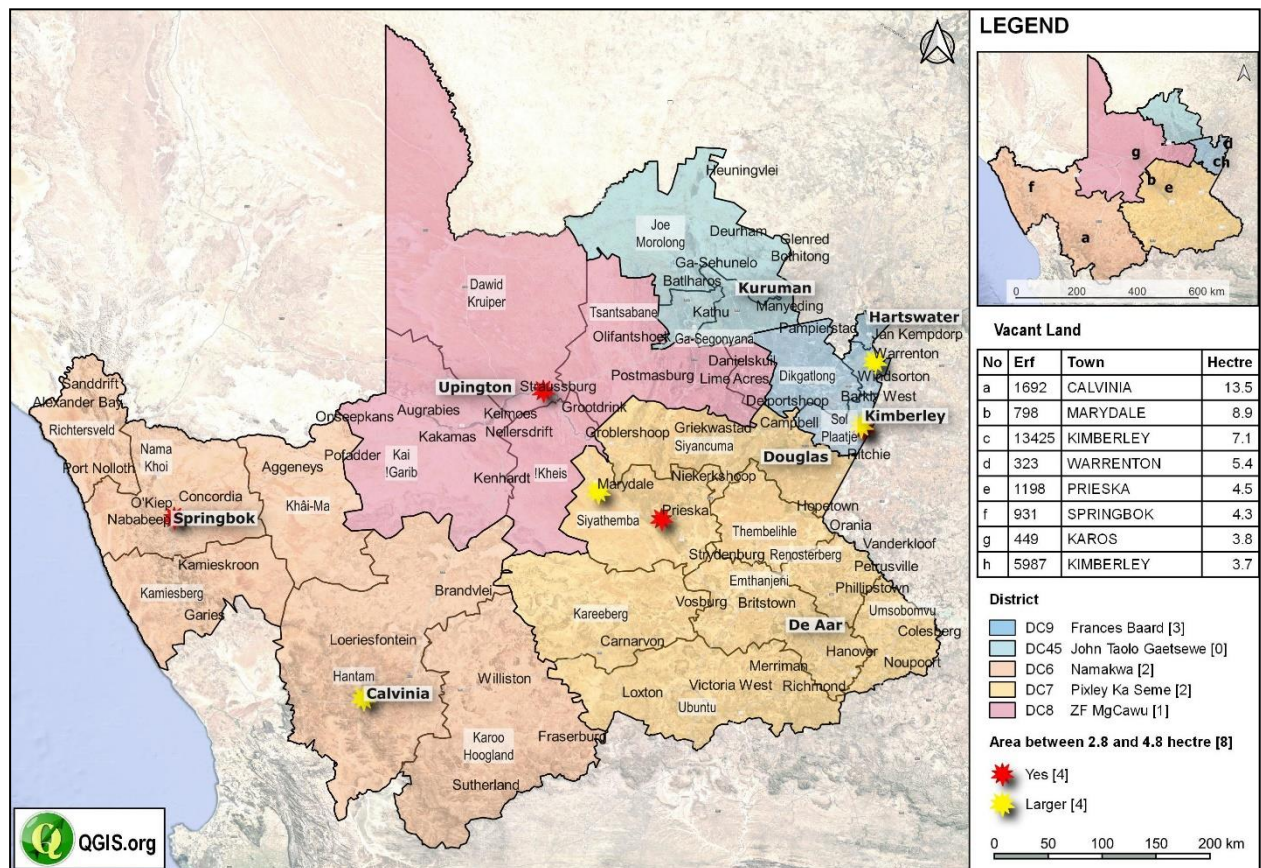
Land Use	Frances Baard	John Taolo Gaetsewe	Namakwa	Pixley Ka Seme	ZF MgCawu
Access Road			1	1	1
Agriculture	2	1			14
College	3			1	
Hostel	7	2	26	16	9
Library			2		
Offices	9	1	2	1	
Pre-Primary School			1		
Residential	8	1	16		
School	167	246	187	172	144
School & Clinic	1				
School & Hostel	2		4	7	4
Sportsground	22	5	14	23	20
State-Owned Residence					3
Vacant Land	5	2	3	6	12
Vineyard					2
Grand Total	226	258	256	238	209

(Source: Northern Cape Department of Roads and Public Works, 2022)

According to the Department's Asset Register, there are currently twenty-eight Vacant Land parcels, five in Frances Baard, two in John Taolo Gaetsewe, three in Namakwa, and six vacant land properties in Pixley Ka Seme and 12 in ZF MgCawu District Municipality. The vacant land for ZF MgCawu increased by three assets since the 2018/19 Asset Register. The other district's vacant land decreased due to an asset's land use incorrectly captured in the Department of Roads and Public Work's Asset Register. The department will explore utilising these pieces of land in future development. Furthermore, the Department is in the process of identifying all vacant land zoned for Educational Purposes in the Northern Cape in collaboration with the Municipalities to upkeep the vacant land register for future development.

The following map indicates all vacant properties within the Northern Cape, and the minimum required size. The minimum required space that should accommodate the school buildings and sports grounds is 2.8 ha for a Primary school and 4.8 ha for a Secondary school. Therefore sites smaller than 2.8 ha will be considered to be surrendered back to the custodian. In consultation with the Northern Cape Department of Roads and Public Works on acquiring new sites to construct new schools, vacant land was identified that meets Primary and Secondary school site

sizes. As these sites are already state-owned and can, therefore, just be subdivided if necessary and rezoned for Educational Purposes, Map 6-13 indicates these identified sites:



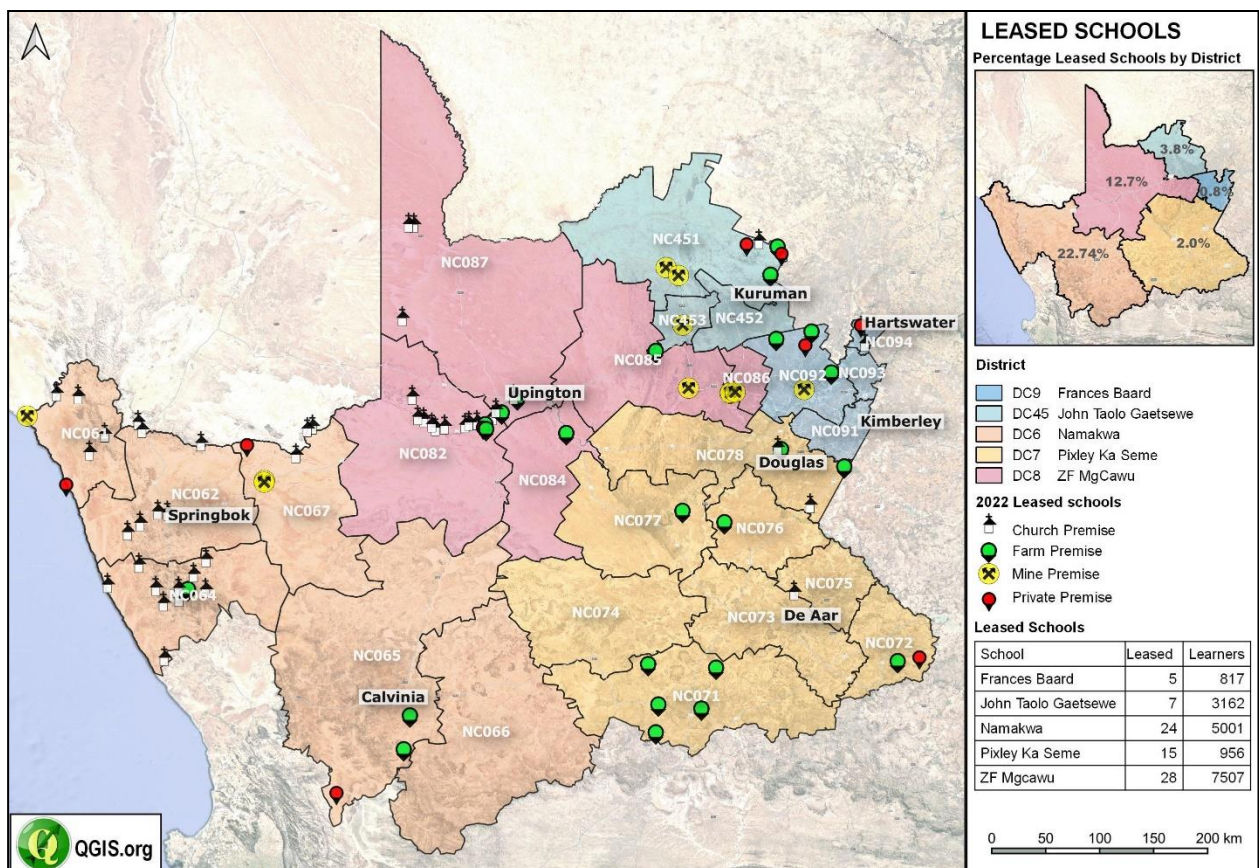
Map 6-13: State-Owned Vacant Land location

(Source: Wells, 2022)

As the custodian, the Northern Cape Department of Roads and Public Works conducted a full Asset Condition Assessment for each of the current immovable assets. This assessment assisted in determining the planning of infrastructure and identified maintenance requirements that the Department could prioritise and budget for the current state of the Department's capital assets.

The NCDoe has 49 leased facilities, a total of which two of these facilities are standard leases located in Frances Baard (Jannie Brink Special School) and Namakwa (RVV Building) and a total of 47 Section 14 leased facilities. Leased facilities are maintained and upgraded thru the various contractual agreements between the Department and the lessor. Both of these leased facilities obtain a fair performance level rating and utilisation. The Department is determined to limit the number of leased properties on its asset register to properties with no feasible or viable alternative to provide the necessary accommodation but to lease. In terms of Section 14 Leases, the department has 47 leases. In terms of section 29 of the Constitution of the Republic of South Africa (1996), "all children have a right to basic education irrespective of their geographical

location” (RSA, 1996). The 2005 Ministerial Committee Report on Rural Education alludes to the poor quality of education in public schools on private property (PSOPP), particularly in farms and rural areas. The protracted process compromises education quality in concluding Section 14 Agreements as envisaged in South African Schools Act (SASA). Furthermore, the findings of the Ministerial Committee endorse the idea of more effective and creative implementation of Section 14 to enhance the delivery of quality public education. In line with the effective delivery of quality education, the following map indicates the schools per district managed under the conclusion of Section 14 Agreements effectively and efficiently.



Map 6-14: Leased Schools

(Source: Wells, 2022)

All reasonable maintenance, including insurance, security to the buildings and immovable assets and improvements, is the owner's responsibility in the Deeds Registries Act, 1937 (Act No. 47 of 1937). The DoE resolved that if such maintenance is the school's responsibility, an agreement must be entered between the school and the Owner stipulating the extent of the maintenance. This agreement may be entered between the school and the Owner only if the SGB has been allocated section 21(1) function in SASA. In the spirit of quality education and maintaining the school buildings and other physical amenities, regular meetings between the landowner and the

SGB are necessary. The landowner must be provided with the constitution of the SGB and the South African Schools Act (refer to the legislative framework above) to facilitate the awareness of school governing bodies' obligations, roles, and responsibilities. Additions to the existing building should be made under the agreement between the landowner and the MEC for Education. If the agreement does not stipulate such a proviso, it must be amended to add the existing building. The agreement must also provide compensation for additional improvements made to immovable assets in case of a merger (section 12 A of SASA) or closure (section 33 of SASA). Parties to the agreement must honour their obligations regarding the maintenance of the property.

Schools and properties closed have been disposed of and surrendered to the Department of Roads and Public Works. Disposal is an efficient measure to reduce the cost of unviable schools and construct spaces that allow the department to control better learner attendance, given the volatile political landscape of the John Taolo Gaetsewe district. For instance, in the Pixley Ka Seme District, the interactions with the district office have informed the possible closure of schools in progress with the respective communities. Seven (7) schools in the district are being considered for closure. Once this process has been concluded, the necessary interventions to provide suitable infrastructure at the affected schools where the learners will be relocating to and subsequent planning and infrastructure implementation.

The Department of Public Works currently deals with the disposal strategy in line with GIAMA requirements as custodian of infrastructure assets in the province. The Department, as indicated above, does not surrender viable assets to DRPW due to the continued identification of alternative utilisation of under-utilised assets at schools. For instance, this means that before the surrender of an asset, the Department would determine whether an unused classroom would be fit for conversion into a laboratory or multi-purpose classroom. The cost of conversion into a computer laboratory is far less than constructing a new structure. The engagement with municipalities and interrogation of development plans, the engagement with the districts and other departments, and adopting a “wait and see” approach may inform economic developments in areas once considered non-viable. If growth occurs in these areas, the department may revisit these obsolete schools and improve the current infrastructure to accommodate additional learners.

For instance, the hostel at Gariep High School in Prieska had been earmarked for surrender to the Department of Roads and Public Works as it was not utilised. An influx of learners is expected in Prieska due to difficulties experienced with learner transport from Marydale and Griekwastad. The envisaged solar power project in the Prieska area will contribute to the influx of learners. Therefore a decision to revamp and retain the hostel has been taken to benefit the learners and

the department. Value for Money must be realised when an immovable asset is disposed of or acquired. The re-evaluation of identified obsolete assets in collaboration with the DoE district offices is intended to inform future circuit offices' needs. In some instances, it is anticipated that various obsolete and unused infrastructure assets can be converted into critical office accommodation for the circuits as long as they meet the space requirements per the respective circuit office organograms.

6.9. Life Cycle Costing

To optimally plan for educational facilities, it is necessary to reflect on the integration of asset base assessment and land use planning. Planning for the facilities' life cycle is key to optimising the current assets and funding and ensuring that facilities remain sustainable and viable. The department has captured this verified data on the Education Facility Management System (EFMS) and the departmental infrastructure database and accurately reflects all data in the attached relevant templates.

The departmental infrastructure database allows the province to generate a complete life cycle costing on all immovable assets and informs the routine maintenance and the condition-based maintenance required at all schools. The following tables are examples of the different scenarios and assets concerning the current life cycle costing and the viability of maintaining current assets for the next 30 years. Table 6-11 indicates where the asset is over its presumed lifespan of 100 years. The cost of maintaining the asset surpasses the cost of replacement. One school have been identified, and a feasibility study will be conducted to determine the remaining lifecycle.

Table 6-11: Assets that are over their original presumed lifespan

Asset Description	Acquisition Date	Capital Cost	Current Replacement Value	Annualised Asset Cost
Waterworks Primary School	1907	R 4 796 027.89	R 9 601 171.33	R 11 320 284.36

(Source: Author's creation, 2022)

Error! Not a valid bookmark self-reference. indicates where the annualised asset cost determines that the cost of maintaining the asset over 30 years is significantly less than the replacement cost of a new asset. Continued maintenance of these assets remains viable for the department.

Table 6-12: Assets that have a remaining lifecycle of over 15 years left

Asset Description	Acquisition Date	Capital Cost	Current Replacement Value	Annualised Asset Cost
Assmang Primêre Skool	1977	R 11,111,188	R 55,627,860	R 18,102,043
Hoër Landbouskool Noord-Kaapland	1957	R 10,321,414	R 79,798,770	R 13,235,260
Lime Acres Primary School	1993	R 7,213,615	R 43,248,232	R 12,697,221

(Source: Author's creation, 2022)

A total of 426 schools still have a lifecycle of more than 15 years left of the 100-year lifespan. Furthermore, the verified data allowed the province to generate a 10-year plan based on the current condition and infrastructure backlog. This database has formed the baseline, and EFMS is updated when projects are completed to inform planning and provide real-time data.

Developing a comprehensive life-cycle asset management system is an essential asset management component. The operationalisation of the NEIMS system and the registration of the asset register on the EFMS will form the backbone of the NCDoe's envisaged eventual infrastructure maintenance strategy. The maintenance is conducted to identify first-line school maintenance requirements and apply appropriate interventions to attend to these needs. The department's assets' current value adds up to R 5 428 390 832, and the total replacement value was R 19 725 353 146. The asset cost of R 2 017 875 was determined over the asset's presumed lifespan of 100 years. Taking into account that the department only had the SG Diagram date and the known historic buildings that were verified through DRPW's Condition Assessments to work with, the conclusion was as follows:

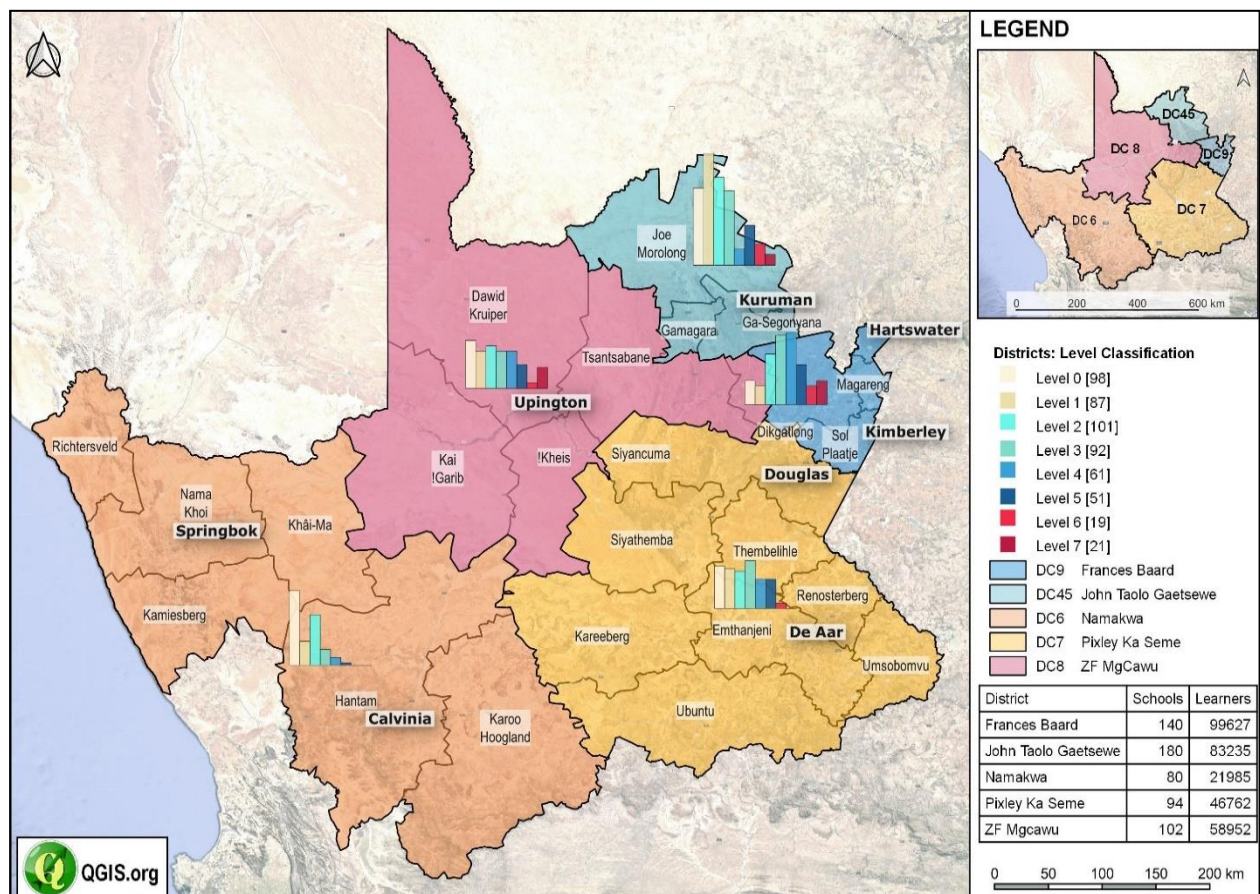
- Where the asset is over its presumed lifespan of 100 years, the cost of maintaining the asset exceeds the cost of replacement. A total of 1 school has been identified, and a feasibility study will be conducted to determine the remaining lifecycle.
- Where the asset is over its presumed lifespan of 100 years, the cost of maintaining it does not exceed the replacement cost. A total of 56 schools have been identified, and a feasibility study will be conducted to determine the remaining lifecycle.
- Suppose the asset has a remaining lifecycle of between 1 and 15 years. Maintenance costs do not exceed the replacement cost, and there is a slight difference between the current asset value and the analysed asset cost. The continued viability of these 28 schools will therefore be determined. It is concluded that these assets will fall under planned maintenance.
- A total of 426 assets still have a lifecycle of more than 15 years left of the 100-year lifespan; the analysed asset cost decreases where the assets still have a long lifecycle left continued maintenance is viable.

6.10. Level Classification

Instead of classifying schools as Micro, Small, Medium, Large and Mega Schools, where the schools are planned for the current learner numbers, the Northern Cape Department classified schools as levels indicating the classes per grade. The former method allowed for the learner

numbers to be divided by 40 learners per classroom, not taking into account the classes per grade, resulting in a shortage of classrooms in the long run.

The classification of levels indicates how many classrooms the school will host per grade, e.g. a level 3 Primary school will have three classrooms for each grade (Grades 1-7), which equals 21 classrooms, and a level 4 Secondary School will have four classrooms per grade (Grades 8-12), which equals 20 classrooms. Classifying the schools at levels allows for planning enough classrooms for growth, double medium language teaching, and enough classrooms for learners' progress to the next grade. Level classification is a much more forward way of thought and prevents the Department from regularly revisiting the schools with classroom additions. In line with these level classifications, the recommendation is to develop a master plan for each facility. Map 6-15 indicates the level classification distribution in the districts:



Map 6-15: School-Level Classification Distribution

(Source: Wells, 2022)

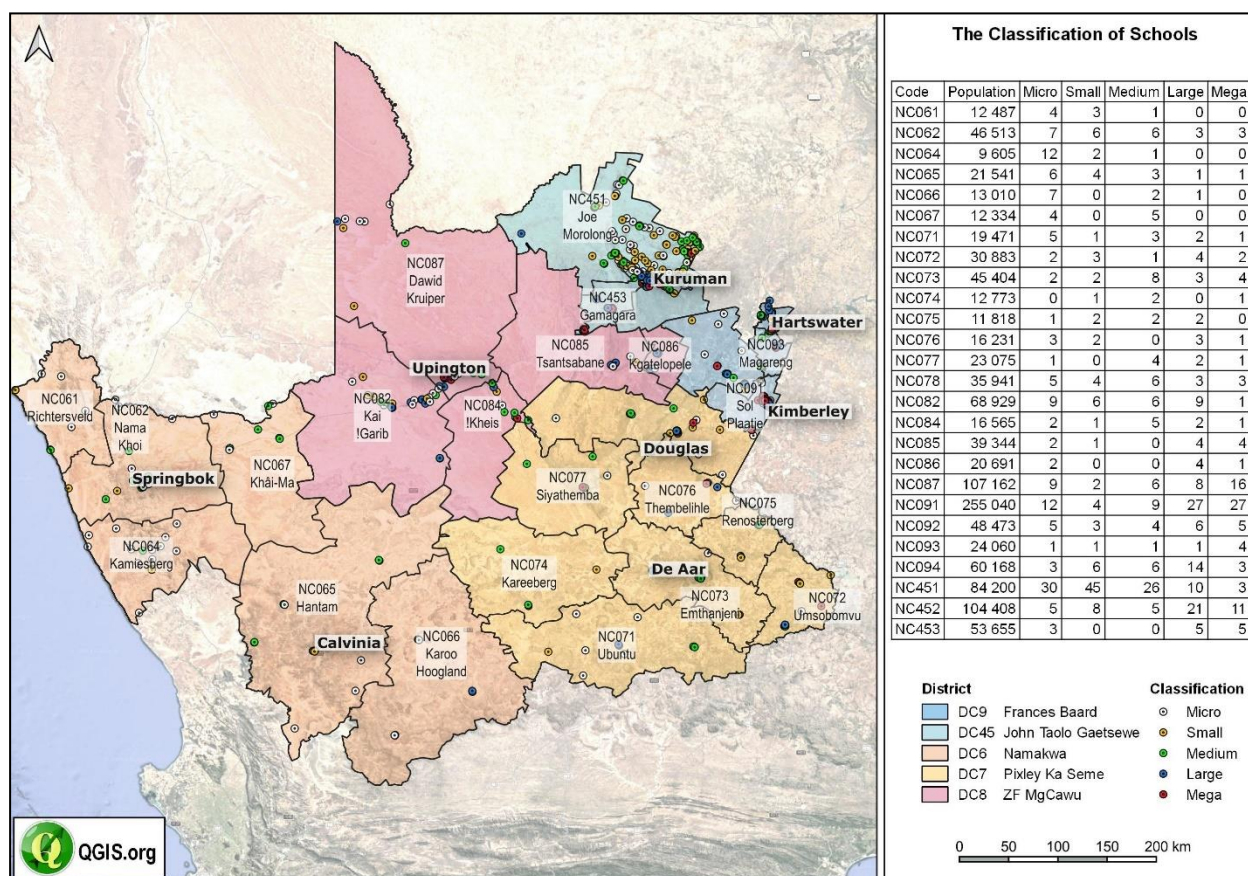
6.11. Current Supply of School Infrastructure

The Northern Cape has 596 schools; this includes the 11 Special Schools and the 40 independent schools with a total of 310 561 learners. Most learners and schools are in the Primary Phase

contributing 49,9 % of the learners and 53,1% of the schools. The Secondary Schools contribute 26,1 % of the learners and 19,1% of the schools to the Northern Cape. The other numbers are Intermediate, Special Schools and Combination schools. The majority of schools are located in John Taolo Gaetsewe District Municipality (31%); however, this District does not have an immense amount of learners (27,1%), and the majority of learners are located in Frances Baard (31,8%). In contrast, Namakwa has the smallest amount of schools (13%) and learners.

The Department is driven to ensure the accessibility of all its learners to quality education delivered in safe, accessible, and quality education facilities. However, in the Northern Cape, very small/micro-schools compromise their efforts to provide curriculum support efficiently and cost-effectively. Regardless of the size of a school, the Department must give adequate teachers and appropriate school facilities with a sufficient number of classrooms and other functional spaces, which has significantly affected the Departmental budget. Learners in micro-schools cannot always have a broad subject choice, especially in secondary schools. There are also limited sports codes; therefore, participation in sports and other extracurricular or extramural activities is compromised. The effectiveness of teaching is also affected by multi-grade teaching in some micro primary schools.

Therefore, the Department considered it prudent to close down some micro-schools and merge them with nearby schools as part of the School Rationalisation Process. Thus, the primary objective of the School Rationalisation Process is to ensure that, where possible, micro-schools that are unviable/non-viable are closed down and merged with nearby schools, having considered factors. The following map provides the location of these micro and small schools within the Northern Cape. From Map 6-16, it is clear that the majority of micro-schools are located in Namakwa and Pixley Ka Seme District and that the small primary schools are mainly located in John Taolo Gaetsewe, and that majority of the special and independent schools are located in Kimberley:



Map 6-16: School Classification Distribution
(Source: Wells, 2022)

The medium and large schools within the Northern Cape are mainly the schools located within the urban areas of the District Municipalities. A Medium primary school is a school with a minimum capacity of 311 learners and a maximum capacity of 620 learners with two classes per grade, whereas a large primary school with a minimum capacity of 621 learners and a maximum capacity of 930 learners with three classes per grade. A Medium secondary school has a minimum capacity of 401 learners and a maximum capacity of 600 learners, with four classes per grade. A large secondary school has a minimum capacity of 601 learners and a maximum capacity of 1000 learners, with five classes per grade. Mega Schools are classified when Primary Schools exceed 931 learners and secondary schools exceed 1001 learners; these schools are located in the major urban areas within the province, such as Kimberley, Kuruman, Kathu, Upington and Springbok. The demand for classrooms and ablution facilities is driven by the number of learners at the institution. The Norms and Standards speak to 1:40 learners per classroom for Primary Schools and 1:35 learners per classroom for Secondary Schools.

Consideration must be given to the overcrowding at certain schools in the Kimberley area, where it is feasible to construct additional learning spaces. The construction of additional classrooms cannot be viable if there are not enough educators to teach in these classes. Other areas, such as Hartswater in the Frances Baard district, require additional classrooms to accommodate more learners. It has been identified that learners from Hartswater attend schools in Kimberley, which is approximately 100km away. The provision of classrooms in the area will alleviate the burden on the current accommodation available in Kimberley. Once all consultations with the districts have been concluded, the Department will be better positioned to identify the critical intervention areas and apply the most appropriate measures to ensure that learners in problem areas are accommodated accordingly. Table 6-13 indicates the number of learners per classroom for the 2022 Academic year. Table 6-13 above shows that all districts' average learner/classroom ratio is within the Norms and Standards. This ratio does not consider that there are classrooms in the districts that are severely overcrowded or underutilised. Though the learner/classroom ratio average is within the Norms and Standards, the anomalies between underutilised and over-utilised schools do not reflect that ratio. The Norms and Standards indicate a range of ratios for sanitation requirements for Public Schools, depending on the size of the school.

Table 6-13: Current Learner/Classrooms ratio

District Municipality	Number Learners	of	Number Existing Classrooms	of	Learner Classroom Ratio	/	Number Classrooms Gap	of	The Number of Schools affected
Frances Baard	99627		3094		32		158		46
John Taolo Gaetsewe	83235		2312		34		190		46
Namakwa	21985		1150		19		35		10
Pixley Ka Seme	46762		1629		29		138		30
ZF MgCawu	58952		1892		31		84		30
TOTAL	310561		10077		29		605		162

(Source: Author's creation, 2022)

The department aims to attain a ratio of 1:22 learners per toilet seat. Table 6-14 indicates the number of learners vs the number of toilet seats for the 2022 Academic Year. According to Table 6-14, the average learner/toilet ratio in John Taolo Gaetsewe, Frances Baard, and ZF MgCawu exceed the average learner ratio in Namakwa by almost double; this is mainly due to Ventilated Improved PIT Latrines within the District. The Department furthermore renovates existing ablution facilities within the districts to ensure adequate ablution supply. The greatest need for ablution facilities is in John Taolo Gaetsewe.

Table 6-14: Current Learner/Toilet seat ratio

Ablutions Per District	Number of Learners	Number of Toilet Seats	Average Learner-Toilet Ratio	Number of Toilet Seats Needed	Number of Additional Ablution Blocks Required	The Number of Additional Schools Affected
Frances Baard	99627	3 968	25	190	74	49
John Taolo Gaetsewe	83235	2 385	33	562	105	77
Namakwa	21985	1 684	13	140	18	15
Pixley Ka Seme	46762	2231	21	238	51	29
ZF MgCawu	58952	2 391	24	140	57	26
Total	310561	12 659	23	1 270	305	196

(Source: Author's creation, 2022)

6.12. Current Gap Analysis for Northern Cape Department of Education

To determine the current gap through a Gap Analysis, the process is described in section 5.4 (Source: Author's creation, 2022)

Gap Analysis, and Graph 5-1: Gap Analysis Generic planning processes.

were utilised to determine the gap between the optimal asset and the currently utilised asset to determine a quantified need statement for each of the strategic programmes of the NCDoe. The gaps were identified by the NIEMS and Condition Assessment data on EFMS. Consultation with other stakeholders, such as the Early Childhood Development Directorate, also identified the critical gaps in providing ECD classrooms for foundation phase learners. Consultations with curriculum directorates identified critical needs. The department identified alternative solutions that increase the asset's cost-benefit, such as converting unused classrooms into computer labs, science laboratories, libraries, etc., at specific schools to provide enriched learning environments and address identified gaps.

Table 6-15: Gap Analysis

Programme	Optimal Assets	Gap Between Optimal Assets and Currently Utilised Assets	Quantified Need Statement
Programme 1: Administration To provide management and support to the education sector under the National Education Policy Act, Public Finance Management Act and other relevant policies.	Head office IK Nkoane Education House to accommodate 974 officials	Head office IK Nkoane Education House to accommodate an additional 434 officials	Locality: Kimberley Type of accommodation: Offices Specialised requirements: Additional conference and storage facilities
	Frances Baard District Office to accommodate 290 officials	Frances Baard District Office to accommodate an additional 112 officials	Locality: District Offices
	John Taolo Gaetsewe	John Taolo Gaetsewe District Office to accommodate an additional 161 officials	Type of accommodation: Offices

Programme	Optimal Assets	Gap Between Optimal Assets and Currently Utilised Assets	Quantified Need Statement
	District Office to accommodate 292 officials Namakwa District Office to accommodate 277 officials Pixley Ka Seme District Office to accommodate 281 officials ZF MgCawu District Office to accommodate 282 officials	Namakwa District Office to accommodate an additional 168 officials Pixley Ka Seme District Office to accommodate an additional 161 officials ZF MgCawu District Office to accommodate an additional 159 officials	Specialised requirements: Additional conference and storage facilities
Programme 2: Public Ordinary School Education To provide ordinary public education from Grades 1 to 12 under the South African Schools Act	Upgrades and Additions in terms of Basic Safety	Conversions are considered where the school is underutilised and does not have all the required areas	Conversions: 45 schools
	New and replacement assets Upgrades and additions Rehabilitation, renovations, and refurbishments	Most schools in the province are provided electricity through a grid connection. However, some schools experience insufficient supply, whilst others are served through solar power, and very few have been identified as having no electricity. Schools with a C1 & C2 rating will receive either new connections or significant upgrades, whilst C3 to C5-rated schools will receive minor upgrades and maintenance to their electricity supply.	Electricity: 139 schools
		Fencing at schools in the province is of varying types, and to bring the fencing at schools to the required standard as per the Norms and standards, the department intends to replace all fences with a C1 and C2 rating, whilst fences with a C3 rating that may require replacement or upgrading.	Fencing: 150 schools (including replacement schools)
		Schools were identified to improve accessibility by providing ramps for disabled learners as they currently cater for disabled learners.	School Accessibility: 46 schools (including replacement schools)
		All schools in the Northern Cape do not have sufficient security and storage.	Security and Storage: 82 schools (including replacement schools)
		The provision of water includes drilling boreholes to augment erratic water supply to schools that have achieved a C1 – C3 Condition Rating, whilst schools that achieve a C4 & C5 rating will be subjected to the upgrading or maintenance of current water reticulation supplies to schools.	Water: 268 schools (including replacement schools)
Programme 3: Independent School Subsidies To support independent schools under the South African Schools Act	Independent schools are supported and monitored by the Department of Education	Independent schools are supported and monitored by the Department of Education	Independent schools are supported and monitored by the Department of Education
Programme 4: Public Special School Education in special schools under the South African Schools Act and	Repairs and Renovations, as well as Upgrades and Additions	Included in Programme 2: Public Ordinary Schools	Included in Programme 2: Public Ordinary Schools

Programme	Optimal Assets	Gap Between Optimal Assets and Currently Utilised Assets	Quantified Need Statement
White Paper 6 on Special Needs Education: Building an Inclusive and Training System			
Programme 5: Early Childhood Development To provide Early Childhood Education (ECD) at the Grade R level under White Paper 5.	Ensure classrooms and mobiles are provided where there is potential growth and to public schools with no Grade R thru new infrastructure	Out of all primary schools catering for Grade R learners in the Northern Cape, a total of 91 were identified for ECD classrooms	ECD 140 schools & 190 classrooms (including replacement schools)
Programme 6: Infrastructure Development To provide and maintain infrastructure facilities for schools and non-schools	3-Year Implementation Programme: All Public schools in the Northern Cape must have access to water, power and sanitation, and all inappropriate structures built from materials such as mud, asbestos, metal and wood must be eradicated. 7-Year Implementation Programme: By the end of the 2019/20 financial year: All Public schools must have adequate classrooms, electricity, water, sanitation, electronic connectivity, perimeter security and admin facilities, and ECD facilities and access for the differently-abled learners in the province. 10-Year Implementation Programme: By the end of the 2022/23 financial year: All Public schools must have access to libraries, media centres, computer centres, laboratories for science, technology and life sciences, school halls and/or multi-purpose classrooms and overcrowding in schools must be addressed. 17-Year Final Implementation Programme: By 31 December 2030: All Public schools must be adequately accessible and identified. Schools must have sports and recreation facilities, caretaker and security facilities, nutrition centres, and storage.	The NEIMS Assessments and Condition Assessments from DRPW show the number of buildings and their conditions.	Administration Blocks: 377 schools
		Classroom Block was identified where schools had overcrowding and exceeded the 1:40 classroom-learner ratio	Classroom Blocks: 142 schools
		Computer Centres were identified where schools did not have a computer centre but had a library and where schools had computer centres with a condition rating of C1 or C2	Computer Centres: 91 schools (including replacement schools)
		Inappropriate Structures were identified where schools consisted of inappropriate materials such as asbestos, wood, mud and metal.	Inappropriate Structures: 19 schools
		Libraries were identified where schools did not have a media centre or a library or had a library with a condition rating of C1 or C2	Libraries: 14 schools (including replacement schools)
		Media Centres were identified where schools do not have a formal library or computer centre	Media Centre: 156 schools (including replacement schools)
		In the foreseeable future, the Department has been identified through the rigorous interrogation of migratory statistics, the development plans of local municipalities and the determination of the current gaps in available infrastructure that the planning and implementation of new schools will be required in the areas identified	New Schools: 30 schools
		In the Northern Cape, the majority of schools cater for school nutrition by utilising a kitchen; however, these 140 schools were identified as complete nutrition Centres	Nutrition Centres: 317 schools (including replacement schools)
		To achieve the acceptable Learner-to-Toilet Seat ratio as prescribed in the norms and standards, schools with ratios exceeding 1:25 are prioritised to receive adequate new sanitation facilities. Other existing sanitation facilities with a C1 and C2 rating have been identified and replaced with new structures.	Ablution Blocks: 305 schools (including replacement schools)
		Most schools in the Northern Cape do not have a school hall. These 122 schools were identified for this programme	School Halls: 249 schools (including replacement schools)
		The majority of schools in the Northern Cape are within walking distance for the learners or are catered for by learner transport; however, there are instances where the learners have to travel a distance, and these two schools will be provided with hostels	Hostels: 2 schools
		The following schools have been identified thru the verification exercise to address the gap in Science Laboratories	Science Laboratory: 308 schools (including

Programme	Optimal Assets	Gap Between Optimal Assets and Currently Utilised Assets	Quantified Need Statement
			replacement schools)
		Most schools in the Northern Cape do not have sufficient formal sports facilities.	Sports Facilities: 197 schools (including replacement schools)
Programme 7: Examination and Education-Related Services To provide educational institutions with examination and education-related services.	Provide and maintain infrastructure facilities for the administration of schools	All schools need to be maintained on a seven-year cycle. The schools, however, first need to be repaired and renovated to an optimum condition rating of C5	All Schools

(Source: Author's creation, 2022)

6.13. Functional Performance and Utilisation of Existing School Infrastructure

The utilisation and condition of each school are used as a baseline to determine the performance standard. The required performance standard is the benchmark for evaluating the immovable asset's suitability and operating performance in supporting service delivery objectives. Ensuring that the utilisation and condition of the schools' infrastructure are sustained at optimum levels facilitates an environment that ensures continuous and best standards of overall asset performance. Currently, all schools in the Northern Cape perform on a P3 level where there are functionally-focused assets at a good utility level.

The South African Schools Act (No. 84 of 1996), as amended, and the Government Immovable Asset Management Act (Act No. 19 of 2007) Section 5(1) (d) require that immovable assets that are currently used be kept operational to function in a manner that supports efficient service delivery. Section 13(1) (d) of GIAMA further requires that "the accounting officer of a custodian must, for all immovable assets for which that custodian is responsible" (The Presidency, 2007:12):

- Manage the life cycle of an immovable asset;
- Assess the performance and condition of the immovable asset at least every fifth year;
- Identify the effect of the condition of an immovable asset on service delivery ability; and
- Determine the maintenance required and the estimated cost to return the immovable asset to the state where it would provide the most effective service.

The Norms and Standards are intended to provide minimum standards to be adhered to when providing new or upgrading education facilities, thereby correcting the ills of the past where lower standards of education and education facilities were provided for specific population groupings. The Norms and Standards stipulate infrastructure provisions for each education facility based on

the business needs and service offerings. The Condition Rating indicates the physical condition of assets as verified since 2014 and updated regularly; this was also based on the site inspections and visual assessments of the condition of education facilities in the Northern Cape. An average condition rating of these infrastructure assets is applied to determine the overall condition rating of the school in its entirety. Table 6-16 was used in determining condition ratings for existing infrastructure assets are defined as follows:

Table 6-16: Condition Rating

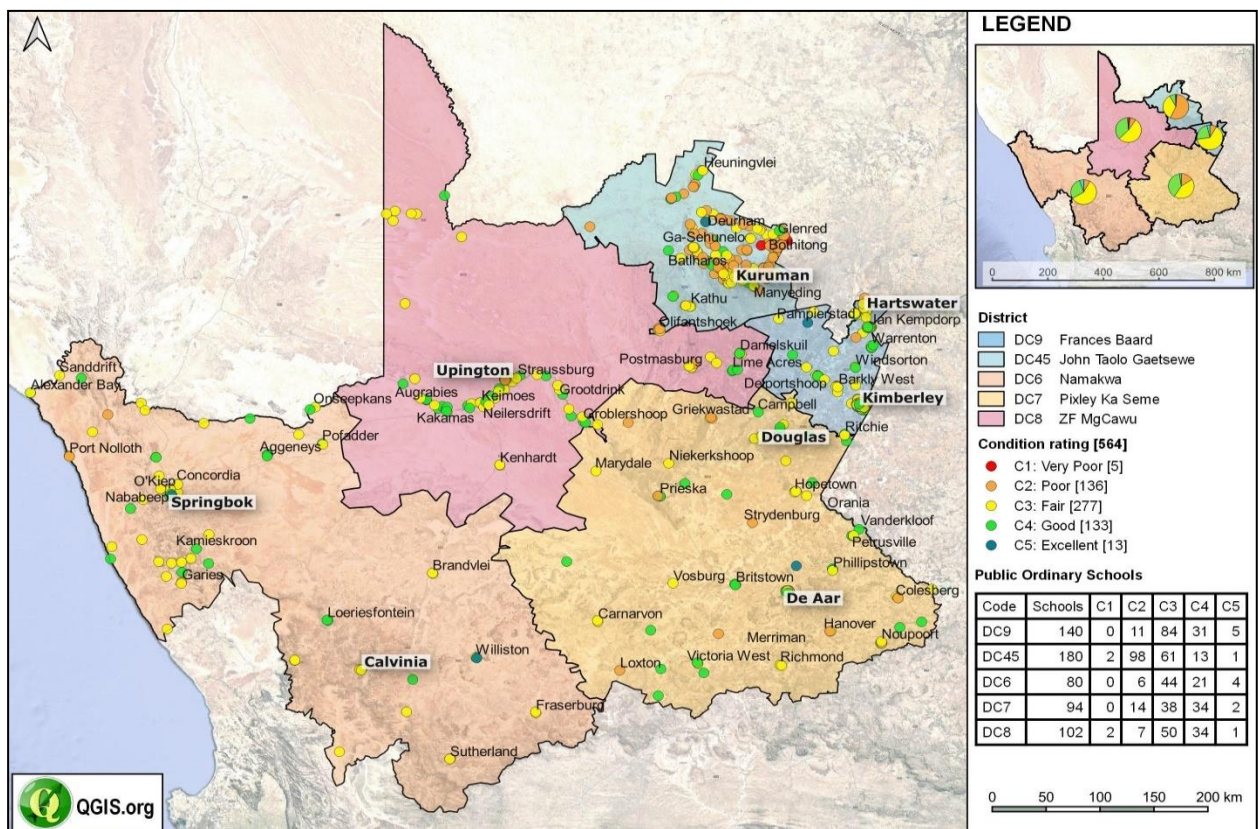
Condition / Maintenance Rating	Condition	Description
C5 No Maintenance Needed		Excellent Condition No Maintenance Is Needed But Should Be Scheduled For Routine Maintenance
C4 Less Than 25%		Good Condition 25% Of The Item (Wall, Roof, Floor, Ceiling Or Basic Service) Need Maintenance.
C3 Less Than 50%		Fair Condition 50% Of The Item (Wall, Roof, Floor, Ceiling Or Basic Service) Need Maintenance.
C2 Less Than 75%		Poor Condition 75% Of The Item (Wall, Roof, Floor, Ceiling Or Basic Service) Need Maintenance.
C1 Less Than 100%		Very Poor Condition The Entire Item (Wall, Roof, Floor, Ceiling Or Basic Service) Needs Maintenance. [Roof Is Leaking]

(Source: Author's creation, 2022)

The condition of the Northern Cape Education Facilities was based on the site visits conducted, and the entire technical condition assessment received from DRPW in conjunction with the department's ongoing NEIMS Assessments will determine which projects are prioritised for urgent or routine maintenance. The condition of the education facilities can be classified as follows:

- Condition 5: The NCDoE has eight education facilities rated at this condition; this number is an increase of 4 schools since 2018. When schools have been maintained and renovated in excellent condition (C5), they will fall under the planned maintenance category. Every five years, they will be maintained at an estimated cost of 4% of the asset's value by the user or department.
- Condition 4: A total of 162 schools were identified where there is only minor wear and tear. Six schools are leased facilities with minor defects and signs of deterioration to surface finishes. This number increased to 38 schools, indicating where maintenance was conducted and completed. Schools in this category should be prioritised for preventative maintenance in the maintenance plan.
- Condition 3: The majority (66%) of schools (350) have a fair condition rating, of which 36 schools are leased facilities, where it can be stated that it is an average condition and that attention is required, and a backlog on maintenance exists. These schools have been identified and prioritised per building for significant maintenance.
- Condition 2: 10% of schools (59) have a poor condition rating where the assets have deteriorated, and some structural problems have occurred to varying degrees. The general appearance of these schools is flawed as most elements are broken, services are interrupted, and a significant number of major defects exist.
- Condition 1: The 13 schools with a C1 rating were identified through the condition assessments as done by DRPW, where the asset has failed and is not operational or unfit for occupancy.

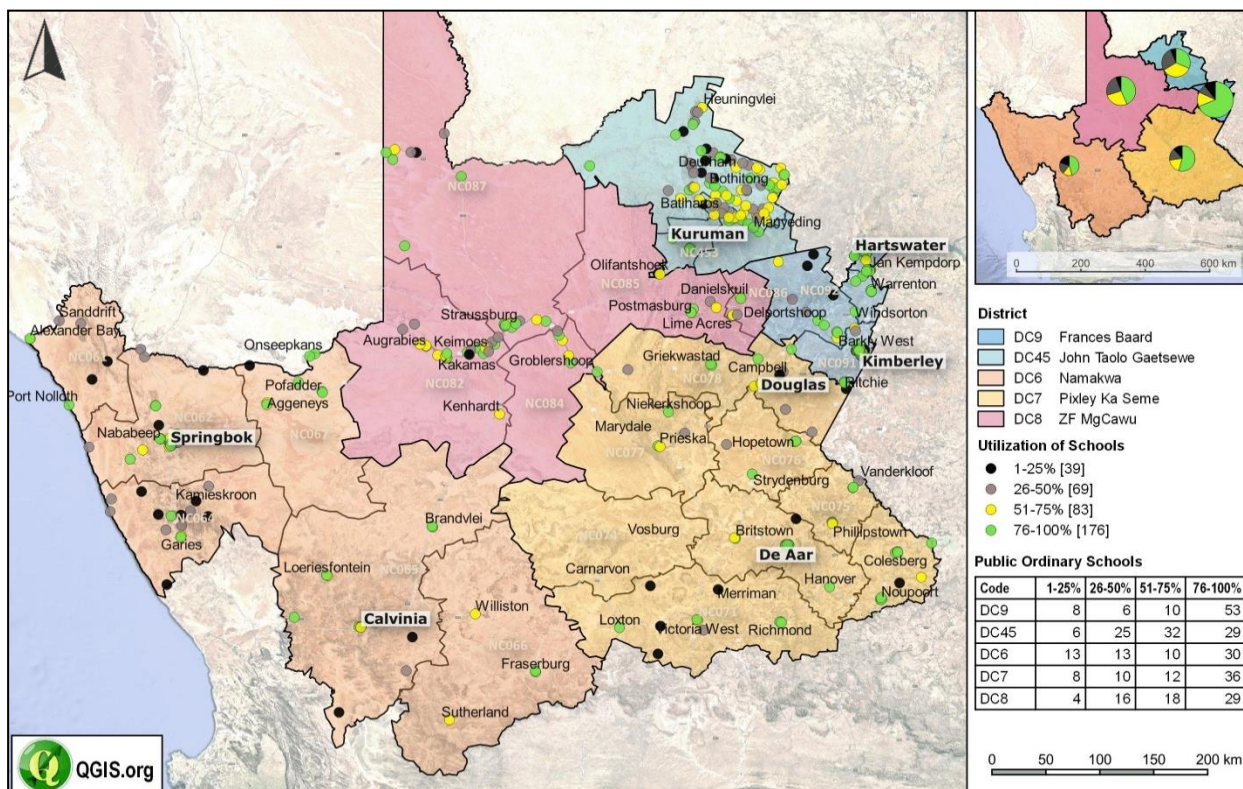
Map 6-17 indicates the condition of the Northern Cape Schools:



Map 6-17: Condition Ratings

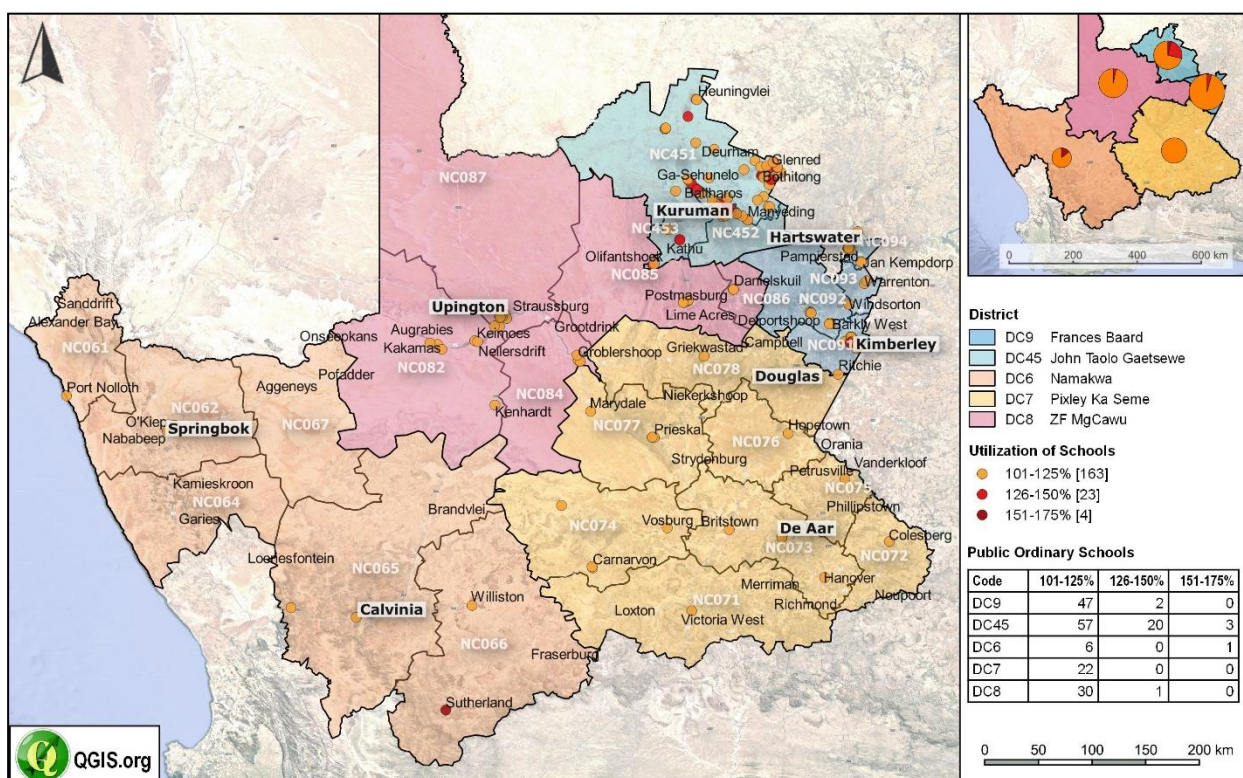
Source: Wells (2022)

The utilisation of assets was measured against the Norms & Standards ratio for learners per classroom; this includes all closed schools still on the Departmental Asset Register as these facilities have not yet been surrendered and still form part of the Department's portfolio. The utilisation assessment is intended to determine the overcrowding of the Northern Cape Facilities. The utilisation of the facilities in the Northern Cape indicates that a total of 370 facilities are underutilised; these facilities are geographically illustrated in Map 6-18 and Map 6-19: Only four of these over-utilised facilities are severely over-utilised; these facilities are geographically illustrated in Map 6-19. On average, the current infrastructure assets experience a 67% utilisation rate, and it is evident that most of the assets are under-utilised, whilst only a few show a high utilisation percentage. The utilisation is a result of the demographic profile of the province, fewer people living in rural areas and as a result of migratory patterns within the province.



Map 6-18: 1-100% Utilised School facilities within the Northern Cape

(Source: Wells, 2022)



Map 6-19: Over-utilised School facilities within the Northern Cape

(Source: Wells, 2022)

Given the geographic landscape of the Northern Cape, the vast distances between human settlements and the migratory patterns of the population, there are many under-utilised schools, possible conversions, or the surrendering of an asset to the custodian, this allows for the department to provide an enriched environment for learners by converting spaces for other functions than they were intended for initially. Therefore, the functional performance and utilisation ranking are used in the prioritisation strategy to determine the refurbishment and conversion of these assets. There are several assets in the province which are identified as being underutilised. For example, the migratory trends of persons from one area to another and the slow population growth in districts such as Namakwa result in the existing school assets being under-utilised. The same phenomena also apply to the over-utilisation of schools. The migration of persons in search of work opportunities available in economically vibrant areas of the province impacts the availability of the current infrastructure assets to satisfy the accommodation requirements; this often results in overcrowded classrooms and stressed facilities.

Concerning addressing the over-utilisation of existing assets, the Department identifies these assets and plans for and implements interventions to relieve the strain placed upon them by excessive use through its infrastructure delivery programme. For instance, Vaal Oranje Primary School in 2020 accommodated 1887 learners in 37 classrooms and had a ratio of 51 learners per classroom; this quantifies to an utilisation percentage of 127%.

The Department utilised its prioritisation process to either opt for the construction of additional classrooms depending on the availability of land on the school site or the construction of a new school. New Schools are also informed by spatial development plans of local municipalities and depend on the size of the existing facility as the Department opted not to construct mega schools with more than 28 classrooms for primary schools and 30 classrooms for secondary schools due to the management of the facilities. The result was that the Department prioritised an off-shoot school within the area to provide additional learning spaces to address these issues, in line with the implementation of the Norms and Standards.

The Department's efforts are geared towards providing adequate, sustainable and manageable infrastructure optimally utilised and functional. The site for the new Laerskool Douglas was handed over to the contractors on 30 May 2018. The construction of the mentioned school came to a final project cost of R 105 674 587, including Professional Fees, Disbursement Fees and Variation Orders, completed in January 2021. The new Douglas Laerskool, indicated in Figure 6-5, caters for 60 Gr R learners and 1000 Gr1 to Gr7 learners. Value for Money and spatial efficiency were inevitable considerations in response to the natural context and encouraging

imaginative play and environmental legibility for young learners, which can be seen in the use of colour, arrangement in terms of site layout and circles in the landscaping.

The school hall and sports facilities are positioned to create a community presence for use after hours. Services and maintenance are essential considerations, affecting the material choices and the unseen drainage and structure elements specified for maximum longevity with minimum maintenance requirements. A total of 110 accumulative work opportunities were created during the construction phase of this school.



Figure 6-5: Laerskool Douglas, Douglas, Northern Cape – New School
(Source: Author's creation, 2022)

Table 6-17 indicates the learner enrolment of the schools within the vicinity of the new school, and it is clear that there was a significant drop in enrolment at Vaal-Oranje Primêre Skool from 2021 when the new Laerskool Douglas was completed; this is also clearly indicated in Figure 6-6:

Table 6-17: Breipaal, Douglas School Enrolment

School Names	Level Classification	Lowest Grade (As Captured)	Highest Grade (As Captured)	Leamers 2018	Leamers 2019	Leamers 2020	Leamers 2021	Leamers 2022	Grade R 2022
Laerskool Douglas	Level 4 Primary School	Grade R	Grade 7				839	965	109

School Names	Level Classification	Lowest Grade (As Captured)	Highest Grade (As Captured)	Learners 2018	Learners 2019	Learners 2020	Learners 2021	Learners 2022	Grade R 2022
Hoërskool Riverside	Level 5 Secondary School	Grade 7	Grade 9	802	813	829	852	832	0
Vaal-Oranje Primêre Skool	Level 5 Primary School	Grade R	Grade 6	1845	1884	1919	1099	1078	166
Weslaan Sekondêre Skool	Level 5 Secondary School	Grade 10	Grade 12	804	744	709	734	659	0

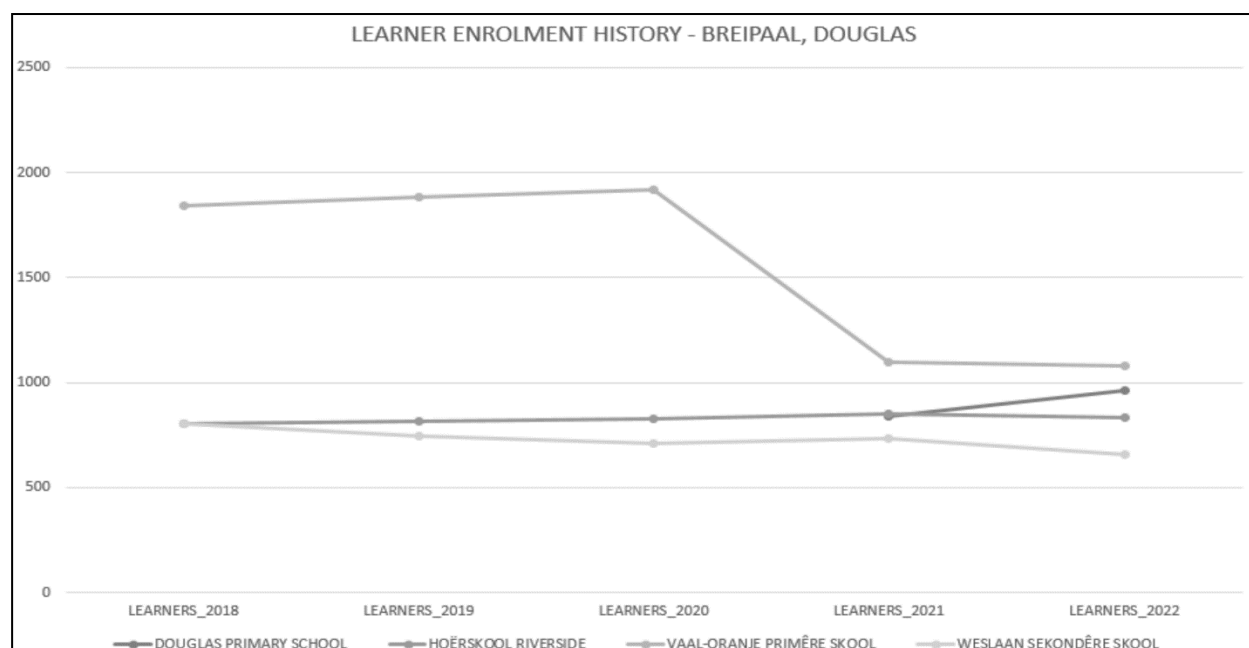


Figure 6-6: Learner Enrolment History, Breipaal, Douglas, Northern Cape
(Source: NCDoe, 2022)

Functional performance is the measure the Department applies to determine how an asset meets the asset requirements and, thereby, the service delivery objectives that such an asset supports. The functional performance rating was determined by considering the linkage between the suitability and operating performance indexes. Table 6-18 indicates the total number of schools in the Northern Cape per Functional Performance Rating:

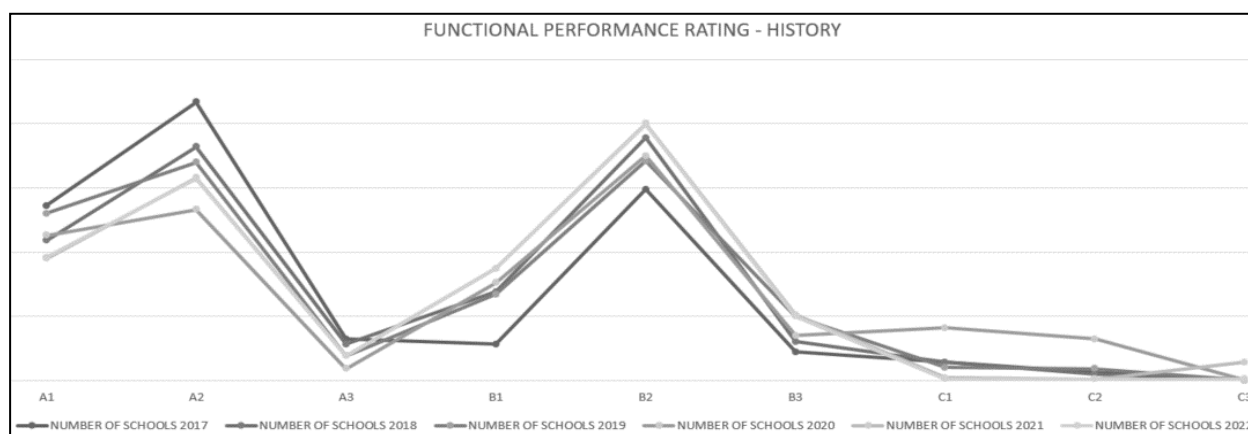
Table 6-18: Functional Performance Rating

Functional Performance Rating	Description	Number Of Schools
A1	The Asset Is Operating Optimally and Is Entirely Suitable for Its Required Function	96
A2	The Asset Meets the Minimum Operating Criteria And Is Entirely Suitable For Its Required Function	157

Functional Performance Rating	Description	Number Of Schools
A3	The Asset Does Not Meet The Minimum Operating Requirements But Is Entirely Suitable For Its Required Function	19
B1	The Asset Meets the Optimal Operating Requirements But Only Meets The Minimum Suitability Criteria For Its Required Function	87
B2	The Asset Meets the Minimum Operating And Suitability Criteria For Its Required Function	199
B3	The Asset Does Not Meet the Minimum Operating Criteria But Meets The Minimum Suitability Criteria For Its Required Function	50
C1	The Asset Is Operating Optimally but Does Not Meet the Minimum Suitability Criteria	1
C2	The Asset Meets the Minimum Operating Criteria But Does Not Meet The Minimum Suitability Criteria	1
C3	The Asset Does Not Meet The Minimum Operating Criteria And Does Not Meet The Minimum Suitability Criteria	1

(Source: Department of Public Works and Construction Industry Development Board, 2015)

The Functional Performance Ratings of operating assets operating optimally and are entirely suitable for their required function (A1) and assets with minimum operating criteria that are wholly suitable for their required function (A2) have decreased since 2016. In contrast, assets that meet the optimal operational requirements but only meet the minimum suitability criteria for their required function (B1) and asset that meets the minimum operating and suitability criteria for their required function (B2) increased, as shown in Graph 6-3. Functional Performance Ratings, however, indicate that the learner increases in schools, which affects the functionality and the condition of deteriorating facilities affecting the overall functionality of the assets.



Graph 6-3: Functional Performance Rating – History

(Source: Author's creation, 2022)

The schools were classified into three groups; these groups are aligned to and are based on the Public Ordinary and Special Schools, excluding Independent Schools, and table 6-16 indicates the matrix that was used to determine the Functional Performance Rating:

Table 6-19: Functional Performance Rating

Operating Performance Index / Suitability Index	1 – Optimal	2 – Minimum	3 – Outside
Optimal - A	A1	A2	A3
Minimum - B	B1	B2	B3
Outside - C	C1	C2	C3

GROUP A (Optimal) includes A1, A2, B1, and B2. Schools that are in an acceptable condition to the User.

GROUP B (Minimum) includes A3 and B3. Schools that are suitable but require a technical condition assessment.

GROUP C (Outside) includes C1, C2, and C3. Schools that are unsuitable to the current User's requirements.

(Source: Department of Public Works, 2009)

Group A: Schools that are in an acceptable condition to the User.

A total of 464 schools, of which 80 assets are leased facilities, and in addition to the schools, 7 Residences are functional, and at a minimum or optimum performance index, these schools will have preventative maintenance on them.

Group B: Schools that are suitable but require a technical condition assessment are 145 Facilities, of which nine schools are leased and did not meet the minimum operating requirements or the minimal or optimal suitability for their assumed required function. A Technical Assessment (Condition Based Assessment or NEIMS assessment) will be conducted on these schools to determine the impact of repairs and renovations, including an indication of alternative utilisation where identified.

Group C: One (1) facility has been identified as unsuitable to the current User's requirements; these schools met the minimum operating criteria but did not meet the minimum suitability criteria; therefore, a feasibility study will be conducted on these assets where after it is concluded if the asset can be disposed of or rehabilitated. Most schools in this category are on the inappropriate structure list or are earmarked for closure.

Table 6-20: Group C Functional Performance

School Names	Emis Number	Unique Identifying Code	Property Status	Learners 2022	100% Replacement - Asbestos	100% Replacement - Asbestos	-
Carlton Van Heerden Sekondêre Skool	300043401	Ncprp0574	Public Ordinary School	1223	100% Replacement - Asbestos	100% Replacement - Asbestos	-

(Source: Author's creation, 2022)

Schools' functional performance and utilisation are aligned with the Norms and Standards. The Department has considered the under-utilisation of learning spaces and the viability of various school infrastructure assets to implement interventions that will enhance the asset's functional performance. For example, the current and anticipated learner numbers indicate that the learner-per-classroom ratio has or will decline, and there exists an excess in classroom accommodation plans put into place to convert that classroom into an educational support space, such as a computer classroom or library.

6.14. Inappropriate Structures

The following section will elaborate on Inappropriate Structures as it is one of the main challenges facing the NCDoe with the highest cost implication. The Regulations Relating to Minimum Norms and Standards for Public School Infrastructure (November 2013) state that schools/buildings or portions built from materials such as asbestos, metal, mud, and wood are deemed inappropriate and must be prioritised (DBE, 2013).



Figure 6-7: Examples of Inappropriate Structures
(Source: Author's creation, 2022)



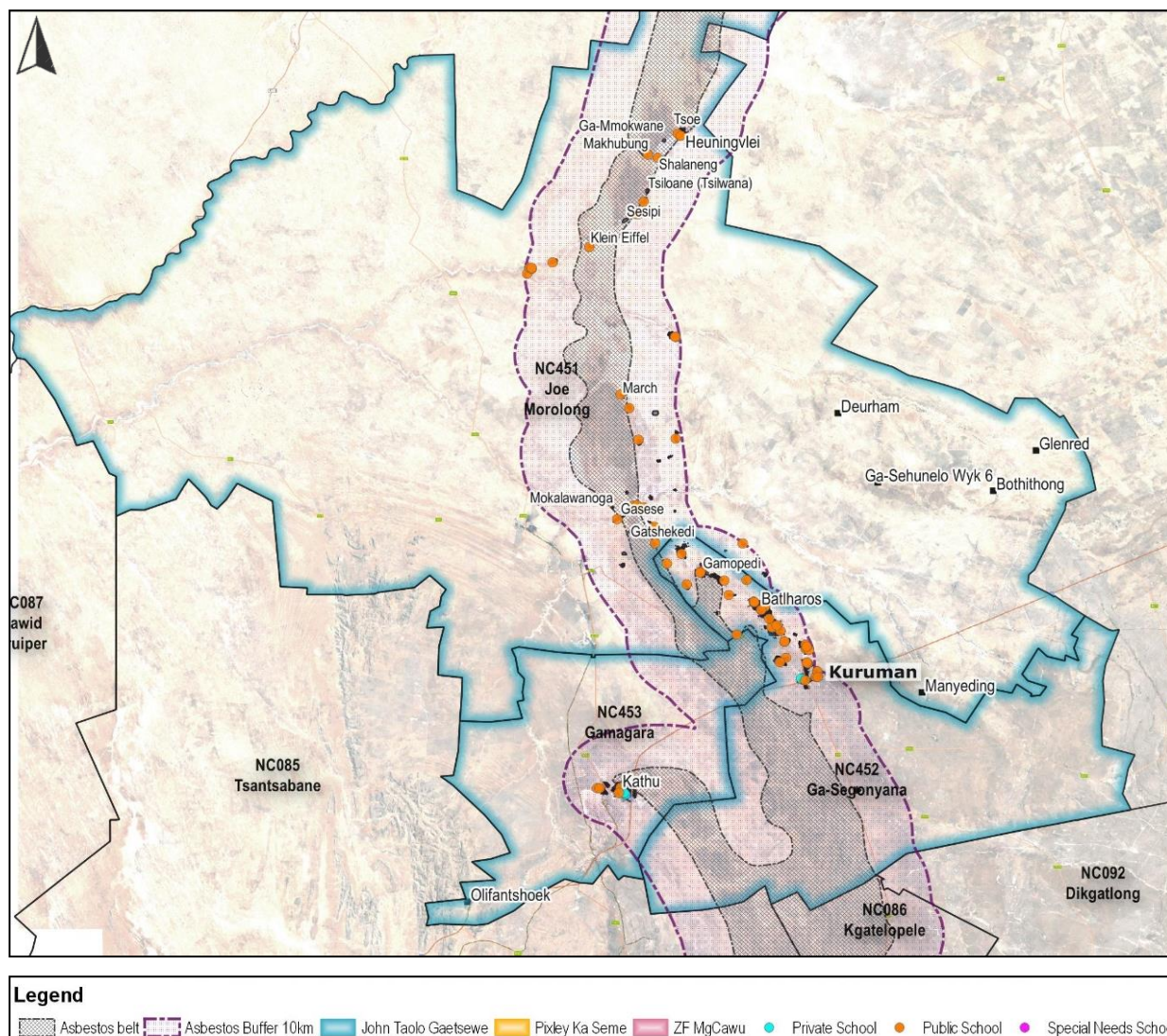
Figure 6-8: Categories of Inappropriate Structures
(Source: Author's creation, 2022)

In October 2014, The Department of Labour (DOL) served the NCDoE with three contravention Notices and one prohibition notice at schools in John Taolo Gaetsewe.

- **Prohibition Notice:** Immediate suspension of learning activities and closure of Khiba Intermediate School
- **Contravention Notice:** Intent to suspend learning activities at Gamohana Middle School, Gamopedi Primary School, and Sedibeng Primary School

The impact of these notices on the Department resulted in the disruption of learning activities, possible closure of schools at critical year-end examination time, and substantial financial implications that do not adequately address the more significant problem. The Department intervened and facilitated the works required to suspend the Prohibition notice temporarily, and learners were temporarily moved from Khiba to Gamopedi and accommodated in mobile classrooms. Replacement School for Khiba Middle School was prioritised, and emergency remediation projects at Gamopedi, Gamohana and Sedibeng were implemented. The Northern Cape is affected by four categories concerning inappropriate structures: Full Inappropriate Structures, Partial Inappropriate Structures, Relocation Schools (due to Asbestos Belt), and lastly, Asbestos Roofs and Ceilings.

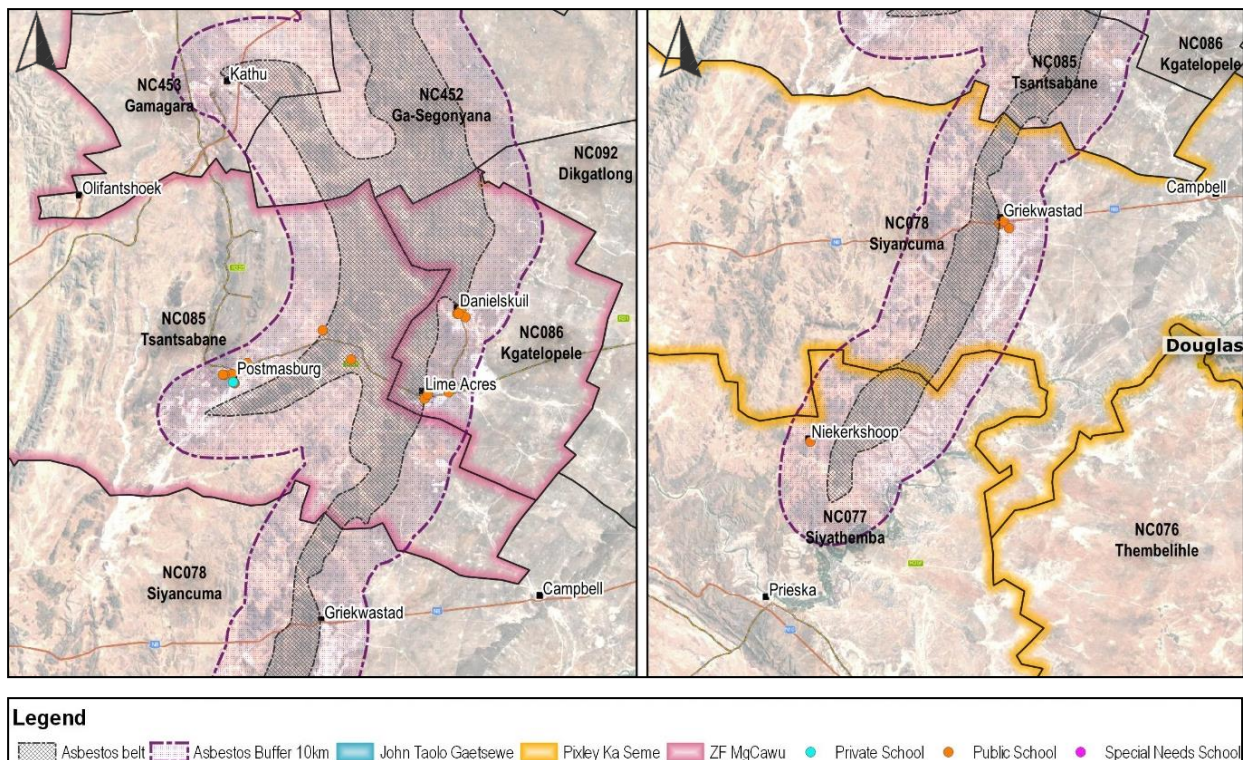
The Northern Cape asbestos belt stretches over 450 kilometres and covers areas in the Pixley Ka Seme District Municipality, including Prieska, Niekerkshoop, and Griekwastad. The Asbestos belt then runs up into ZF MgCawu District Municipality, affecting towns such as Daniëlskuil, and John Taolo Gaetsewe, where various towns, including Kuruman, Gamopedi, and Khiba, are affected and ends at the Botswana border, which is the Molopo River.



Map 6-20: Asbestos Belt in the Northern Cape John Taolo Gaetsewe

(Source: Wells, 2022)

A total of 71 Northern Cape Schools are located in this Asbestos Belt; however, it is not only schools that are affected but entire communities, sports facilities, clinics, and more than 400km of roads that contain asbestos, and attending to individual cases does not solve the bigger problem. The Northern Cape Provincial Government (NCPG) has a legal obligation and responsibility to protect the health and safety of its citizens from asbestos exposure. Although the issues identified by the Department of Labour involved schools in the John Taolo Gaetsewe District, it has been determined that all districts in the Province are affected, with the two other vital districts being Pixley Ka Seme and ZF MgCawu.



Map 6-21: Asbestos Belt in the Northern Cape ZF MgCawu and Pixley Ka Seme
(Source: Wells, 2022)

It is not only the DoE that is affected, and the following provides more detail on how each of these departments is affected:

- **Housing:** Department of Co-operative Governance Human Settlements and Traditional Affairs (COGHSTA) - Many settlements are in the Asbestos Belt. Residents often use raw or waste asbestos in the construction of their homes.
- **Schools:** DOE - The Northern Cape currently have schools classified as wholly Inappropriate Structures; schools located in the Asbestos Belt where these schools will have to be relocated, and schools classified as partially Inappropriate Structures where structures, roofs and ceilings at schools will also have to be replaced.
- **Roads:** Department of Roads and Public Works (DRPW) - Roads and streets (almost 400km) also contribute to the problem and contain asbestos contamination - For example, the Kuruman-Daniëlskuil Road and streets in Prieska were found to have asbestos contamination.
- **Clinics and Health:** Department of Health (DOH) - The effects of asbestos and diseases as a result of contamination place excessive burdens on the Health Care System, and clinics located in the Asbestos Belt will need to be relocated

- **Mines:** Department of Mineral Resources (DMR) - The South African Department of Mineral Resources identifies and rehabilitates mines; however, there are many open pits due to illegal mining.
- **Environmental:** Department of Environmental and Nature Conservation (DENC) - Soil contamination, asbestos airborne pollution assessments, results, and remediation plans should form part of the comprehensive document.

The following Departments are also affected and should form part of the Comprehensive study:

- Department of Agriculture
- Department of Sports Arts and Culture
- Department of Rural Development and Land Reform
- Department of Social Development
- Department of Trade & Industry
- Private Property (Office of the Premier)

Many schools were constructed from asbestos-containing materials within the Northern Cape. These schools were constructed as a medium-term solution; although maintained, these structures are considered a health hazard to the end-user. With the replacement of inappropriate structures, the frameworks of the buildings can be utilised. There are concrete or steel structures that support the roofs in these cases, and in some cases, there are double-storey concrete frames. It is proposed that a Structural Engineer be appointed to survey the structures at these schools and recommend whether the structures can be retained and cladded or filled in with bricks, concrete or lightweight materials. The survey outcome can influence the costs and prioritisation of Inappropriate Structures. Table 6-18 identifies the schools classified as inappropriate structures that need to be entirely replaced.

Table 6-21: Full Inappropriate Schools

School Names	Unique Identifying Code	Emis Number	District Municipality	Levels	Utilisation Gr 1-12/ Classrooms	Inappropriate Structure
Aalwyn Intermediêre Skool	NCPRP1520	300016201	Pixley Ka Seme	Level 2	80%	100% Replacement - Asbestos
Aggeneys Laerskool	NCPRP1343	300034301	Namakwa	Level 1	64%	100% Asbestos - Mine School - Possible Relocation
Anderson Primêre Skool	NCPRP0641	300016202	Pixley Ka Seme	Level 4	92%	100% Replacement - Asbestos

School Names	Unique Identifying Code	Emis Number	District Municipality	Levels	Utilisation Gr 1-12/ Classrooms	Inappropriate Structure
Ba Ga Lotlhare Intermediate School	NCPRP0155	300100037	John Taolo Gaetsewe	Level 3	100%	100% Relocation - Asbestos Belt
Carlton Van Heerden Sekondêre Skool	NCPRP0574	300043401	ZF MgCawu	Level 3	81%	100% Replacement - Asbestos
Eureka Intermediêre Skool	NCPRP1115, 1117	300023301	Pixley Ka Seme	Level 3	75%	100% Replacement - Asbestos
Finsch (Sskv) Primary School	NCPRP1772	300044204	ZF MgCawu	Level 0	175%	100% Relocation - Asbestos Belt - Mine School
Franciscus Intermediate School	NCPRP0445	300041202	ZF MgCawu	Level 3	77%	100% Replacement - Asbestos
Gamopedi Primary School	NCPRP0051	300100405	John Taolo Gaetsewe	Level 2	88%	100% Relocation - Asbestos Belt - Brick Contamination
Gariepwater Primêre Skool	NCPRP1810	300043208	ZF MgCawu	Level 0	150%	100% Replacement - Asbestos
Groenpunt Primêre Skool	NCPRP1368	300016203	Frances Baard	Level 5	103%	100% Replacement - Asbestos
Hoër Landbouskool Noord-Kaapland	NCPRP1468, 1469, 2337	300012601	Frances Baard	Level 2	110%	100% Replacement - Asbestos Hostel
Hoërskool Oranjezicht	NCPRP0629	300042401	ZF MgCawu	Level 5	43%	100% Replacement - Fibre Cement
Homevale Primary School	NCPRP0734	300014202	Frances Baard	Level 4	100%	100% Replacement - Asbestos
Hutchinson Primêre Skool	NCPRP2763	300024206	Pixley Ka Seme	Level 0	88%	100% Replacement - Asbestos
JG Jansen Intermediêre Skool	NCPRP1795	300043309	ZF MgCawu	Level 2	100%	100% Replacement - Asbestos
JJ Dreyer Primêre Skool	NCPRP0430	300022203	Pixley Ka Seme	Level 3	81%	100% Replacement - Fibre Cement
Karos Intermediate School	NCPRP1550	300043304	ZF MgCawu	Level 2	41%	100% Replacement - Structural
Keurtjiekloof Primêre Skool	NCPRP1159	300021205	Pixley Ka Seme	Level 0	233%	100% Replacement - Asbestos
Khiba Secondary School	NCPRP0278	300100707	John Taolo Gaetsewe	Level 2	100%	100% Asbestos, Relocation Belt -
Kitlanyang Primary School	NCPRP1565	300045207	John Taolo Gaetsewe	Level 0	50%	100% Replacement - Fibre Cement
Maipeing Primary School	NCPRP0076	300101010	John Taolo Gaetsewe	Level 1	73%	100% Relocation - Asbestos Belt - Brick Contamination

School Names	Unique Identifying Code	Emis Number	District Municipality	Levels	Utilisation Gr 1-12/ Classrooms	Inappropriate Structure		
Makhubung Primary School	NCPRP0075	300101035	John Taolo Gaetsewe	Level 0	140%	100% Asbestos	Relocation Belt	-
March Primary School	NCPRP0123	300101099	John Taolo Gaetsewe	Level 0	150%	100% Asbestos	Relocation Belt	-
Olyvenhoutsdrift Primêre Skool	NCPRP1553	300041212	ZF MgCawu	Level 2	55%	100% Asbestos	Replacement	-
Oranje-Oewer Intermediêre Skool	NCPRP0446	300041213	ZF MgCawu	Level 4	100%	100% Asbestos	Replacement	-
Oranje-Suid Primêre Skool	NCPRP0533, 0534	300043221	ZF MgCawu	Level 3	58%	100% Asbestos	Replacement	-
Oreeditse Primary School	NCPRP0153	300101579	John Taolo Gaetsewe	Level 1	88%	100% Asbestos	Relocation Belt	-
Orion Sekondêre Skool	NCPRP1317	300021404	Pixley Ka Seme	Level 5	70%	100% Asbestos	Replacement	-
Petrusville Primêre Skool	NCPRP1118	300021304	Pixley Ka Seme	Level 3	106%	100% Asbestos	Replacement	-
Philipvale Primêre Skool	NCPRP1143	300021306	Pixley Ka Seme	Level 3	60%	100% Asbestos	Replacement	-
Re Fentse Primary School	NCPRP1790	300044220	ZF MgCawu	Level 1	114%	100% Asbestos	Relocation Belt	-
Rosendal Intermediate School	NCPRP0375	300043224	ZF MgCawu	Level 5	94%	100% Asbestos	Replacement	-
Sedibeng Primary School	NCPRP0136	300101901	John Taolo Gaetsewe	Level 2	100%	100% Asbestos	Relocation Belt	-
Shalana Primary School	NCPRP0310	300101991	John Taolo Gaetsewe	Level 0	233%	100% Asbestos	Relocation Belt	-
Simbruner Primary School	NCPRP0695	300043226	ZF MgCawu	Level 3	79%	100% Wood	Replacement	-
Sonskyn Intermediate School	NCPRP0434, 0652	300022306	Pixley Ka Seme	Level 2	79%	100% Wood	Replacement	-
Steinkopf Sekondêre Skool	NCPRP1479	300031403	Namakwa	Level 3	31%	100% Wood	Replacement	-
Sternham Intermediêre Skool	NCPRP1793	300043308	ZF MgCawu	Level 4	96%	100% Asbestos	Replacement	-
Tsineng Primary School	NCPRP0305	300102261	John Taolo Gaetsewe	Level 2	80%	100% Asbestos	Relocation Belt	-
Tsoe Primary School	NCPRP0154	300104019	John Taolo Gaetsewe	Level 2	78%	100% Asbestos	Relocation Belt	-
Vooruitsig Intermediate School	NCPRP0453, 0468, 0513	300041217	ZF MgCawu	Level 3	74%	100% Asbestos	Replacement	-
Vredesvallei Primêre Skool	NCPRP1799	300041219	ZF MgCawu	Level 0	140%	100% Fibre Cement	Replacement	-

(Source: Author's creation, 2022)



Figure 6-9: Carlton van Heerden Sekondêre Skool, Uppington, Northern Cape
(Source: Author's creation, 2022)



Figure 6-10: Eureka Intermediate School, Noupoort, Northern Cape
(Source: Author's creation, 2022)



Figure 6-11: Homevale Primary School, Kimberley, Northern Cape
(Source: Author's creation, 2022)



Figure 6-12: Venus Primary School, Kimberley, Northern Cape

(Source: Author's creation, 2022)



Figure 6-13: Petrusville Primêre Skool, Petrusville, Northern Cape

(Source: Author's creation, 2022)

Table 6-22 indicates the schools with Partial Inappropriate Structures as well as schools with Asbestos Roofs, plans for these schools will be addressed in the following section:

Table 6-22: Partial Inappropriate Schools

School Names		Unique Identifying Code	Emis Number	District Municipality	Levels	Utilisation Gr 1-12/ Classrooms	Inappropriate Structure
Bontleng School	Primary	NCPRP1926	300100181	Frances Baard	Level 3	86%	Asbestos Roofs to Be Replaced
Carolusberg Skool	Primêre	NCPRP1736	300034201	Namakwa	Level 0	140%	Asbestos Roofs to Be Replaced

School Names	Unique Identifying Code	Emis Number	District Municipality	Levels	Utilisation Gr 1-12/ Classrooms	Inappropriate Structure
Delta Primary Skool	NCPRP0820	300024203	Pixley Ka Seme	Level 1	64%	75% Replacement - Asbestos
Du Toitspan Laerskool	NCPRP0495, 0551, 0580, 0633, 0675, 0700, 0721, 1280, 1242	300015206	Frances Baard	Level 3	89%	Asbestos Roofs to Be Replaced
Gaoshupe Makodi Primary School	NCPRP1927	300100415	Frances Baard	Level 2	82%	Asbestos Roofs to Be Replaced
Hoërskool Wrenchville	NCPRP1549	300045403	John Taolo Gaetsewe	Level 4	92%	10% Replacement - Asbestos - 2 Classrooms to Be Replaced
Ikhaya Primary School	NCPRP1162, 1167, 1501	300024305	Pixley Ka Seme	Level 3	94%	75% Replacement - Fibre Cement
Johan Hein Primêre Skool	NCPRP1747	300031207	Namakwa	Level 0	100%	Asbestos Roofs to Be Replaced
John Taolo Gaetsewe District Office - Baitiredi	NOT ON THE ASSET REGISTER	300000008	John Taolo Gaetsewe			Asbestos Roofs to Be Replaced (Science Center)
Kenhardt Primêre Skool	NCPRP0552	300034307	ZF MgCawu	Level 3	57%	75% Replacement - Fibre Cement
Kgono Primary School	NCPRP1930	300100691	Frances Baard	Level 3	84%	25% Replacement - Asbestos
Kharkams Gekombineerde Skool	NCPRP1738	300032305	Namakwa	Level 2	121%	Asbestos Roofs to Be Replaced
Laerskool Eureka	NCPRP0599	300016208	Frances Baard	Level 3	88%	Asbestos Roofs to Be Replaced
Laerskool Maree Gaffie	NCPRP1748	300031208	Namakwa	Level 2	50%	Asbestos Roofs to Be Replaced
Laerskool Kleinzee	NOT ON ASSET REGISTER	300033221	Namakwa		100%	Asbestos Roofs to Be Replaced
Laerskool Saambou	NCPRP2012	300044212	ZF MgCawu	Level 0	100%	50% Replacement - Fibre Cement
Laerskool Vooruitsig	NCPRP0453, 0468	300016210	Frances Baard	Level 3	150%	Asbestos Mobiles and Roofs to Be Replaced
Marais Gedenk Primêre Skool	NCPRP1741	300032206	Namakwa	Level 0	140%	Asbestos Roofs to Be Replaced
Môreson Intermediêre Skool	NCPRP0475	300043307	Pixley Ka Seme	Level 2	67%	50% Replacement - Fibre Cement
Nico Bekker Intermediate School	NCPRP0791, 0829, 0875, 1265, 2133	300033308	Namakwa	Level 2	47%	75% Replacement - Fibre Cement
Norvalspont Intermediate School	NCPRP1763	300023209	Pixley Ka Seme	Level 1	56%	50% Replacement - Fibre Cement
Nourivier Met Primêre Skool	NCPRP1966	300034208	Namakwa	Level 0	120%	50% Asbestos and Roofs Asbestos -

School Names		Unique Identifying Code	Emis Number	District Municipality	Levels	Utilisation Gr 1-12/ Classrooms	Inappropriate Structure
							Church School - Possible Relocation
Philipstown School	Primary	NCPRP1143, 1141	300021305	Pixley Ka Seme	Level 0	100%	25% Replacement - Wood
Pixley Ka Seme District Office - De Aar		NOT ON THE ASSET REGISTER	300000030	Pixley Ka Seme			Asbestos Roofs to Be Replaced
Port Nolloth Hoërskool		NCPRP2326	300032308	Namakwa	Level 2	38%	25% Replacement and House Roof - Asbestos
Rd Williams School	Primary	NCPRP0489	300022208	Pixley Ka Seme	Level 6	83%	50% Replacement - Asbestos
Rietrivier School	Primary	NCPRP0426, 0558, 2106	300014208	Frances Baard	Level 5	88%	75% Replacement - Fibre Cement
Rooiwal (Vgk) Primêre Skool		NCPRP2753	300031210	Namakwa	Level 0	175%	Asbestos Roofs to Be Replaced
Sa Van Wyk High School		NCPRP0899	300032402	Namakwa	Level 4	20%	Asbestos Roofs to Be Replaced
Saul Sekondêre Skool	Damon	NCPRP0648	300042403	ZF MgCawu	Level 6	62%	Asbestos Roofs to Be Replaced
Sha-Leje School	Primary	NCPRP1773	300044214	ZF MgCawu	Level 0	100%	50% Replacement - Asbestos
Spoegrivier Primêre Skool	Met	NCPRP1473	300032208	Namakwa	Level 0	117%	Asbestos Roofs to Be Replaced
Staats Primary School		NCPRP0418, 0606, 1457	300013209	Frances Baard	Level 3	75%	Asbestos Replacement - Grade RR Classroom
Stephen Malherbe Primêre Skool		NCPRP1743	300031211	Namakwa	Level 0	233%	Asbestos Roofs? - Church School - Possible Relocation
Vaal-Oranje Skool	Primêre	NCPRP0565, 0654	300011214	Pixley Ka Seme	Level 5	91%	75% Replacement - Asbestos
Venus Primêre Skool		NCPRP0631	300016217	Frances Baard	Level 5	94%	75% Replacement - Wood
Voorspoed School	Primary	NCPRP2461, 2773, 2774, 1947	300012208	Frances Baard	Level 3	95%	Asbestos Replacement - Grade R Classroom
Warrenvale School	Combined	NCPRP1948	300017305	Frances Baard	Level 2	58%	50% Replacement - Wood

(Source: Author's creation, 2022)

A substantial number of schools are also located in the asbestos mining belts where asbestos fibres that were spread by wind are polluting the surrounding areas. These schools are indicated within Table 6-23 and will be required to relocate to areas where there is no contamination, plans for these schools will be addressed in the following section:

Table 6-23: Asbestos Belt - Relocation Schools

School Names			Unique Identifying Code	Emis Number	District Municipality	Level Classification	Utilisation (Classrooms)	Utilisation Improvement Actions	
Ba Ga Lotlhare Intermediate School			NCPRP0155	300100037	John Gaetsewe	Taolo	3	70%	Asbestos Belt
Finsch Primary School	(Sskv)		NCPRP1772	300044204	ZF MgCawu		0	26%	Lease Facilities
Gamopedi School	Primary		NCPRP0051	300100405	John Gaetsewe	Taolo	2	95%	Asbestos Belt
Makhubung School	Primary		NCPRP0075	300101035	John Gaetsewe	Taolo	0/1	47%	Asbestos Belt
March School	Primary		NCPRP0123	300101099	John Gaetsewe	Taolo	0	40%	Asbestos Belt
Oreeditse School	Primary		NCPRP0153	300101579	John Gaetsewe	Taolo		74%	Asbestos Belt
Re Fentse School	Primary		NCPRP1790	300044220	ZF MgCawu			64%	Asbestos Belt
Shalana School	Primary		NCPRP0310	300101991	John Gaetsewe	Taolo		90%	Asbestos Belt
Tsineng School	Primary		NCPRP0305	300102261	John Gaetsewe	Taolo		88%	Asbestos Belt
Tsoe School	Primary		NCPRP0154	300104019	John Gaetsewe	Taolo		91%	Asbestos Belt

(Source: Author's creation, 2022)

The number of schools per district and local municipality that are located within the 10km Buffer Zone of the Asbestos belt is indicated in Table 6-24:

Table 6-24: Number of Schools located within the 10km Buffer of the Asbestos Band

District Municipality/ Local Municipality	Within 10km Buffer	Within 10km Buffer and Asbestos Structures
John Taolo Gaetsewe		
Ga-Segonyana	29	1
Joe Morolong	21	1
Pixley Ka Seme		
Siyancuma	-	3
Siyathemba	1	-
ZF MgCawu		
Kgatelopele	5	-
Tsantsabane	10	-
Grand Total	66	5

(Source: Author's creation, 2022)

6.15. Demand for new schools in the Northern Cape

The demand for school infrastructure is identified by the current backlogs at Northern Cape schools and the mandate and policies of government departments that describe the minimum level of service provided and how a department conducts its business. These mandates and policies are set through political processes in the legislative environment. The strategic plan takes a five-year view of development according to a department's defined mandate and policies. The schools planned are in line with the expected migration patterns within the province and the anticipated economic growth of various communities. As identified through the IDP & SDF processes, housing developments and the formalisation of informal settlements also inform these plans.

A departmental strategic plan will define how the community members will be provided with the services defined in the government's policies. It comprises two main components – the strategic plan for service delivery; and the supporting plans for Human Resources, Asset Management, Infrastructure, Information Systems and Financial Strategies. Infrastructure planning is analogous to the strategic plan's development and alignment. The Strategic and associated Performance Plans are developed in the context of national, provincial and local development frameworks, as represented in the following graph, in the process of top-down and bottom-up planning. Thus careful consideration and integration are required with the development planning processes of the other spheres of government, which is inherent in the principles of cooperative government set out in Chapter 3 of the Constitution. The flowing Bottom-up linkages apply in determining the demand for school infrastructure:

- Strategic objectives and policy mandates from the Strategic planning process
- Spatial Development Frameworks, Integrated Development Plans, Growth and Development Strategies and Local Economic Development strategies of the district and local municipalities
- A demographic profile providing future population models
- Factors such as population growth trends, density, ethnicity, income, and employment will enable a profile of the likely effects of population growth and changing populations to be analysed. Land use, the density of development and the rate of growth contribute to the composition of the urban form and the analysis of this information and, in particular, changes in the use will provide valuable information for infrastructure planning changes in demand and utilisation
- Norms and standards

As indicated in section 2 above, learners primarily influence the demand for classrooms and ablution facilities. Other core educational spaces are required to provide a conducive and enriched learning environment, primarily determined by the size and type of the school as per norms and standards. Still, the two core spaces whose demand is most affected by fluctuating learner numbers are classrooms and ablution blocks.

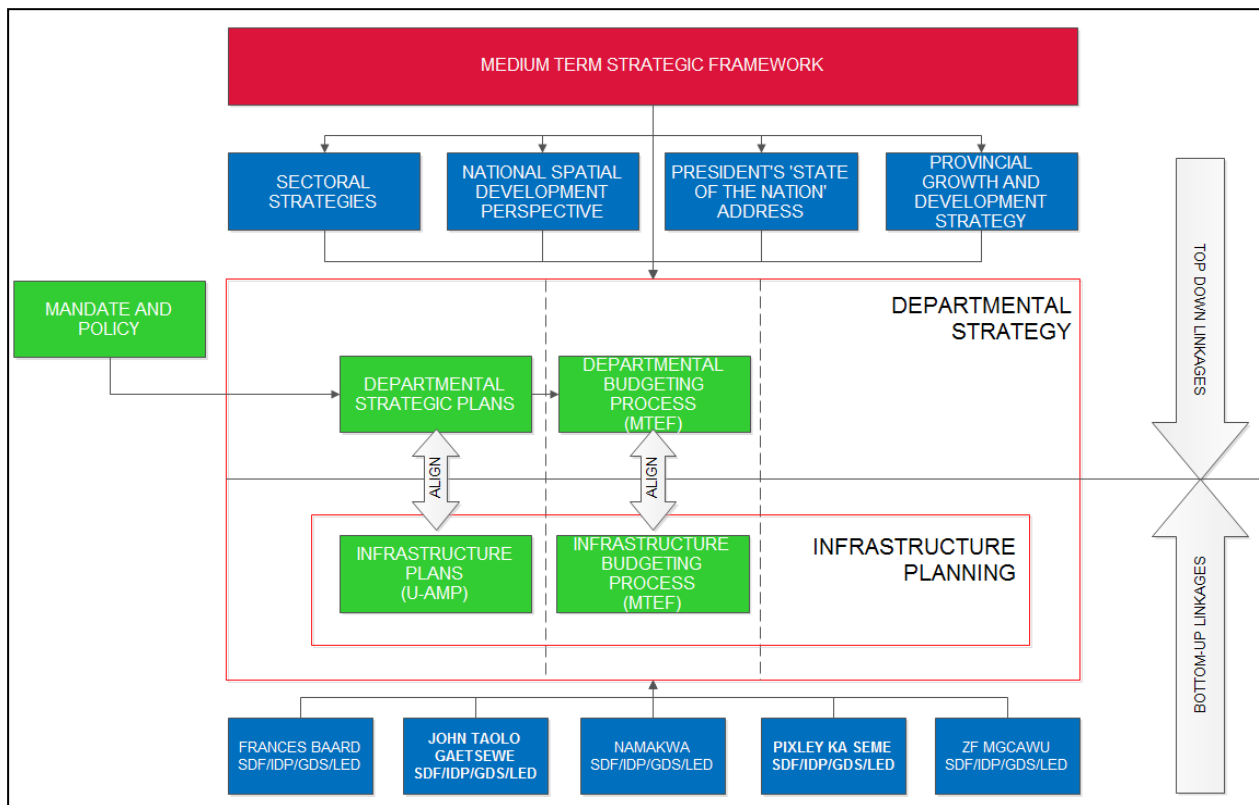


Figure 6-14: Infrastructure Demand

(Source: National Treasury, 2012)

Key inputs into the demand forecasting for infrastructure planning align with these Top-Down and Bottom-up Linkages. The Top-Down flowing linkages apply in determining the demand for school infrastructure:

- Sectorial Strategies such as the NCDoe Strategic Plan (2015-2020)
- National Spatial Development Strategy
- President's State of the Nation Address
- Provincial Growth and Development Strategy

The current demand for core school infrastructure; classrooms, ablution blocks, administration blocks, science laboratories, computer laboratories and libraries is determined by interrogating the following:

- Current Supply of Infrastructure to cater for the needs of learners in the province;
- Current over-utilisation of existing assets;
- The current condition of existing infrastructure; assets of poor condition rating must be replaced or upgraded to satisfy existing demand;
- Number and types of educational spaces required to achieve optimum functionality at all existing schools;
- Long-term provincial economic and spatial development plans, including specific sector department plans such as planning for future human settlements; and
- Migration patterns identified within the province and expected utilisation of existing infrastructure, and the need for new infrastructure.

6.16. Condition Improvement

Facilities complications affect teaching and learning, health and safety, day-to-day operations, and the entire education organisation. To some people's surprise, facilities problems are less a function of geography or socioeconomics and more directly related to staff levels, training, and practices, all of which can be controlled by the organisation. Thus, every School should plan to meet the challenges of effective facility maintenance. As school buildings age, we face the growing challenge of maintaining education facilities at a level that allows teachers to meet the needs of 21st-century learners. Facilities issues arise at all educational levels and all sites, from classrooms to administrative offices. Challenges arise in new and old facilities, although the concerns may differ. Where component analysis indicates through condition monitoring, end-of-the-lifecycle, condition assessment or end-of-life predictions that a component requires replacement or significant overhaul or repairs, these items should be included in the capital budget. When compiling the capital budget, the maintenance planning function could group corrective maintenance actions into projects. The projects should follow the normal capital project pipeline process prescribed by the National Treasury from time to time for the approval of capital projects. When several projects with a similar objective are identified, the projects may be grouped into programmes, and a single programme application may be considered. Maintenance programmes are often funded as conditional grants to reduce the maintenance backlog or the accrued deferred maintenance. In prioritising the budget for Maintenance, the Department utilise the following strategy:

- First, allocate preventative and condition-based maintenance for highly critical components and all components with a high priority rating.

- Secondly, allocate to the preventative maintenance of moderately critical components and deferred maintenance from the previous budget cycle.
- After that, allocate to the remaining corrective maintenance.

Any maintenance action deferred due to inadequate budgets is classified as such on the maintenance schedule. Based on the results of the performance report, the maintenance requirements can be prioritised.

- Preventative Maintenance - A total of 464 schools were classified in Group A, which states that the schools are functional and at a minimum or optimum performance index; these schools are prioritised for preventative maintenance.
- Corrective Maintenance - Schools that are suitable but require technical condition assessment as the asset performance does not meet the minimum functional requirements of the facility are prioritised for condition-based maintenance. A total of 145 schools did not meet the minimum operating requirements or the minimal or optimal suitability for their assumed required function. A Technical Assessment (Condition Based Assessment or NEIMS assessment) will be conducted on these schools to determine the impact of repairs and renovations, including an indication of alternative utilisation where identified.
- Feasibility Study to determine Maintenance Requirements - 1 School has been identified as unsuitable to the current User's requirements.

6.16.1. Maintenance Manual

The Maintenance Manual initiative by the NCDoE is to adopt a user-centred approach to school infrastructure maintenance. It aims to empower principals and Student Governing Bodies to take care of the school building and facilities under the prescribed Norms and Standards and relevant legislation. The increased awareness of the user's role and responsibility is critical to addressing the derelict state of schools. Further, it is crucial to ensure that the investments made in school infrastructure are maintained and that future generations can reap the benefits.

A community involved in the upkeep of its school infrastructure sets positive examples that build the necessary morale needed to create a teaching and learning environment for both the teacher and the learner. This Maintenance Manual is moving toward taking an integrated stakeholder approach to school infrastructure maintenance. The purpose is to assist and guide the School Principal and the School Governing Body (SGB) to maximise the benefit of the Norms and

Standards funds allocated for the day-to-day maintenance of their school facilities and Planning of Maintenance.

Routine maintenance, cleaning and upkeep of school facilities as the condition of these facilities are generally unacceptable. The Norms and Standards funds should be utilised for the intended purpose, and School Principals must keep a maintenance register. The Reporting and monitoring of allocated funds need to be brought up to standard, and schools must familiarise themselves with the processes in terms of Planning for maintenance and getting the work done.

The Maintenance Manual document outlines an essential asset list and summarises what asset information should be considered. It points out that “Immovable Asset Information” is derived from all the buildings that make up a school as a complete entity – from the classroom, laboratories, and the ablution blocks to the principal’s office and “Movable Asset Information” is derived from the furniture needed to make these Immovable Assets functional. The school needs to maintain their movable assets or furniture and equipment and immovable assets or buildings to keep the spaces at a functional level. Faulty or broken equipment and furniture cannot help a school reach its maximum output in curriculum delivery. Neglect of Movable and Immovable Assets may lead to health and safety problems at the school.

The Maintenance Manual explains the maintenance concept and provides the rationale for maintenance work. It gives the procedures to be followed and provides a detailed explanation for compiling the manual. Similarly, the “Maintenance Planning Activities” steps are outlined as illustrations. The diagrams direct what should be done at each step as the school plans its maintenance activities. The Manual explains further what a condition assessment and rating is and shows how to conduct and complete such a form. The Manual’s approach is practical, clear, and thorough. The details are simplified with illustrations that even a non-technical person will find user-friendly.

The South African Schools Act No. 84 of 1996 states in clause 20 (1) (g) that “the governing body of a public school must administer and control the school's property, and buildings and grounds occupied by the school, including school hostels”. Clause 16A (2) (a) states that the principal must:

“assist the governing body with the management of the school’s funds, including the provision of information relating to any conditions imposed or directions issued by the Minister, the Member of the Executive Council or the Head of Department in respect of all

financial matters of the school and the giving of advice to the governing body on the financial implications of decisions relating to the financial matters of the school.”

This document will assist and guide the School Principal, the School Governing Body (SGB) and officials in terms of the processes that need to be followed to maximise the benefit of the Norms and Standards funds allocated for the day-to-day maintenance of their school facilities.

6.17. Improved Consultative Processes

The Infrastructure Directorate within the department adopts a consultative process concerning implementing the programme. The MTEF project list was borne out of consultation with the respective Districts. Consultation within the programme was not limited to respective districts; other units within the department were engaged prior to and throughout the financial years. The Department attended Local and District Municipality planning meetings and has been participating in the development of the Integrated Development Frameworks (IDP), Spatial Development Frameworks (SDF) and Land Use Management Schemes (LUMS) of these municipalities. These municipalities have received the Department's Prioritised Project List, which is included in most of the IDPs and SDFs. The Department also informs and consults with the municipalities to review and renew their LUMS about possible school sites.

6.18. Geographic Information System (GIS)

The Department developed a range of information captured on the GIS, and it is recommended to continue with the development and update existing GIS data regularly. Thus utilising the information more effectively will improve the responsiveness of future prioritisation. As never before in history, COVID-19 brought the globe together in one space where common destiny beckons us to seek a new beginning, a renewal in the way we plan, act and share essential sources. To integrate these initiatives, the Department need to streamline access to information, which supports consistent decision-making. The functionality of PLOTMAPS enables the grouping of geographic information within a specific space. The consideration was to address geospatial analysis that would be practical to the broader GIS user community with decision-making and planning. Important was also to do these groupings with communities with the same interest, a clear indication of specific grouping that will be useful for macro and micro reporting in the future. PLOTMAPS is unique in the sense of communities, not space, and aligns data by Ward number.

6.19. Cost Estimates

The costing that was utilised in calculating the estimates of the required infrastructure was based on the following:

- The Cost Norm developed by the National Treasury and DBE considers escalation;
- Differences in costs associated with building construction in different provinces based on the reports issued by the Bureau for Economic Research and Medium Term Forecasting Associates, which take into account factors such as:
 - materials costs (.e.g. transport costs from Gauteng manufacturers of construction materials and the existence of oligopolies or regional monopolies in the supplies of sand, stone, steel and cement);
 - labour costs;
 - composition of labour;
 - building methods (e.g. cavity wall construction, corrosion protection of window and door frames in certain coastal regions);
 - market competitiveness (e.g. differences in workloads); and
 - productivity (e.g. that caused by adverse weather conditions).
- A history of the priced bill of quantities and tenders within the Northern Cape on recently appointed projects, including escalation, was taken into account;
- Facilities for learners with special education needs which comply with requirements relating to the nature of the specialised support programme offered at a school and the level of support required at the school that affects the price of infrastructure;
- Precautionary measures for schools located on class P sites (see SANS 10400-H), including those underlain by dolomite land, were required at the school;
- The demolition of inappropriate buildings which are no longer required was included in the schools; and
- The utilisation of the standard designs as developed by the NCDoe.

Assumptions made in the costing of this programme.

- That costs will escalate at a rate of 6% annually;
- That there will be no significant price increases in materials such as steel, as was the case in 2020;
- the decanting of learners and educators in existing schools during construction, where educational areas are replaced, was required at the school;

- the distance of the school from a regional centre and the condition of the roads serving such schools are acceptable;
- the demolition of inappropriate buildings which are no longer required does not pose any challenges;
- the site/soil conditions are acceptable for the construction of proposed facilities;
- Sites with a waterborne sanitation means of sanitary disposal where the sewer does not connect to an existing municipal sewer require additional structures such as septic or conservancy tanks;
- The site class designations are C, S, H and R and will not require additional precautionary measures of foundation designs to accommodate differential movement; and
- The assumption is that no significant site slopes exceed 1:10, which will require terracing.

The costing estimates utilised for determining the budget requirement of the Northern Cape were based on the following prices as indicated in Table 6-25:

Table 6-25: Cost Model used to determine Estimate Costing

COMPONENTS	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2022/23	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2023/24	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2024/25	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2025/26	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2026/27	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2027/28
STAFF AND ADMIN						
ADMINISTRATION BLOCK (LARGE)	R 3 889 206	R 4 122 558	R 4 369 912	R 4 632 106	R 4 910 033	R 5 204 635
ADMINISTRATION BLOCK (MEDIUM)	R 3 431 452	R 3 637 339	R 3 855 580	R 4 086 914	R 4 332 129	R 4 592 057
ADMINISTRATION SPACES (SMALL)	R 1 475 353	R 1 563 874	R 1 657 706	R 1 757 168	R 1 862 599	R 1 974 354
THERAPY ROOM	R 127 347	R 134 988	R 143 087	R 151 672	R 160 772	R 170 419
SPEECH AND AUDIO ROOM	R 222 291	R 235 629	R 249 766	R 264 752	R 280 637	R 297 476
HOD OFFICE	R 127 347	R 134 988	R 143 087	R 151 672	R 160 772	R 170 419
BOOK STORE	R 110 090	R 116 696	R 123 697	R 131 119	R 138 987	R 147 326
MINIMUM EDUCATION SPACES: CLASSROOMS						
ECD (SINGLE)	R 1 304 640	R 1 382 918	R 1 465 893	R 1 553 847	R 1 647 077	R 1 745 902
ECD (COVERED AREA)	R 1 266 297	R 1 342 275	R 1 422 812	R 1 508 180	R 1 598 671	R 1 694 591
ECD (DOUBLE)	R 3 909 172	R 4 143 722	R 4 392 346	R 4 655 887	R 4 935 240	R 5 231 354
OUTDOOR PLAY AREA	R 33 596	R 35 611	R 37 748	R 40 013	R 42 414	R 44 959
CLASSROOM (FOUNDATION)	R 850 525	R 901 557	R 955 650	R 1 012 989	R 1 073 769	R 1 138 195

COMPONENTS	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2022/23	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2023/24	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2024/25	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2025/26	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2026/27	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2027/28
CLASSROOM ORDINARY	R 839 671	R 890 052	R 943 455	R 1 000 062	R 1 060 066	R 1 123 670
EDUCATION SUPPORT: ABLUTION FACILITIES						
ABLUTION BLOCK (LARGE)	R 1 784 951	R 1 892 048	R 2 005 571	R 2 125 905	R 2 253 459	R 2 388 667
ABLUTION BLOCK (MEDIUM)	R 1 381 803	R 1 464 711	R 1 552 594	R 1 645 750	R 1 744 495	R 1 849 164
ABLUTION BLOCK (SMALL)	R 621 126	R 658 394	R 697 897	R 739 771	R 784 157	R 831 207
CHANGE ROOMS	R 1 551 467	R 1 644 555	R 1 743 228	R 1 847 822	R 1 958 691	R 2 076 213
MINIMUM EDUCATION SPACES: LEARNER RESOURCES						
COMPUTER CLASSROOM (WITH STORE 13SQM) AND HIGH SECURITY	R 1 591 438	R 1 686 925	R 1 788 140	R 1 895 429	R 2 009 154	R 2 129 704
SCIENCE LAB AND STORE (WITH STORE 13SQM)	R 1 277 287	R 1 353 924	R 1 435 160	R 1 521 269	R 1 612 545	R 1 709 298
MULTI-MEDIA LIBRARY (WITH STORE 13SQM) WITH HIGH SECURITY	R 1 197 594	R 1 269 450	R 1 345 617	R 1 426 354	R 1 511 935	R 1 602 651
MEDIA CENTRE (WITH 2 X STORE 13SQM AND OFFICE 9SQM) AND HIGH SECURITY	R 2 885 943	R 3 059 100	R 3 242 646	R 3 437 204	R 3 643 437	R 3 862 043
SPECIALIST CLASSROOM	R 1 227 313	R 1 300 952	R 1 379 009	R 1 461 750	R 1 549 455	R 1 642 422
WORKSHOP	R 3 165 523	R 3 355 455	R 3 556 782	R 3 770 189	R 3 996 400	R 4 236 184
MULTI-PURPOSE CLASSROOM (WITH SINK AND STORE 13SQM)	R 1 227 313	R 1 300 952	R 1 379 009	R 1 461 750	R 1 549 455	R 1 642 422
SPECIAL SCHOOL CLASSROOM	R 443 822	R 470 451	R 498 678	R 528 599	R 560 315	R 593 934
SPECIAL SCHOOL CLASSROOM WITH TOILET	R 443 822	R 470 451	R 498 678	R 528 599	R 560 315	R 593 934
EDUCATION SUPPORT: ASSEMBLY						
TUCK SHOP	R 183 484	R 194 493	R 206 162	R 218 532	R 231 644	R 245 543
HALL (LARGE SCHOOLS WITH MORE THAN 900 LEARNERS) & (CHAIR STORE 40SQM)	R 6 218 243	R 6 591 337	R 6 986 818	R 7 406 027	R 7 850 388	R 8 321 412
HALL (MEDIUM SCHOOLS LESS THAN 900 LEARNERS) & (CHAIR STORE 25SQM)	R 4 029 358	R 4 271 119	R 4 527 386	R 4 799 029	R 5 086 971	R 5 392 190
OPEN ASSEMBLY AREA (FORUM)	R 390 226	R 413 640	R 438 458	R 464 766	R 492 652	R 522 211
NUTRITION CENTRE WITH LARGE DINING HALL (200SQM)	R 2 174 827	R 2 305 316	R 2 443 635	R 2 590 253	R 2 745 669	R 2 910 409

COMPONENTS	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2022/23	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2023/24	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2024/25	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2025/26	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2026/27	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2027/28
NUTRITION CENTRE (100SQM DINING HALL)	R 1 422 827	R 1 508 197	R 1 598 688	R 1 694 610	R 1 796 286	R 1 904 064
NUTRITION KITCHEN	R 445 220	R 471 933	R 500 249	R 530 264	R 562 080	R 595 804
EDUCATION SUPPORT: FACILITIES						
GUARD HOUSE	R 60 007	R 63 607	R 67 424	R 71 469	R 75 757	R 80 303
JANITOR QUARTERS	R 357 639	R 379 097	R 401 843	R 425 953	R 451 510	R 478 601
REFUSE AREA	R 5 815	R 6 164	R 6 533	R 6 925	R 7 341	R 7 781
CONDEMNATION ROOM	R 14 537	R 15 409	R 16 333	R 17 313	R 18 352	R 19 453
ACCESSIBILITY (BASIC)	R 323 035	R 342 417	R 362 962	R 384 740	R 407 824	R 432 294
EDUCATION SUPPORT: OUTDOOR						
CARPORT PER CAR	R 6 978	R 7 396	R 7 840	R 8 310	R 8 809	R 9 338
PARKING PAVED AREAS PER CAR	R 12 598	R 13 354	R 14 156	R 15 005	R 15 905	R 16 859
PAVED COURTYARD	R 38 764	R 41 090	R 43 555	R 46 169	R 48 939	R 51 875
PAVED ASSEMBLY AREA	R 129 214	R 136 967	R 145 185	R 153 896	R 163 130	R 172 917
COVERED WALKWAYS /10M	R 17 767	R 18 833	R 19 963	R 21 161	R 22 430	R 23 776
COMBI COURT WITH FENCE	R 393 260	R 416 856	R 441 867	R 468 379	R 496 482	R 526 271
SOCCER FIELD WITH LOOSE PAVILIONS	R 842 700	R 893 262	R 946 858	R 1 003 669	R 1 063 889	R 1 127 723
FLAGPOLE	R 2 584	R 2 739	R 2 904	R 3 078	R 3 263	R 3 458
DRINKING FOUNTAIN	R 388	R 411	R 436	R 462	R 489	R 519
FENCES						
HIGH-SECURITY FENCE PRIMARY	R 1 628 096	R 1 725 782	R 1 829 329	R 1 939 089	R 2 055 434	R 2 178 760
HIGH-SECURITY FENCE SECONDARY	R 1 976 974	R 2 095 593	R 2 221 328	R 2 354 608	R 2 495 884	R 2 645 637
FENCE SECURITY - PALISADE	R 28 427	R 30 133	R 31 941	R 33 857	R 35 889	R 38 042
FENCE ECD - PALISADE	R 71 068	R 75 332	R 79 852	R 84 643	R 89 721	R 95 105
FOOD GARDEN FENCE - WELDED MESH	R 45 225	R 47 938	R 50 815	R 53 864	R 57 095	R 60 521
HIGH-SECURITY FENCE /M	R 2 326	R 2 465	R 2 613	R 2 770	R 2 936	R 3 113
PALISADE FENCE /M	R 1 421	R 1 507	R 1 597	R 1 693	R 1 794	R 1 902
WELDED MESH FENCE /M	R 904	R 959	R 1 016	R 1 077	R 1 142	R 1 210

COMPONENTS	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2022/23	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2023/24	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2024/25	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2025/26	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2026/27	TOTAL CONSTRUCTION , INCLUDING FURNITURE 2027/28
SERVICES						
SERVICES LARGE	R 5 168 560	R 5 478 674	R 5 807 394	R 6 155 838	R 6 525 188	R 6 916 699
SERVICES MEDIUM	R 3 876 420	R 4 109 005	R 4 355 546	R 4 616 878	R 4 893 891	R 5 187 524
SERVICES SMALL	R 2 584 280	R 2 739 337	R 2 903 697	R 3 077 919	R 3 262 594	R 3 458 350
REPLACEMENT OF ASBESTOS LARGE	R 2 261 245	R 2 396 920	R 2 540 735	R 2 693 179	R 2 854 770	R 3 026 056
REPLACEMENT OF ASBESTOS MEDIUM	R 1 808 996	R 1 917 536	R 2 032 588	R 2 154 543	R 2 283 816	R 2 420 845
REPLACEMENT OF ASBESTOS SMALL	R 1 162 926	R 1 232 702	R 1 306 664	R 1 385 063	R 1 468 167	R 1 556 257
STRUCTURAL DAMAGES MAJOR	R 2 584 280	R 2 739 337	R 2 903 697	R 3 077 919	R 3 262 594	R 3 458 350
STRUCTURAL DAMAGES MEDIUM	R 2 067 424	R 2 191 469	R 2 322 958	R 2 462 335	R 2 610 075	R 2 766 680
STRUCTURAL DAMAGES SMALL	R 1 292 140	R 1 369 668	R 1 451 849	R 1 538 959	R 1 631 297	R 1 729 175

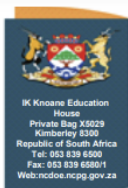
(Source: NCDoe, 2022)

6.19.1. Operating Expenditure

Except for new schools that are planned and currently under construction, all existing schools are currently operational and have the following:

- Learners per Phase and per Grade
- Have set curriculums with the appropriate LTSM Material to deliver this curriculum
- Have current facilities being utilised for teaching and learning
- Have appointed and functional staffing structures
 - Appointed Principals
 - Staff establishment, in terms of educators and support staff
- Have a functional management system in terms of Student Governing Bodies
- Sufficient budget for operation and maintenance

The following serves as an example of one of the schools, Carlton van Heerden Sekondêre Skool in Upington, ZF MgCawu district, but is available for each of the schools.



Northern Cape Department of Education

2022 Educator Staff Establishments

Public Ordinary Schools

Enquiries: **Mr. TI Van Staden**
CD: HRM&D
053 - 8396500

Reference: **300043401**
Date of Issue: **28 September 2021**

ZF MGCAWU (ZFM)

300043401

CARLTON VAN HEERDEN SEKONDÊRE SKOOL

Quintile 4

In accordance with the National Post Provisioning Norms and Standards, the Northern Cape Department of Education has endeavoured to distribute the number of affordable posts to all Public Ordinary and Special Schools under its administration. Please find included the 2022 Educator Staff Establishment for your school, based on the 2021 Learner Totals. Upon receipt of this Establishment, schools are encouraged to report any errors found on the document. All appeals have to be logged on the HRMS (Human Resource Management System), to be found under 'Post Provisioning' main menu and 'Staff Establishment Appeal' sub menu, as indicated in the PPN Circular. All queries/appeals should be submitted between 28 September and 08 October 2021. Where necessary, the NCDDoE reserves the right to amend or re-calculate any ESE, subsequent to the verification of learner/subject data, medium of instruction and poverty ranking.

Please note that the application for Additional Posts will be dealt with during the first quarter of the 2022 academic year. If required, Independent Audits will be conducted throughout the Province, to verify actual learner totals.

	GrR	Gr1	Gr2	Gr3	Gr4	Gr5	Gr6	Gr7	Gr8	Gr9	Gr10	Gr11	Gr12
Learners	0	0	0	0	0	0	0	0	0	305	348	278	234
Weight	0	0	0	0	0	0	0	0	0	1,24	1,3	1,3	1,3
Weighted Learners	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	379,12	452,00	361,00	304,00

WEIGHTING VARIABLES

Actual Learner Numbers (l) 1165

Weighted Learners (wl)	1496,115	Main Language	12
Constant Weight (a)	46	Alternative Language	24
Redress Weight =w-(a+wl)	38,553	School weight	10
School Weight (w)	1580,668	Redress	38,553
All weighted learners(TotW)	338058	Factor	1,025
Pool	8142	Posts	38,07
Posts Rounded	38		

$$wl \text{ per Post} = \frac{\text{Totw}}{\text{Pool}} = \frac{338058,128}{8142} = 41,52$$

$$\text{Posts} = \frac{w}{wl \text{ per Post}} = \frac{1580,668}{41,52} = 38,07$$

To calculate the number of posts, determine the weighted learners, add 84,553 and divide by 41,52

Weighted Secondary Subjects : Grade 10 - 12

Subject	Weight Factor	Grade 10		Grade 11		Grade 12	
		Learners	Weight	Learners	Weight	Learners	Weight
Accounting	0,187	102	19	37	6	32	5
Business Studies	0,187	92	17	57	10	39	7
Computer Applications Techn	0,277	44	12	27	7	26	7
Economics	0,187	71	13	57	10	35	6
Geography	0,187	206	38	212	39	108	20
History	0,187	226	42	191	35	182	34
Life Orientation	0,094	352	33	278	26	234	21
Life Sciences	0,216	138	29	107	23	105	22
Mathematics	0,223	58	12	35	7	41	9
Mathematics/ Maths Lit	0,223	294	65	243	54	193	43
Physical Sciences	0,231	34	7	25	5	22	5
Tourism	0,187	144	26	121	22	153	28

You qualify for 1 principal, 2 deputy principals, 6 heads of department, 29 post level 1 posts (38 posts).

FINAL ALLOCATION	
Total Posts	Ratio
38	30,7

Given your number of weighted learners, your school qualifies for the following number of Support Staff

Admin. Clerk	Cleaner	Grounds-man	Supervisor/Foreman	Total
2	3	2	1	8

NB. Posts can only be filled with the availability of funds

PRINCIPLES OF THE MODEL

The Post Provisioning Model is based on the principle that available posts are distributed among schools, proportionally to their number of weighted learners.

The concept of "weighted learner", instead of actual learner, is used to enable schools to compete on an equal footing for posts. As some learners and some learning areas require more favourable post allocations than others, each learner is given a certain weighting that reflects its relative need in respect of post provisioning.

A weighted learner enrolment for each school is determined, which, in relation to the total learner enrolment of the province, reflects its relative claim to the total pool of available posts in the province.

Figure 6-15: Post-Establishment Example

(Source: NCDDoE, 2022)

As is seen from Figure 6-15, there are currently 38 posts filled at the school, and the school has a Principal, a Circuit Manager and a functional SGB. The school is classified as a Quintile 4 school

and received a maintenance allocation through the Section 21 Norms and Standards funding as indicated in Figure 6-16:

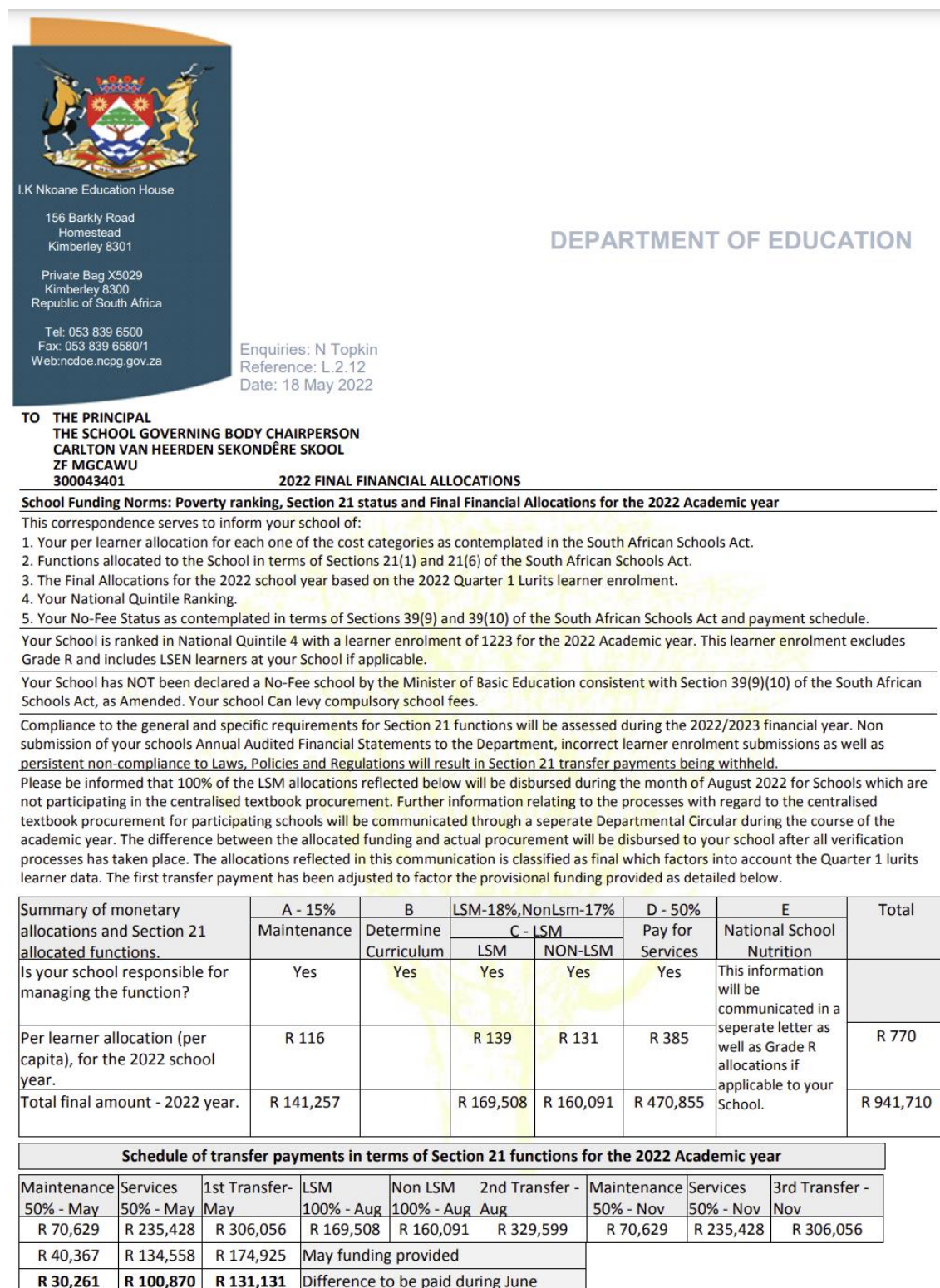


Figure 6-16: 2022 Final Financial Allocations Example
(Source: NCDoe, 2022)

The **Revenue/Fees** collected by schools are money parents pay to schools, aimed at improving the quality of education of learners. This amount is agreed to between the parent and the school. Parents who cannot afford school fees must apply to the school governing board for conditional, partial, or complete exemption from paying school fees. The revenue collected is utilised for the school's operation and is not intended for infrastructure.

6.19.2. Major Maintenance Cost

The national norms and standards for school funding in the South African Schools Act, 1996 (No. 84 of 1996) are intended to finance key inputs other than personnel and buildings in the education process. Therefore the funding is intended for textbooks, stationery and non-educational items such as cleaning materials and electricity. Such inputs are necessary if educators and other school personnel perform their functions properly. The school allocation is an important instrument supporting the Government's commitment to fulfilling the state's Constitutional obligation to provide education.

Life Cycle Cost – the Department does prioritise all schools for Routine Maintenance every seven years and Emergency Maintenance as and when required. Nationally there is an increased focus on maintenance and life cycle management – this is clear with the conditions of the EIG for the utilisation of 60% of the budget for maintenance; therefore, schools will be prioritised for their routine and preventative maintenance as per the Departmental Maintenance Plan. The following table indicates the estimated cost that these identified schools will be prioritised for through the Education Infrastructure Grant in line with the Maintenance Policy and Plan of the Department indicated in Table 6-26:

Table 6-26: Maintenance Costing

Components	Total Construction, Including Furniture 2022/23		Total Construction, Including Furniture 2023/24		Total Construction, Including Furniture 2024/25		Total Construction, Including Furniture 2025/26		Total Construction, Including Furniture 2026/27		Total Construction, Including Furniture 2027/28	
Minor Maintenance												
Level 0 - Primary - Minor Maintenance	R	378 725	R	401 448	R	425 535	R	451 067	R	478 131	R	506 819
Level 1 - Primary - Minor Maintenance	R	518 889	R	550 022	R	583 024	R	618 005	R	655 085	R	694 390
Level 2 - Primary - Minor Maintenance	R	662 731	R	702 495	R	744 645	R	789 323	R	836 683	R	886 884
Level 3 - Primary - Minor Maintenance	R	764 708	R	810 591	R	859 226	R	910 780	R	965 427	R	1 023 352
Level 4 - Primary - Minor Maintenance	R	846 454	R	897 241	R	951 076	R	1 008 141	R	1 068 629	R	1 132 747
Level 1 - Secondary - Minor Maintenance	R	430 256	R	456 072	R	483 436	R	512 442	R	543 189	R	575 780
Level 2 - Secondary - Minor Maintenance	R	549 527	R	582 498	R	617 448	R	654 495	R	693 765	R	735 391
Level 3 - Secondary - Minor Maintenance	R	634 092	R	672 138	R	712 466	R	755 214	R	800 527	R	848 558

Components	Total Construction, Including Furniture 2022/23		Total Construction, Including Furniture 2023/24		Total Construction, Including Furniture 2024/25		Total Construction, Including Furniture 2025/26		Total Construction, Including Furniture 2026/27		Total Construction, Including Furniture 2027/28	
Level 4 - Secondary - Minor Maintenance	R	701 862	R	743 973	R	788 612	R	835 928	R	886 084	R	939 249
Level 5 - Secondary - Minor Maintenance	R	759 393	R	804 956	R	853 254	R	904 449	R	958 716	R	1 016 239
Level 6 - Secondary - Minor Maintenance	R	809 876	R	858 468	R	909 976	R	964 575	R	1 022 449	R	1 083 796
Level 7 - Secondary - Minor Maintenance	R	868 881	R	921 014	R	976 275	R	1 034 851	R	1 096 943	R	1 162 759
Level 8 - Secondary - Minor Maintenance	R	896 443	R	950 230	R	1 007 243	R	1 067 678	R	1 131 739	R	1 199 643
Level 1 - Combined - Minor Maintenance	R	610 941	R	647 598	R	686 454	R	727 641	R	771 299	R	817 577
Level 2 - Combined - Minor Maintenance	R	780 308	R	827 127	R	876 754	R	929 360	R	985 121	R	1 044 228
Level 3 - Combined - Minor Maintenance	R	900 367	R	954 389	R	1 011 653	R	1 072 352	R	1 136 693	R	1 204 894
Small Hostel (150 Learners) - Minor Maintenance	R	1 123 600	R	1 191 016	R	1 262 477	R	1 338 226	R	1 418 519	R	1 503 630
Medium Hostel (200 Learners) - Minor Maintenance	R	1 404 500	R	1 488 770	R	1 578 096	R	1 672 782	R	1 773 149	R	1 879 538
Large Hostel (350 Learners) - Minor Maintenance	R	1 685 400	R	1 786 524	R	1 893 715	R	2 007 338	R	2 127 779	R	2 255 445
Major Maintenance												
Level 0 - Primary - Major Maintenance	R	1 136 175	R	1 204 345	R	1 276 606	R	1 353 202	R	1 434 394	R	1 520 458
Level 1 - Primary - Major Maintenance	R	1 556 667	R	1 650 067	R	1 749 071	R	1 854 015	R	1 965 256	R	2 083 171
Level 2 - Primary - Major Maintenance	R	1 988 193	R	2 107 484	R	2 233 934	R	2 367 970	R	2 510 048	R	2 660 651
Level 3 - Primary - Major Maintenance	R	2 294 125	R	2 431 772	R	2 577 679	R	2 732 339	R	2 896 280	R	3 070 057
Level 4 - Primary - Major Maintenance	R	2 539 363	R	2 691 724	R	2 853 228	R	3 024 422	R	3 205 887	R	3 398 240
Level 1 - Secondary - Major Maintenance	R	1 290 769	R	1 368 215	R	1 450 308	R	1 537 326	R	1 629 566	R	1 727 340
Level 2 - Secondary - Major Maintenance	R	1 648 581	R	1 747 495	R	1 852 345	R	1 963 486	R	2 081 295	R	2 206 173
Level 3 - Secondary - Major Maintenance	R	1 902 276	R	2 016 413	R	2 137 398	R	2 265 642	R	2 401 580	R	2 545 675
Level 4 - Secondary - Major Maintenance	R	2 105 585	R	2 231 920	R	2 365 835	R	2 507 785	R	2 658 252	R	2 817 747
Level 5 - Secondary - Major Maintenance	R	2 278 178	R	2 414 869	R	2 559 761	R	2 713 347	R	2 876 147	R	3 048 716
Level 6 - Secondary - Major Maintenance	R	2 429 627	R	2 575 405	R	2 729 929	R	2 893 725	R	3 067 348	R	3 251 389
Level 7 - Secondary - Major Maintenance	R	2 606 644	R	2 763 042	R	2 928 825	R	3 104 554	R	3 290 828	R	3 488 277
Level 8 - Secondary - Major Maintenance	R	2 689 329	R	2 850 689	R	3 021 730	R	3 203 034	R	3 395 216	R	3 598 929
Level 1 - Combined - Major Maintenance	R	1 832 824	R	1 942 793	R	2 059 361	R	2 182 922	R	2 313 898	R	2 452 731
Level 2 - Combined - Major Maintenance	R	2 340 925	R	2 481 380	R	2 630 263	R	2 788 079	R	2 955 363	R	3 132 685
Level 3 - Combined - Major Maintenance	R	2 701 102	R	2 863 168	R	3 034 958	R	3 217 055	R	3 410 079	R	3 614 683
Small Hostel (150 Learners) - Major Maintenance	R	3 370 800	R	3 573 048	R	3 787 431	R	4 014 677	R	4 255 557	R	4 510 891
Medium Hostel (200 Learners) - Major Maintenance	R	5 618 000	R	5 955 080	R	6 312 385	R	6 691 128	R	7 092 596	R	7 518 151
Large Hostel (350 Learners) - Major Maintenance	R	8 988 800	R	9 528 128	R	10 099 816	R	10 705 805	R	11 348 153	R	12 029 042
Preventative Maintenance												
Level 0 - Primary - Preventative Maintenance	R	757 450	R	802 897	R	851 070	R	902 135	R	956 263	R	1 013 639

Components	Total Construction, Including Furniture 2022/23	Total Construction, Including Furniture 2023/24	Total Construction, Including Furniture 2024/25	Total Construction, Including Furniture 2025/26	Total Construction, Including Furniture 2026/27	Total Construction, Including Furniture 2027/28
Level 1 - Primary - Preventative Maintenance	R 1 037 778	R 1 100 044	R 1 166 047	R 1 236 010	R 1 310 171	R 1 388 781
Level 2 - Primary - Preventative Maintenance	R 1 325 462	R 1 404 990	R 1 489 289	R 1 578 646	R 1 673 365	R 1 773 767
Level 3 - Primary - Preventative Maintenance	R 1 529 417	R 1 621 182	R 1 718 452	R 1 821 560	R 1 930 853	R 2 046 704
Level 4 - Primary - Preventative Maintenance	R 1 692 908	R 1 794 483	R 1 902 152	R 2 016 281	R 2 137 258	R 2 265 493
Level 5 - Primary - Preventative Maintenance	R 1 831 643	R 1 941 542	R 2 058 034	R 2 181 516	R 2 312 407	R 2 451 152
Level 1 - Secondary - Preventative Maintenance	R 860 512	R 912 143	R 966 872	R 1 024 884	R 1 086 377	R 1 151 560
Level 2 - Secondary - Preventative Maintenance	R 1 099 054	R 1 164 997	R 1 234 897	R 1 308 991	R 1 387 530	R 1 470 782
Level 3 - Secondary - Preventative Maintenance	R 1 268 184	R 1 344 275	R 1 424 932	R 1 510 428	R 1 601 053	R 1 697 117
Level 4 - Secondary - Preventative Maintenance	R 1 403 723	R 1 487 946	R 1 577 223	R 1 671 857	R 1 772 168	R 1 878 498
Level 5 - Secondary - Preventative Maintenance	R 1 518 785	R 1 609 913	R 1 706 507	R 1 808 898	R 1 917 432	R 2 032 477
Level 6 - Secondary - Preventative Maintenance	R 1 619 751	R 1 716 936	R 1 819 953	R 1 929 150	R 2 044 899	R 2 167 593
Level 7 - Secondary - Preventative Maintenance	R 1 737 762	R 1 842 028	R 1 952 550	R 2 069 703	R 2 193 885	R 2 325 518
Level 8 - Secondary - Preventative Maintenance	R 1 792 886	R 1 900 459	R 2 014 487	R 2 135 356	R 2 263 477	R 2 399 286
Level 1 - Combined - Preventative Maintenance	R 1 221 882	R 1 295 195	R 1 372 907	R 1 455 282	R 1 542 598	R 1 635 154
Level 2 - Combined - Preventative Maintenance	R 1 560 616	R 1 654 253	R 1 753 509	R 1 858 719	R 1 970 242	R 2 088 457
Level 3 - Combined - Preventative Maintenance	R 1 800 734	R 1 908 778	R 2 023 305	R 2 144 703	R 2 273 386	R 2 409 789
Small Hostel (150 Learners) - Preventative Maintenance	R 2 247 200	R 2 382 032	R 2 524 954	R 2 676 451	R 2 837 038	R 3 007 261
Medium Hostel (200 Learners) - Preventative Maintenance	R 3 089 900	R 3 275 294	R 3 471 812	R 3 680 120	R 3 900 928	R 4 134 983
Large Hostel (350 Learners) - Preventative Maintenance	R 3 932 600	R 4 168 556	R 4 418 669	R 4 683 790	R 4 964 817	R 5 262 706

(Source: NCDoe, 2022)

6.20. Budget Requirement

The NCDoe has addressed the provisioning of basic services per the First Line Priority (3-Year Timeframe) stated in the Norms and Standards. The Northern Cape Schools have a suitable category of electricity supply, a suitable category of water supply, and an appropriate category of sanitation; therefore, the department has already started to implement the Second Line Priority (7-Year Timeframe), where the sufficiency is addressed for basic services. The main issue in addressing completed inappropriate structures (asbestos, wood, metal) is that the problem is on a higher level due to the cost implications to which the NCDoe budget will not be able to cater; therefore, this target of eradicating all wholly inappropriate structures was not met by November 2016. The Regulations set out timeframes for providing the various categories of facilities required for a school. The estimated budgetary value of the backlogs for each of the timeframes, in terms thereof, is summarised below:

Table 6-27: The estimated budget required to address Norms and Standards

Norms And Standards Category	Priority In Terms of Norms And Standards	Type Of Facility in Line with Norms And Standards	Baseline Backlog [2014]	Total Completed Projects	Backlog As of November 2021	Budget Requirement on Revised Backlog As Of November 2021	Comment
1st Line Priority	1.1	Full Replacement Schools	31	7	25	R 1 661 599 605	Includes the Full Inappropriate Structures
1st Line Priority	1.2	Relocation Schools	80		16	R 825 120 930	Includes Schools in The High-Risk Areas Of The Asbestos Belt
1st Line Priority	1.3	No Water - Number of Schools To Be Provided With Water	46	7	30	R -	New Schools Where Water Needs To Be Provided - Price Is Included In The New School Programme
1st Line Priority	1.4	No Ablution Facilities - Number Of Schools To Be Provided With Sanitation	50	8	30	R -	New Schools Where Sanitation Needs To Be Provided - Price Is Included In The New School Programme
1st Line Priority	1.5	No Source of Electricity - Number of Schools To Be Provided With Electricity	49	10	30	R -	New Schools Where Electricity Needs To Be Provided - Price Is Included In The New School Programme
2nd Line Priority	2.1	Partial Replacement Schools	28		46	R 904 376 323	Includes The Partial Inappropriate Structures
2nd Line Priority	2.2	Upgrading Or Additional Supply of Water Facilities - Number of Schools	160	41	196	R 90 824 215	Includes Upgrade to Water Network and Additional Supply
2nd Line Priority	2.3	Upgrading Of Additional Supply of Sanitation Facilities - Number Of Schools	123	74	305	R 381 070 000	Includes All Sewer Network Challenges, Age-Appropriate Sanitation and Sufficient And Reliable Supply
2nd Line Priority	2.4	Upgrading Of Electricity - Number of Schools	9	30	139	R 74 794 841	Includes Upgrades to Electricity
2nd Line Priority	2.5	Number Of Ordinary Classrooms	224	367	605	R 457 963 523	Excluding New and Replacement Schools [162 Schools]
2nd Line Priority	2.6	Number Of Grade R Classrooms	91	40	190	R 521 956 885	Excluding New and Replacement Schools [122 Schools]
2nd Line Priority	2.7	No Fencing - Number of Schools To Be Provided With Fencing	46	8	30	R -	New Schools Where Fencing Needs To Be Provided - The Price Is Included In The New School Programme
2nd Line Priority	2.8	Upgrading Of Fencing - Number of Schools	103	28	150	R 300 845 776	

Norms And Standards Category	Priority In Terms of Norms And Standards	Type Of Facility in Line with Norms And Standards	Baseline Backlog [2014]	Total Completed Projects	Backlog As of November 2021	Budget Requirement on Revised Backlog As Of November 2021	Comment
3rd Line Priority	3.1	Number Of Multipurpose Centres (Library+Computer)	154	11	156	R 400 682 724	
3rd Line Priority	3.2	Number Of Computer Rooms	42	11	91	R 128 890 080	This Figure Increased Due to Learner Enrolment and The Need to Construct Independent Computer Centres As Ordinary Classrooms Were Utilised
3rd Line Priority	3.3	Number Of Laboratories	105	22	308	R 344 124 000	
3rd Line Priority	3.4	Number Of Libraries	154	4	154	R -	Included In Media Centre Programme
4th Line Priority	4.1	Number Of Nutrition Centre	135	14	317	R 572 770 000	Caters For the Replacement of Inappropriate Structure Nutrition Kitchens as Well As Independent Kitchens
4th Line Priority	4.2	Number Of Schools That Require Additional Administrative Spaces		16	377	R 683 628 000	
4th Line Priority	4.10	Number Of Halls / Forums	No	16	249	R 1 378 019 286	
4th Line Priority	4.11	Number Of Multipurpose Classrooms	462	5	190	R 207 537 760	
4th Line Priority	4.12	Number Of Technical Workshops	0	0			
4th Line Priority	4.13	No Sports Facilities - Number of Schools To Be Provided With Sports Facilities		11			
4th Line Priority	4.14	Upgrading Of Sport Facilities Number of Schools		29	197	R 108 350 000	
Condition Improvement		Maintenance / Upgrading / Renovations - Number of Schools	460	103	552	R 2 734 838 519	Almost All Schools Have Some Sort of Maintenance Requirement

Norms And Standards Category	Priority In Terms Of Norms And Standards	Type Of Facility in Line with Norms And Standards	Baseline Backlog [2014]	Total Completed Projects	Backlog As of November 2021	Budget Requirement on Revised Backlog As Of November 2021	Comment
New Schools		New Schools	46	8	30	R 2 458 005 270	
Schools To Be Closed		Schools In The Process Of Being Closed		0			The Rationalisation Process Is Still Underway

(Source: Author's creation, 2022)

A total of R14.2 billion is required to address the Norms and Standards Backlog; this is indicated in Table 6-28:

Table 6-28: The estimated budget required to address Norms and Standards - Summary

Norms And Standards Timeframe	Budget Requirement on Revised Backlog as Of November 2021
1st Line Priority No Basic Services (Water, Sanitation & Electricity) And Schools Comprised Entirely of Inappropriate Structures	R 2 486 720 535
2nd Line Priority Classrooms, Inappropriate Partial Structures, Insufficient Basic Services, Fencing & Security, Connectivity	R 2 731 831 563
3rd Line Priority Multipurpose Classrooms, Libraries, Laboratories, Computer Labs	R 873 696 804
4th Line Priority Administration Areas, Nutrition Centres, Parking Bays, Sports Fields	R 2 950 305 046
Condition Improvement	R 2 734 838 519
New Schools	R 2 458 005 270
Grand Total	R14 235 397 737

(Source: Author's creation, 2022)

6.21. Budget allocation

The department's budgetary requirements over the next ten years are immense, considering the number of schools in the province and the need to eradicate inappropriate structures. The current condition of historically neglected assets in the John Taolo Gaetsewe District, formerly Kgalagadi District of the North-West Province, and the need to revamp and revitalise school and hostel buildings that have spanned over 100 years and are still in use have an impact on the budget

requirement. Given the geographic profile of the province, the provision of accommodation for learners from rural areas into peri-urban or urban areas, adhering to the timeframes within the Norms and Standards, has a cost implication that exceeds the budget allocations. The Department spent all the funds (100%) on infrastructure delivery within the financial year, as had been the case in the previous financial year. The following graph indicates the budget expenditure for the last twelve (12) financial years and forward estimates for the 2022/23 MTEF Period for the Northern Cape Education Infrastructure Grant (EIG) and the Equitable Share (ES) allocations.

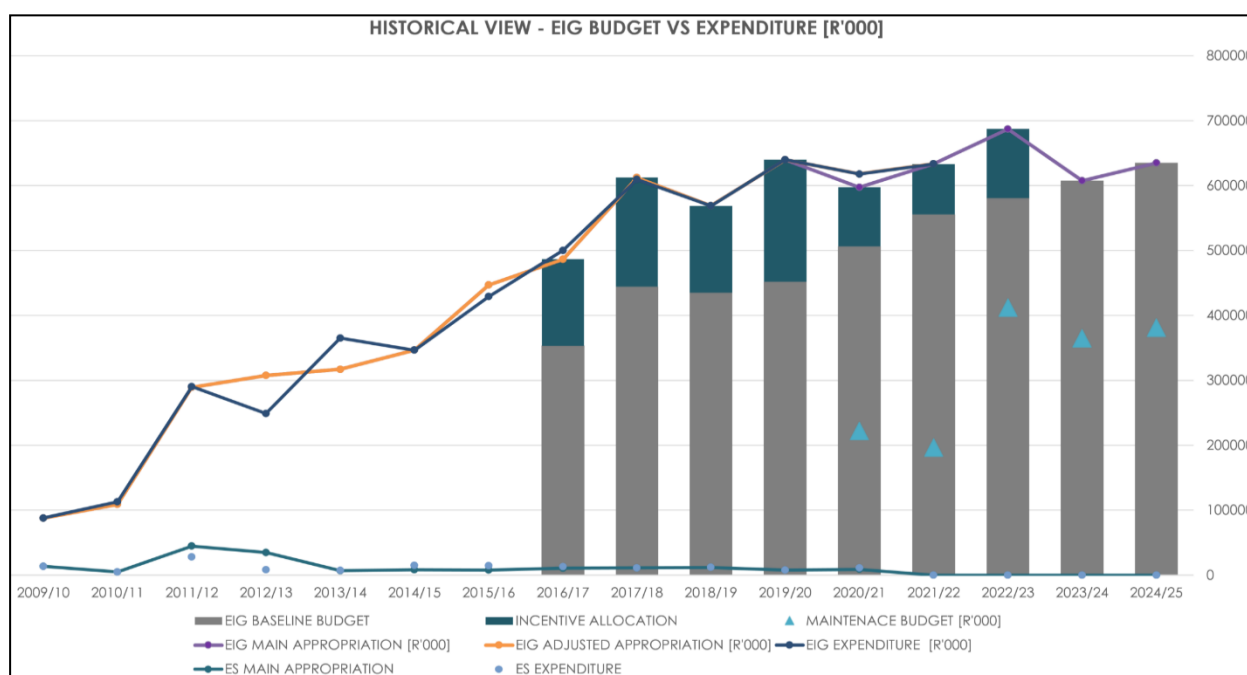
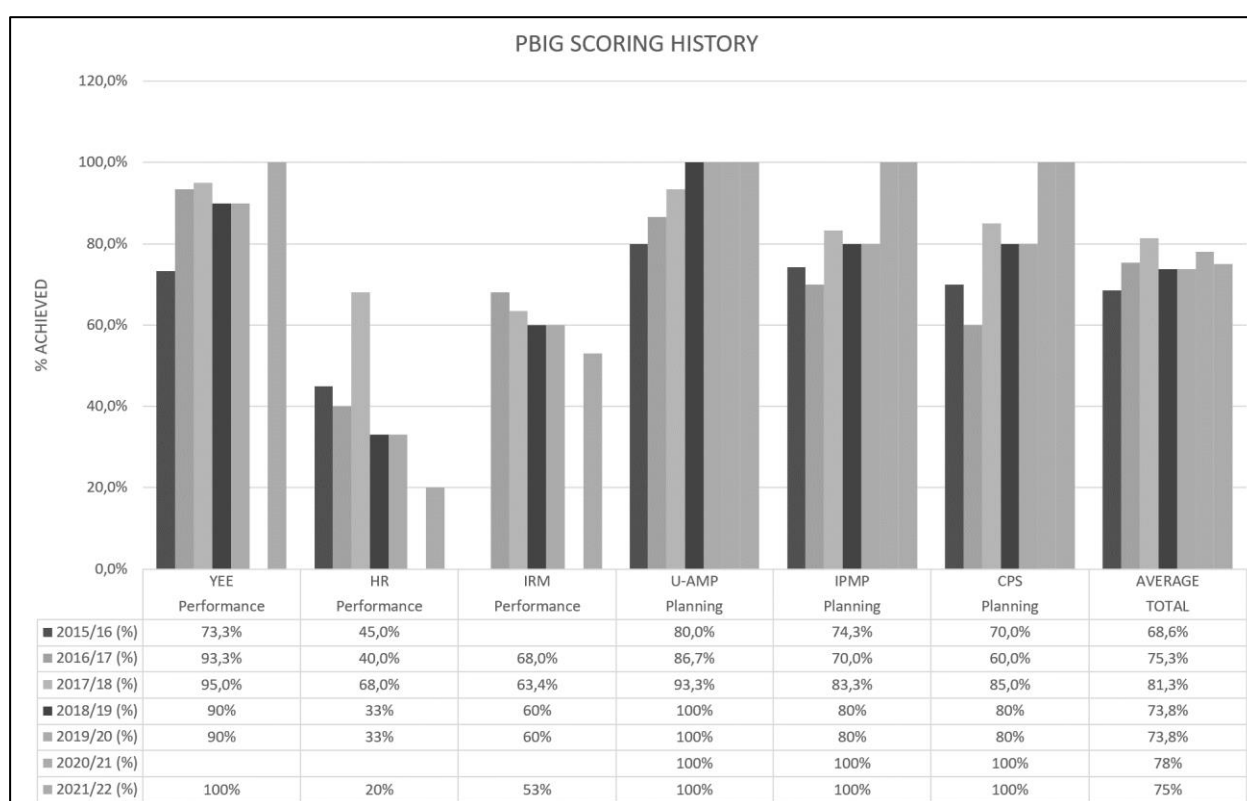


Table 6-29: Budget vs Expenditure – Historical View EIG & ES

(Source: Author's creation, 2022)

It is clear that since the Department of Education's Physical Resources Management Unit has been capacitated in the Human Resources Capacitation Programme from 2013/14, the department's performance has improved. The infrastructure delivery unit adopted an integrated approach to planning, consultation, project prioritisation and implementation. A wide range of data sources was used in compiling the Planning Documents, including updated Condition Assessments from the Department of Roads and Public Works (DRPW), NEIMS Survey data, Education Management Information System (EMIS) data, StatsSA, records maintained by the Department on the provincial audit of infrastructure (2014/15 – 2015/16) municipal data and information from the district offices and schools themselves. The collation of information identified gaps in required assets, the performance of assets and the condition of assets at all schools in the province. This information assists in the delivery programme for future project identification, planning and implementation.

The Northern Cape Province had an opportunity to access additional funding to the provincial infrastructure baselines by submitting planning documents and performance reports that meet the minimum requirements outlined in the performance-based system's guidelines. The financial incentive was ring-fenced as “unallocated” within the baselines of the Education Infrastructure Grant (EIG). To pre-qualify for the incentive allocation, the Provincial Department must attain an overall score of 75%. The NCDoE achieved a final score of 75% and qualified for the incentive allocation of R 105 million, which was added to the baseline for the 2022/23 financial year. The Northern Cape qualified for the Performance Base Incentive Grant (PBIG) since its inception in 2015 and has received a total of R 1 168 650 200 additional incentive allocations. Graph 6-4 indicates the achieved scoring per requirement:



Graph 6-4: PBIG Scoring History – Northern Cape
(Source: Author's creation, 2022)

The Department has a funding strategy in place to deal with donor funding. The funding from Non-Government Organisations (NGOs) has increased over the years as the organisations have grown. The funding is usually applied toward the building of school infrastructure. The respective funding organisation commonly identifies a need for infrastructure at a specific school in its immediate vicinity of business operations and submits a proposal to the DoE. The Northern Cape has numerous mining companies conducting business in the province. The department

approaches these companies and vice versa with proposals vetted for viability. The Department engages with these donors to ensure that the intended infrastructure is in line with the Norms and Standards and adheres to the standard architectural plans as approved by the Department. In the past, donors have constructed Classrooms, Science laboratories, hostels and ECD Centres. The Department also sometimes solicits donor funding to address critical infrastructure challenges at specific schools. The implementation of such projects is co-funded by the two parties. The Donor funding is aimed at core costs and is explicitly intended to help schools transform and develop. Once this funding is allocated to various projects, the Department

This type of funding requires a concise Memorandum of Agreement (MOA). The agreement determined definitive time constraints, including a component of the relationship between the Department and the funder. Donors are not in a position to annually fund projects required by the Department; therefore, the Department's monitoring and evaluation and future maintenance of the end product are responsible. The NCDoe identified the Inappropriate Structure Programme for the Budget Facility for Infrastructure (BFI) process as a sizeable Strategic Infrastructure Programme for the 2023 MTEF.

“The Budget Facility for Infrastructure (BFI) was introduced in 2016 as a reform to the budget process. It supports the execution of national priority projects and programmes by establishing specialised structures, procedures and criteria for committing fiscal resources to public infrastructure spending. As directed by Cabinet, National Treasury is working jointly with other stakeholders to support the development of a robust pipeline of infrastructure projects. The aim is to support quality public investments through robust project appraisal, effective project development and execution and sustainable financing arrangements” (National Treasury, 2022:22).

The budget availability through the Education Infrastructure Grant [EIG] is limited; even though the replacement of Inappropriate structures is a national priority, the conditions of the EIG for the utilisation of 60% of the budget for maintenance results in limited resources for this programme and without any intervention will have a consequence that the Department will not be able to eradicate all inappropriate structures within the next 20years. It was therefore proposed for accelerated implementation through the BFI process.

President Cyril Ramaphosa, in his 2022 State of the Nation Address, stated that infrastructure is central to our economic reconstruction and recovery and that the plan will focus on the priorities identified in the 2021 SoNA, which includes a massive rollout of infrastructure, a substantial increase in local production and an employment stimulus to create jobs and support livelihoods.

The Department did submit an application to ISA in November 2021 that included the New Schools, Replacement Schools and Special Schools. This submission was put together to request additional funding to replace inappropriate structures and build new schools where there is a shortage of classrooms. It also contributes to the NCDoe to the SIDS 2020 to obtain additional funding from the Investment and Infrastructure Office in the Office of the President to replace 8 Full Inappropriate structure schools (Asbestos) and construct 12 new public ordinary and two new special schools.

The proposed Inappropriate Structure Programme includes replacing forty inappropriate schools and one inappropriate hostel, mainly constructed from Asbestos and wood, in four phases, as seen in the following map. All Northern Cape District Municipalities are affected; however, most projects are located in Pixley Ka Seme and ZF MgCawu, the two central affected districts. This BFI application is to request a total budget of **R 3 645 637 212** over five years.

6.22. Alternative Solutions

In the Northern Cape Province, many demanding issues need to be dealt with, like the arid climate and remoteness of the Province. Some areas are sparsely populated but still need a school. In the John Taolo Gaetsewe District, traditional land has its demands. Alternative solutions have been explored to address the funding and space challenges. To address demand challenges in the Province, the Department is using the following non-asset solutions to address demand issues:

- Learner Transport (especially in the Upington area) - as a temporary measure as transport is undesirable due to unreliability and cost;
- Use mobile classrooms as temporary accommodation for schools where it is not financially viable or feasible to construct new buildings and address the need for education infrastructure at farm schools in the province. The department does not purchase new mobiles; instead, it attempts to maintain those currently listed as assets. These mobiles are moved from school to school where the need arises until a more permanent solution is implemented;
- At schools in remote areas where the need for additional infrastructure assets such as computer labs is not a financially viable solution, the department opts to fully utilise the available learning solutions to turn a classroom into a multi-functional asset. For instance, the Norms and Standards recognised ICT as a basic need for education outreach and enhancement. Various schools in the Northern Cape utilise Telematics or virtual learning as a learning option. Telematics provides learning materials through the supply of learning

materials using satellite access to remote areas. In this instance, using the available technology, the Department provides learning spaces for the different subject matters and does not need to build a separate facility to cater for a particular subject, e.g. Science Laboratories;

- Mobile libraries, ECD Classrooms, mobile ablution blocks, and mobile administration blocks temporary options where schools do not have such facilities at present;
- Laboratories in a box and Desktop mini science kits. For an ordinary classroom to serve a dual purpose as a classroom and a science laboratory, especially in primary schools;
- Solar-powered e-books (kindles) to bring technology and alternative delivery of library materials to schools;
- Food gardening as a teaching tool and food security is implemented in many schools on their initiation. The Department is looking at providing affordable means of irrigation to these schools and encouraging other schools to join this effort; and
- Alternative approaches to sourcing water include play pumps that encourage outdoor play and provide a cost-effective alternative to pumping water.



Figure 6-17: Play Pump at Bogosieng Lekwe Primary School – John Taolo Gaetsewe, Northern Cape

(Source: Author's creation, 2022)

6.23. Chapter Conclusion

Within this chapter, it was evident that there are various infrastructure challenges in the Northern Cape. One of the main challenges to be addressed is the inappropriate structures and the budget available to address this challenge. Maintenance of the existing facilities also poses a challenge. Perhaps in the case of Northern Cape, the Division of Revenue Act requirement of 60% budget allocation to the maintenance programme can assist in condition improvement. However, other challenges take priority, and it is evident that with the current budget allocation, the NCDoe should

explore alternatives in terms of funding and infrastructure delivery to adhere to the timeframes set in the Norms and Standards. The amendment of the Norms and Standards will place even more pressure on the delivery of infrastructure due to the alignment with the NDP's deadline of 2030.

What is apparent is that the condition of education facilities and other demands keep changing with time. A capital injection is needed for the sector to stay ahead of all these changes and to ensure that these facilities continue to be conducive for the intended purpose and meet acceptable standards per the provisions of the Norms and Standards. This capital injection must be preceded by careful planning and effective execution of infrastructure plans to realise maximum return on investment. For meaningful, sensible, and effective planning to occur, the sector must know to a reasonable degree of confidence where it is in the greater scheme of things - the status quo concerning the condition and functional adequacy of infrastructure in its education facilities. This would be the basis upon which meaningful infrastructure plans would be developed which requires that up-to-date and authentic information on the education facilities' condition is available for reliable and formidable baseline information to exist. This will enable the government to measure the progress made by the sector and the government in providing basic education infrastructure, which would be assessed objectively against this baseline.

While this thinking is appreciated and commonly agreed upon, the problem is that there are no standard sector-wide and sector-specific guidelines in place that indicate how these condition assessments should be carried out, what information should be solicited from the condition assessments, what to do with the data that has been amassed and what information needs to be provided following the analysis of the data. As a result, there is no standardisation and clarity on the focus areas, as there are no set protocols for undertaking these condition assessments. Figure 6-18 summarises what was identified in this empirical research; it indicates the school distribution and average ratios for education facilities and summarises the identified gaps.

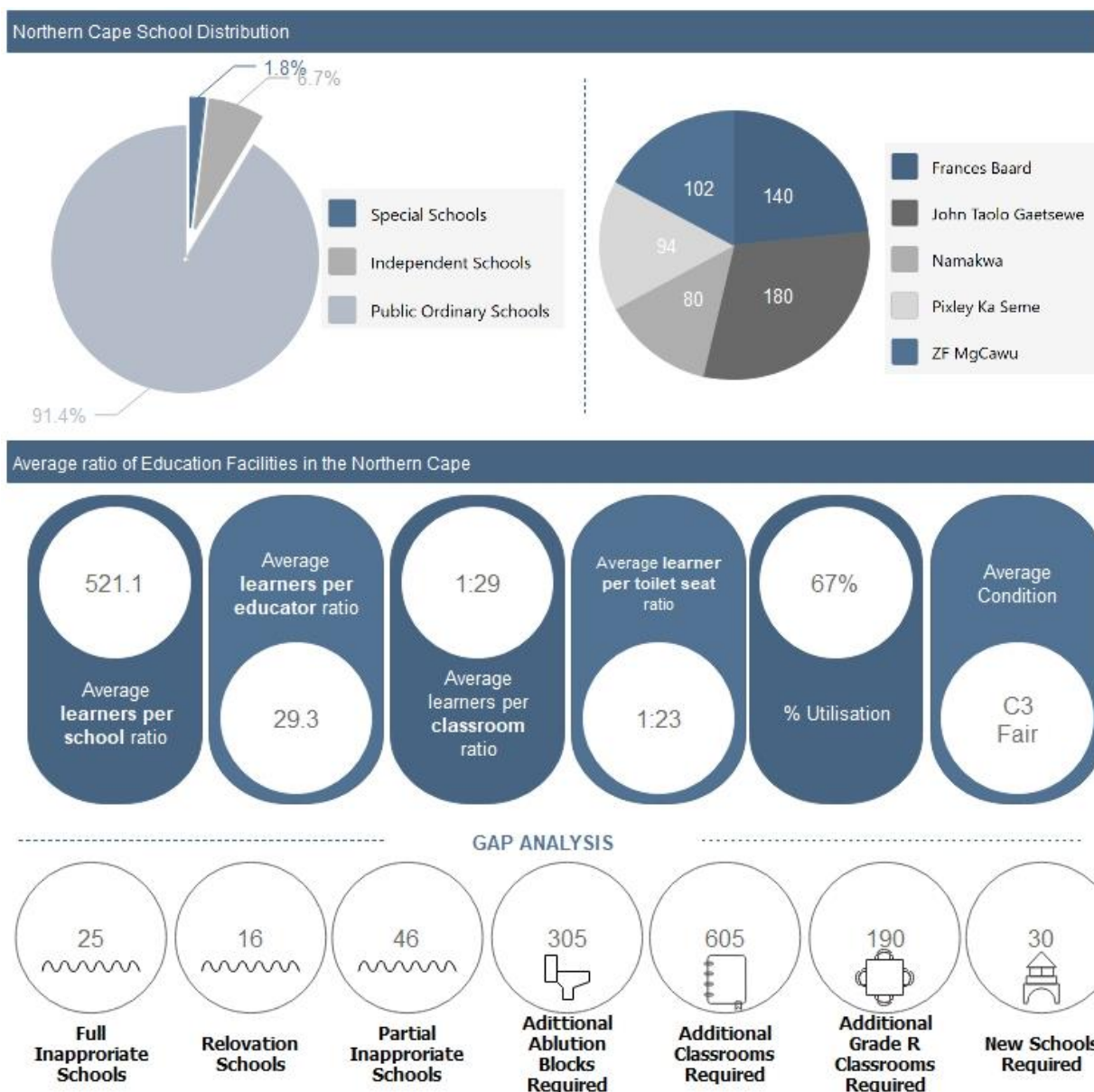


Figure 6-18: Chapter 6 Conclusion

Table 6-30 provides as a concluding remark of this chapter the link between the conclusion reached and the relevant objective in line with the research objectives and primary research questions of this study:

Table 6-30: Linking research objectives to chapter purpose and conclusion

Research Objectives	Primary question	research	The conclusion reached within this chapter
To conduct empirical research on the physical resources within the Northern Cape Department of Education Identify measures to determine the existing school infrastructure (supply) within the Northern Cape Province	What education infrastructure (current supply) forms part of the Northern Cape assets, and what measures can be	existing	Throughout this chapter, the existing infrastructure of the Northern Cape was analysed. Data sets that included the EMIS data, NEIMS data, Condition Assessments, and personal observations were utilised to prepare a master list for the Northern Cape that included all relevant information to determine the supply, the utilisation in terms of ratios and the condition. Ultimately, it can be utilised to determine the need in line with the Norms and Standards. This chapter provides a background of the Northern Cape and its five (5) districts, the population, the number

Research Objectives	Primary research question	The conclusion reached within this chapter
To investigate characteristics of the physical resources within the education sector of the Northern Cape	utilised to determine the characteristics?	of schools, the number of learners and the growth or decline of each district over the last 15 years. It investigated the number of classrooms available for teaching and learning and determined the number of toilet seats utilised at each facility.
Determine the demand for school infrastructure; Determine what school infrastructure is required based on needs assessments;	What education infrastructure is currently needed (demand)?	In line with determining the supply, the next step of the gap analysis was to determine the demand or the need for new infrastructure at these Northern Cape Schools. The demand was calculated in terms of the Norms and Standards minimum requirements and was affected by learner enrolment. A demand for classrooms was registered when a school was overcrowded due to the learner-classroom ratio. However, if a particular facility utilised ordinary classrooms for other purposes, such as libraries, computer rooms, science laboratories or any other purpose other than its intended use, and experienced overcrowding, the construction of a fit-for-purpose structure was indicated as the gap instead of classrooms.
	How can the sector ensure that existing assets are maintained and utilised to their full potential?	This chapter indicated the need for condition improvement as a full condition analysis was done on the Northern Cape Facilities. It can be concluded that even though most schools are in fair condition, all Northern Cape Schools have maintenance requirements. It became evident that schools do not utilise the allocated funds for maintenance repairs. The lack of maintenance at education facilities can be addressed by advocating the need to ring-fence a particular portion of the allocated funds to infrastructure maintenance and implementing the proposed maintenance manual to guide the planning and implementation of maintenance. Throughout the country, there is an increased focus on maintenance. As indicated in Chapter 3, the condition of the Education Infrastructure Grant was amended in 2022 for provinces to utilise 60% of the allocated funds to maintain existing infrastructure. It has therefore become the planners' responsibility within the sector to ensure that facilities are planned for maintenance as it is the most cost-effective option to provide the quality infrastructure that is viable to the end user. That promotes quality education and an enabling environment for teaching and learning.
Investigate the sustainability of existing physical resources	Will it be more cost-effective to plan new facilities to address the demand or improve the existing education infrastructure?	It can be concluded that it is more cost-effective to improve existing infrastructure through the upkeeping and maintenance of infrastructure and the provision of additional infrastructure as per the requirement of the Norms and Standards, and the upgrading of existing infrastructure should be prioritised. After that, when schools are underutilised or declining annually in learner numbers, it is recommended that the conversion into a three-stream school be investigated. A new school should be prioritised as the last option and only when it is deemed feasible and sustainable.

(Source: Author's creation, 2022)

The following Chapters 7 and 8 provide the conclusions of this research and recommendations.

CHAPTER 7 CONCLUSIONS

7.1. Chapter Introduction

This research focused on the content of educational facilities planning, how planning was done in the past, how it is currently done and how it can be optimised in future. This chapter addressed the research objectives and provided concluding remarks based on the theoretical and empirical analysis. This research started with a theoretical basis that explained development theories, legislation, frameworks, and guidelines that impact education facilities planning. It compared education facilities planning on an international level and determined the influence that infrastructure can have on the economy. The empirical study was a case study of the NCDoe's assets and the current supply of education facilities. The study did a life cycle costing analysis and made examples of assets over their presumed life span, where technical assessments are recommended to be conducted to determine if the asset is still viable. The life cycle costing, in the end, determined the maintenance requirement of the Northern Cape Education Facilities. The Northern Cape education facilities were then analysed in terms of their utilisation and gap analysis in line with the current requirements, Norms and Standards, and a complete cost estimate on the Norms and Standards implication on the Northern Cape was the result of these analyses. It was identified that the central infrastructure challenge in the Northern Cape is the inappropriate structures that need to be replaced. It was identified that the asbestos challenge does not just affect the NCDoe but that various other departments are affected; therefore, this study made recommendations in Chapter 8 to address this challenge.

7.2. Findings related to current legislation, regulations and standards for provisioning school infrastructure and its planning and design.

From 1994 onwards, the government passed several pieces of legislation which imply the planning, implementation and operation of education infrastructure. This legislation includes the Constitution of the Republic of South Africa (Act No. 108 of 1996) (section 3.3.1), the South African Schools Act (Act 86 of 1996) (section 3.3.3) and later the Spatial Planning and Land Use Management Act (Act 16 of 2013) (section 3.3.10). These acts gave life to various regulations and guidelines that followed, such as the Regulations Relating to the Minimum Norms and Standards for Public School Infrastructure 2013 (section 3.3.3.1) and the Integrated Urban Development Framework (section 3.3.11), which have key components to achieving the core objective of education which is teaching and learning. The impact of infrastructure development and an education facility on the environment, the spatial planning, social, economic, cultural, and biophysical aspects was indicated in Chapter 3. Chapter 3 also considered all other legislation

and associated regulatory processes with making decisions and stated the urgency and need for an all-inclusive consultation process. It became evident that there is no comprehensive regulatory process for education infrastructure. The previous year's State of the Nation Addresses and provincial budget votes indicated an increased budget allocation to address infrastructure and an increased focus on infrastructure maintenance.

Due to the high priority of education infrastructure and the impact thereof on teaching and learning, a significant amount of legislation, regulations, and standards regulate and guide the planning, implementation, and operation of education infrastructure, as indicated in Chapter 3. It was found that even though there is a significant amount, there is a limited level of support from the various legislation, regulations, and standards regarding the provisioning of school infrastructure, as indicated in Table 3-1: Legislation Conclusion. The legislation broadly guides planning, but there is a prominent gap between literature and practices relating to school infrastructure. A framework to guide Educational Infrastructure planning is needed to ensure this gap is bridged.

The roles and responsibilities of infrastructure from a national level down and an education facility up are also vague and overlapping. The South African Schools Act in Section 3.3.3 indicates that the usage rights to Governing Bodies in respect of the school's immovable property is that a governing body may, with the approval of the Member of the Executive Council - lease, burden, convert or alter the immovable property of the school. Section 20(1) (g) of the SASA states that the governing body "must administer and control the school's property, and buildings and grounds occupied by the school, including school hostels, but the exercise of this power must not in any manner interfere with or otherwise hamper the implementation of a decision made by the Member of the Executive Council or Head of a Department in terms of any law or policy" (DBE, 1996:37). As a concurrent function defined in the Constitution of South Africa, the provision of education is a multifaceted obligation involving several role-players. Structured cooperation between these role-players is the only alternative to chaotic blame-shifting. The DBE has the oversight role and a responsibility to create an equitable environment for the Provincial Departments of Education to plan, implement, operate, and maintain education infrastructure. However, various other role players affect the successful implementation; municipalities must provide basic services; without basic services, a school is not functional. However, the accountability still lies with the DoE to liaise and ensure this function is performed.

The Norms and Standards provide clear guidance on the priorities; however, the norms and standards were not fully implemented as it was not fully costed, and implementation was affected

due to budgetary constraints, so adherence to timeframes is unreasonable. The proposed amendment of the Norms and Standards is welcomed, and this research includes recommendations in Chapter 8 that can be considered.

7.3. The role and function of planning in Education Infrastructure is crucial

The role and function of planners are to gather relevant data, analyse the data and determine the backlog for education infrastructure; this need for either new or additional infrastructure is based on the current supply and the demand for new infrastructure (sections 4.8 and 4.9). The role of planners in planning for educational facilities is to integrate social, economic, and environmental aspects to identify the best possible solution in addressing the demand with the most benefits (section 5.3) and the least challenges. When planning for a new school, it is the planner's role to first confirm the demand by analysing population statistics, learner enrolment in schools in the vicinity, and spatial development of the area. After that, the role is to identify a suitable site that complies with the legislative requirements and will ensure that a school remains viable and sustainable for future use. It is, therefore, imperative to consider all factors influencing a school; as further elaborated in section 7.6, identifying the implication of planning for and constructing a new school and the expansion of existing schools through the provision of additional infrastructure has a direct impact on the surrounding area as it will increase traffic to and from the school, it will affect the density of the residential area and will affect the site layout. The education facility planning process shapes the spatial area of the residential area affected, and the efficiency and sustainability of residential areas are key to ensuring that growth is positive.

Planning of education infrastructure is not limited to the design of the facility to eradicate education infrastructure backlogs determined by planners; it includes factors such as land-use planning, accessibility to the facility in terms of routes to be travelled and walking distance for the area that will be seen as the feeder zone, population, and location. It included size norms and guidelines and a collaborative approach between the local, district, provincial and national spheres of government. Infrastructure is a long-term game as it is planned to last for an expected life span; everything that comes after the planned infrastructure is planned to consider the existing infrastructure. Providing sustainable and stable infrastructure will ensure the facilities remain relevant and utilised optimally.

The role of planning is to strengthen the planning and designs of education infrastructure, and it is recommended that planned infrastructure should represent an architectural flair of the 21st century, espousing the state-of-art concept whilst being cost-effective, thereby ensuring relevance, thematic fit with the local environment, attractiveness and inspirational to end-users

and community. Planners should ensure that rural, farm and township Education Facilities are treated the same as urban facilities concerning the architectural design choices. This will ensure that the gap between economic class differentials and historical tendencies is broken.

The role of the planners and designers is to carefully select the site for constructing Education Facilities, choose appropriate construction materials, assess both the capital costs and operating costs, and produce quality designs with adequate technical specifications and detailed construction drawings to yield optimum designs and robust structures that are maintainable at relatively low cost.

7.4. Spatial and structural principles should be utilised when planning for education facilities

The principle of continuity in terms of the built form should be prioritised when planning for any additional structures at an existing school facility; this principle can also be incorporated when conducting significant repairs and renovations; this principle will ensure integration with the existing facilities to ensure that buildings are planned for in an integrated manner—the principle of green space. In planning for new facilities, it is important to ensure that the principle of sameness and diversity is utilised to ensure that settlements have access to education facilities. As discussed in section 3.3.10, the spatial principles will assist in creating favourable education facilities. The principle of scale ensures that buildings are placed spatially to scale to ensure a sense of enclosure; the principle ensures that the relationship between size, distance and height is contented. Education facilities must reflect spatial flexibility to accommodate the demand on the infrastructure for future use and to ensure sustainability. The spatial principle of the intensity of space use should be utilised when planning new facilities to ensure a positive environment; this will ensure that the land is optimally utilised.

Planning new facilities should prioritise intensification and not imply a standardisation of living conditions or uniform densities. It is important to encourage the development of areas of different character throughout the settlement concerning the natural development or evolution of a range of urban densities, shapes, and sizes.

The majority of work done by the DoE is brownfield projects; however, with new schools done on Greenfield sites and with Greenfield developments, the challenge is integrating the development into the surrounding area. A new school on a Greenfield site should be informed of the needs identified by the key stakeholders, as discussed in section 4.2.2.5. Brownfield projects, such as upgrades and additional infrastructure and maintenance of existing facilities, add value to urban

restructuring, which reinstates the residents' confidence in the surrounding area with the upliftment of the look and feel of the structures. With the formalisation of informal settlements, the placement of education facilities is vital when the population supports it (section 4.5), subject to the surrounding schools in the vicinity not being able to accommodate the informal settlement's learners. Education facilities depend on the public support of the affected communities; therefore, accessibility is key. Creating an enabling environment for teaching and learning is subject to the success of the spatial principles. If integrated correctly, success and value for money can be achieved. Education facilities are key institutions within a community. Schools do not only address the need for teaching and learning space but need to be integrated into the community. Shared facilities, as indicated in this research in section 4.7, are key to this integration; the placement of school halls, libraries and sports facilities at entrance points can be optimally utilised by the community to ensure that the facilities remain relevant within the settlements.

7.5. Standards to ensure that physical resources are planned successful and sustainable

The Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure, 2013 (Norms and Standards) provide the minimum standard for infrastructure at each public school in South Africa. As discussed in section 3.3.3.1, the Norms and Standards provide the different allowed types of infrastructure and the minimum size for each facility to accommodate the learners. It provides timeframes by which the nine Provincial Departments of Education should provide every kind of infrastructure for a school to be functional. However, it does not guide ensuring that the infrastructure is provided sustainably. The formulation of standards will ensure that physical resources are planned successfully and sustainably. Recent years have indicated a definitive move to focus on the maintenance of facilities rather than new construction. The purpose of the Public Finance Management Act 1999 is to promote (National Treasury, 1999:1) "the principles of efficiency, effectiveness, economy and transparency in departmental management. Strategic planning and performance measures as basic requirements for service delivery and the preparation of budgets". National Treasury (1999:1), "To regulate financial management in the national government and provincial governments; to ensure that all revenue, expenditure, assets and liabilities of those governments are managed efficiently and effectively; to provide for the responsibilities of persons entrusted with financial management in those governments, and to provide for matters connected therewith". A strategy plan in line with the Medium Term Expenditure Framework must be prepared and submitted for approval by the relevant executive authority. The plan must include details of planned capital projects and rehabilitation and maintenance of the physical asset (National Treasury, 1999).

Division of Revenue Act, 2022, in section 3.3.5.1, indicates that a condition of the Education Infrastructure Grant is to utilise 60% of the allocated funding for maintenance. This is a move in the right direction; however, it has financial and performance implications for provinces that still have to eradicate inappropriate structures and where severe overcrowding is experienced. An increased focus should also be on providing shared facilities, where sports facilities are provided for several schools to utilise in the vicinity. However, the construction of new and additional facilities should be motivated and proven that the existing space cannot accommodate the number of learners. The implementation of education infrastructure supports sustainable economic growth if implemented appropriately, and this research confirmed that there is a substantial need to plan education facilities that are suitable, sustainable and effectively designed. It is of utmost importance that optimum education infrastructure is prioritised to ensure service delivery to different communities.

Sustainable Development, as indicated in sections 2.3 and 2.4, is a principle that enforces responsible citizenship during a facility's planning, construction, and operations stages. It ensures that the primary need is met while protecting and sustaining the natural environment and ecosystem upon which the society, biodiversity and economy depend currently and in the future. Alternative funding will be essential to successfully adhere to the Norms and Standards and proposed amendments for school infrastructure.

The Department of Public Works and Infrastructure (2022:63) stated that “Social infrastructure such as schools, clinics and police stations are less amenable to private sector financing, although various options have been used around the world such as availability payments through which government pays private partners to ensure public infrastructure is available”. For the Education Sector to adhere to set timeframes in line with the Norms and Standards, investors should be approached. However, it is paramount that the sector has accurate data on the infrastructure assets and that proposed projects are designed appropriately; cashflows must reliably meet the financing costs.

Corporate Social Responsibility (CSR) is stated within the regulations of the Companies Act No. 71 of 2008 (The Republic of South Africa, 2008). CSR describes a business, company or mine's efforts to uplift society. CSR ensures that business is conducted ethically and responsibly as it considers the carbon footprint, the environmental impact, the economic impact and human rights to promote positive change. As is evident throughout this study and emphasised in the case study of the Northern Cape, there are several mines, wind farms, solar plants etc., within South Africa and the Northern Cape. Therefore, it is recommended that the sector approach these businesses

to contribute to the education infrastructure as their social responsibility; this will assist in addressing the gap identified throughout this study. The recommended Master Plans of schools within the vicinity can then be availed to these companies for their intervention and assistance in eradicating the backlog.

The significance of planning sustainable education infrastructure is that alternative approaches are imperative to ensure optimal utilisation and sustainability of education facilities with the current budget pressures and the existing backlogs. Examples were made in this research that, if implemented, can affect the change required; one of these examples is the Green School in Paarl Valley which was constructed to spatially arrange the buildings and the spaces between them at the macro level, as was discussed in section 2.4. Environmental Sustainability, these buildings were constructed from locally sourced building materials and with green infrastructure initiatives such as rainwater collection, natural light and ventilation and are organic tectonic shapes positioned within different zones to ensure passive design principles.

When providing additional or new education spaces, the orientation of these structures to ensure passive heating and cooling should be considered, as the sun's path varies in the different seasons, and temperature variations, especially in the Northern Cape with its arid climate, are eminent. Due to the arid climate of the Northern Cape, alternative sources and approaches for water and electricity will assist in minimising the implication of the ever-rising costs of basic school services, which is a burning issue in the country. The disposal of sewerage was also acknowledged as a great challenge as the local municipal services are sometimes challenged to provide this essential service in some communities. In particular, the villages in the John Taolo Gaetsewe District experience problems with bulk services, particularly related to water and sanitation infrastructure.

7.6. Identification and forecasting of changing needs are crucial

The change in the education system is unavoidable due to various factors, as discussed in section 4.4. The utilisation of Information and Communication Technology (ICT) to teach and learn has become a new norm; these shifting perspectives affect what infrastructure is provided and how the planners have to acclimatise and revolutionise strategic planning to ensure spaces and facilities are constructed to adapt to this change. The changing need affects not only the planning of new schools in terms of the infrastructure provided, the design and placement thereof and the site allocation of these schools, which are of utmost importance but also affects existing schools and ensuring that the schools remain relevant and sustainable for future use.

The changing need affects not only the physical infrastructure but affects services such as water and electricity. To ensure that education facilities remain resilient and sustainable to be viable in the future, planners need to consider the current state of the country's electricity crisis and the reality of load-shedding that is becoming the new norm. Schools should be planned and designed not to be affected by these realities and to incorporate renewable energy; schools are ideal for solar energy due to the roof structures and the area available for solar panels.

Identification and forecasting of changing needs are crucial given the infrastructure demands and the fact that infrastructure-related problems are constantly in flux; with limited financial resources, the basic education sector cannot attend to all these infrastructure interventions simultaneously. However, it is recommended that the changing needs be forecasted annually.

The ideal planning of educational facilities will be developed to adapt to forecasting changing needs, such as alternative building technologies and adaptable construction of spaces. To keep track of changing needs, regular analysis of the provincial, district, local and ward population statistics and interprovincial learner migration patterns and the geographic area of the province should be made to ensure the need is quantified and supported for future growth and not only to address the current need. Forecasting the changing need will ensure that the facility remains relevant and sustainable to achieve its primary objective of teaching and learning.

7.7. There is a need for specific measures to be utilised to determine the existing school infrastructure (supply)

To plan accurately, it is imperative to know the existing asset base, the number of facilities and the condition thereof to determine the gap (section 5.4); therefore, this research emphasises the implication and recommendation of improving data accuracy. Data integration is key in planning for educational facilities to determine the supply of infrastructure that will affect the need and, therefore, the gap as indicated above; various sets of data should be utilised. Data integration from the municipal level up is key to ensure viable infrastructure; data such as land use development and growth of residential areas, which results in the evolution of households and population, affects the current supply of education facilities, it supports the planning of additional facilities and is key to ensure the sustainability of the education facility and the residential area. Furthermore, this implicates the accuracy of land use and zoning plans within municipal areas as the current portfolio of education facilities is located on various land portions that can be consolidated (section 6.8). The supply of quality education facilities does affect the positive growth of a residential area; if education fails in a residential area, there is a tendency for outward

migration, as indicated in section 6.13, Functional Performance and Utilisation of Existing School Infrastructure.

In terms of planning from the municipal level up, as proposed in the One Plan or District Development Model (section 4.2.2), information sharing is key to comprehensive and integrated planning. The supply of education facilities does not only affect the Department of Education but impacts various stakeholders, as indicated in section 4.2.2.5. On the municipal level, the current zoning of facilities is not in line with the land uses associated with the educational zone. Therefore, the implication is that rezoning applications should be prepared, and municipalities' land uses and zoning plans should be updated. As indicated in section 4, it is evident that there are schools that fall on multiple properties. The implication for the local and provincial government spheres is that rates and taxes are not issued or paid correctly. It is recommended that consolidation, subdivision and rezoning of affected properties be prioritised as it will assist municipalities in correcting the land use management schemes of the affected areas and ensure that rates and taxes are issued correctly.

Education infrastructure is vital to the development of viable communities and for the effective management of assets. The measures to determine the existing school infrastructure within the Northern Cape included the development of a complete database utilising specific sets of data kept by the NCDoE, some guided by legislation such as the Condition Assessments (section 3.3.12), and others gathered through a verification exercise and in conducting site visits to determine the accuracy of the data utilised to determine the supply of school infrastructure.

The database was developed to be a Master List to enable this research to conclude on the existing facilities in terms of the number of facilities, the impact of the number of learners on the infrastructure supply, the adherence to the Norms and Standards, and the ability to determine the required infrastructure. The Master List included a life cycle costing to maximise existing assets' service potential by ensuring they are appropriately used, maintained, and safeguarded. A measure utilised to optimise the life cycle costs of these existing facilities was to identify cost-effective options throughout an asset's life cycle to reduce the demand for new assets through optimal use of existing assets and management of demand through non-asset service delivery options. Best practice requires that the existing assets be maintained to prolong their lifespan, recalculate the value, and minimise the impact of deferral. Implementing best practices in asset management will assist the decision-making process.

The data was uploaded and verified on the Education Facilities Management System (EFMS); the EFMS Properties consists of all the schools with their fixed assets (land & buildings), while

the Programme Management Module deals with school projects. The NCDDoE has utilised this system since 2014 and captured all assessed schools in terms of the NEIMS assessments on this system. There is, therefore, a wealth of information captured within this system, and it is of utmost importance to ensure that this system is kept up to date to ensure that the supply can be determined and updated annually.

7.8. The identification of demand and needs through the assessment of school infrastructure

If conducting complete education facility assessments, whether a Condition Assessment or a NEIMS Assessment, the correct verification of the existing infrastructure, the function, the size and the condition thereof should be quantified to determine the demand and need.

The demand for infrastructure is significant in the basic education sector, given the history of the country, the current population growth rates, the rate of occurrence of natural and artificial disasters and the migration of learners from one part of the country to the other (section 6.15). Proper planning for the demand is a prerequisite to successfully implementing infrastructure projects; therefore, if the current supply is calculated and the demand can be quantified and prioritised, sufficient time must be afforded to Planners and Designers to undertake planning processes. The planning processes will assist the decision-making process and ensure that education infrastructure projects are planned properly before being implemented, where such plans should be holistic and integrated. Infrastructure planning and projects are, by their nature, multi-disciplinary and multi-year initiatives. What is therefore critical is that the demand for school infrastructure is planned and prioritised effectively to ensure timeous implementation and completion thereof.

Due to the size of the backlog and continued growing demands, it is impossible to address all the required infrastructural interventions simultaneously. Still, there is a need to prioritise them and implement others in the outer financial years. The prioritisation of infrastructure projects is recommended to be carried out as part of the pre-project planning processes following the prioritisation. The projects implemented in a given financial year should be listed in the Projects List and reflected in the Provincial Education Infrastructure Plans. The implementation of projects to address the demand must, as far as possible, be included in the Provincial Budget.

The demand was determined by identifying the current supply, then measuring that against the required infrastructure in terms of the Norms and Standards and then determining a gap: the demand for new infrastructure. The budget required to address the demand is estimated at R14.2

billion, which will be required to address the Norms and Standards Backlog within the Northern Cape.

As a holistic approach in the provisioning of Education Facilities, all infrastructure provisions required in a particular facility to make it fully functional must be provided when projects are implemented.

7.9. The identification of the ideal location for new school infrastructure is imperative

Within the municipal planning processes, planning new housing developments and allocating appropriate sites are critical to the future utilisation of the facility. Planning education facilities at a correct location, in line with the norms, and locating appropriate zonings and land uses in the vicinity to support a schooling environment within an area with sufficient households will ensure that the facility has a feeder zone and will be sustainable. Planning the correct infrastructure to be constructed at the facility is key to ensuring that the facility remains relevant and caters for the future of education.

The achievement of sustainability as part of spatial planning and design requires conscientiousness among the planners, designers and project managers on the spatial planning, design, sustainability and maintainability of the Education Facilities and the required quality control during planning and construction activities to ensure spatial resilience compliance, correct construction procedures, quality materials are used, design specifications are adhered to, and no short cuts are entertained.

As indicated in section 4.5, The Planning Behind New Schools in line with SPLUMA, the population of a community has to be at least consist of 2500 members or more for it to be feasible to be provided with a school facility, provided that there are no other schools in the nearby vicinity and subject to the provincial strategic imperatives. In this research, it became evident that when planning the ideal location for new proposed schools, the provincial, district, local and ward population statistics be considered, the catchment area of the proposed school, the number of learners in that area that are being transported to other schools, the interprovincial learner migration patterns and the geographic area of the Province.

The primary business of a school is to provide access to education services to learners. Based on this primary goal, schools must be accessible to learners with less inconvenience and at reasonable costs. To improve accessibility, reduce transport costs, eliminate a need for providing Learner Boarding Facilities, and address safety and security concerns, where practicably

possible, a school should be located as close as possible to the communities they serve. It is recommended that no new or replacement school should be built in a remote area that is in the middle of nowhere but must be part of an existing catchment area. Where a newly built school is intended to serve two or more catchment areas, it must be located as part of a catchment area with the highest number of learners (i.e. the main catchment area), having taken into consideration other factors such as the local socio-economic development, local population growth rate, topographical constraints, road conditions, and the availability of essential services.

The location of a new or replacement school must be such that the school concerned is not located in the proximity of land uses that are either in conflict with or not complementary to school activities.

7.10. Characteristics of the physical resources within the education sector of the Northern Cape

The case study focussed on the Northern Cape Education Facilities, and an analysis was done on all available information, databases and systems. Site visits were conducted at 205 education facilities to comprehend the quantitative data collected; this assisted in verifying the data and establishing further knowledge of the condition, utilisation, location and functional performance of education facilities.

In section 6.6, it was found that the two largest districts in learner numbers and total schools were Frances Baard and John Taolo Gaetsewe. From the statistics of 2022, it was evident that even though John Taolo Gaetsewe has the most schools, there are lower learners: educator and learner: school ratios. EMIS list of the last 18 years was retrieved, enabling a complete analysis of the learner patterns for the province and each district over these years. Graph 6-1 shows that the learner numbers in Frances Baard and John Taolo Gaetsewe districts increase annually, whilst the growth in Pixley Ka Seme and ZF MgCawu is significantly lower. A definite decline in the learner numbers in Namakwa annually was evident. There was an overall increase of 19.17% in learners over the last 15 years in the province of which Frances Baard and John Taolo Gaetsewe were the main contributors.

The study analysed the current education facilities (section 6.11), the infrastructure available at these facilities, the condition thereof and the utilisation and calculated the required infrastructure needs in line with the Norms and Standards (section 6.13); this resulted in a full gap analysis (section 6.12) which indicated the difference between what is currently in the system (the supply), what is required (the demand) and what is, therefore, the gap (need). It was found that even

though there is a need for additional classroom and ablution facilities (section 6.12), the average ratio for learners per classroom and learners per toilet was still acceptable, even indicating that there is no necessity for additional facilities on a provincial level. The study, however, went into the school analysis, where each school was analysed for its needs and where schools were severely underutilised. It was found that Northern Cape Education Facilities are in a fair condition, with most of the schools having an average condition and a significant maintenance requirement (section 6.16). In terms of the utilisation of schools, it was found that most facilities are underutilised and that there are only a few cases where facilities are significantly over utilised. Most facilities met the minimum operating requirements and were suitable for their required function. Recommendations are made in Chapter 8; however, where additional infrastructure is required at existing schools, it was included in the budget requirement.

In the Northern Cape Province, the demand is not just linked to physical infrastructure demand determined by the gap analysis; many demanding issues need to be dealt with, like the arid climate and remoteness of the Province. Some areas are sparsely populated but still need a school.

The demand for school infrastructure was found to be significant in the Northern Cape, with the main backlog the addressing of inappropriate structures within the Northern Cape; this has the biggest budget requirement and is one of the main reasons that the Northern Cape has not met the first and second line priorities as stated in the Norms and Standards. The Northern Cape still have 25 full inappropriate structures to eradicate, with a cost estimate exceeding R1,6 billion. There are sixteen (16) schools located in the high-risk area of the asbestos belt that will require relocation; this asbestos belt not only affects the education sector but will have an impact on several sectors such as housing, roads and health. The demand to replace inappropriate partial structures includes but is not limited to single buildings constructed of inappropriate material, asbestos roofs, ceilings and rainwater fittings; as gathered from the data, there are 46 schools affected. The demand for addressing classrooms, ablution facilities, libraries, computer centres, and other structures has been quantified in this study and is indicated in Table 6-28: The estimated budget required to address Norms and Standards - Summary.

The budget requirement was determined by analysing the cost required in line with the cost norm, escalation and the historical prices paid for similar scope projects and was included in Table 6-28. It was found that a total of R14.2 billion is required to address the Norms and Standards Backlog.

CHAPTER 8 RECOMMENDATIONS

8.1. Chapter Introduction

This recommendations chapter concludes the research by proposing spatial planning solutions to optimise educational facilities. It is based on the findings of the assets base assessment and the integration of such with land use planning. Ultimately, it made recommendations in terms of the planning and design of sustainable infrastructure for the education sector in South Africa, referring to a) new schools to be planned, b) schools to receive upgrades in terms of education infrastructure to address population growth among other factors and c) schools that need to be renovated.

8.2. **Specific legislation, regulations and standards for provisioning school infrastructure and the planning and design thereof should be developed as part of mainstream spatial planning.**

The gap between literature and practices relating to school infrastructure is prominent. It should be bridged by revising the norms and standards, as indicated in section 3.3.3.3, Proposed Amendments to the Regulations Relating to the Minimum Uniform Norms and Standards for Public School Infrastructure. Throughout this research and as indicated in the empirical research in Section 6.20, the (Source: NCDoe, 2022)

Budget Requirement, it was evident that the Norms and Standards' timeframes were unrealistic regarding the budget requirement and allocation. Revising the Norms and Standards to ensure better infrastructure delivery within timeframes will ensure alignment with the National Development Plan.

8.2.1. **Recommended amendments required in the Norms and Standards**

The proposed amendments were reviewed in section 3.3.3.3 to the Norms and Standards; however, it is further recommended that timeframes in terms of water, sanitation and electricity be extended for planning and implementation before the end of the 2023/24 financial year as schools will not be able to function without these essential services. The eradication of inappropriate structures will, however, require a significant budget and timeframes, therefore, will have to be extended.

The rationalisation is imperative for the affected schools for all the non-viable schools to be closed and merged. It is recommended that complete conditional and structural assessments be

performed on all these affected schools and that provincial departments prioritise these facilities as per the recommendation of these assessments within the infrastructure plans to ensure that these projects are implementation ready.

For minimum educational spaces, the implementation should not be isolated but should follow priority; it is recommended that all schools first be prioritised for the basic services before receiving minimum education spaces. It will not make sense for a school to have no or limited basic services but another school receives a computer centre.

Collaboration between the stakeholders is required to successfully implement the different acts, policies, guidelines and plans. To achieve adherence, there should be integration between all spheres of government.

8.2.2. Recommendation to develop Functional and Technical Guidelines

All applicable legislation was analysed for their implication on education infrastructure in Chapter 3. Throughout this analysis, it was identified that there is a need for the standardisation of design and functional and technical guidelines aligned to the different legislation. Education is an imperative long-term investment in a country as it lays the foundation for a higher quality of life, more significant employment opportunities and a better-skilled workforce. Strategic and operational policy statements are guiding this investment. It embraces a set of policy norms and standards, now referred to as Regulations, Relating to Minimum Uniform Norms and Standards for Public School infrastructure, standardised architectural designs and a school's Cost Model to reflect the costing realities.

It is recommended that the guideline be developed as a reference tool and guiding framework for all stakeholders involved in the planning, development and operation of public schools in the Northern Cape Province.

It is recommended that Prototype School Designs be developed to be used in conjunction with this proposed guideline to address all aspects of planning, programming, design, construction and post-occupancy monitoring and evaluation of public schools. The designs will provide guidelines for the arrangement, size and quantity of educational, administrative and support spaces, as well as material and design considerations necessary for planning, designing, constructing and maintaining school facilities. Standardisation of school infrastructure relates to equal and equitable learning opportunities and ensuring a minimum service level of educational facilities. The standardised prototype designs are a derivative of the guidelines relating to planning for Public School Infrastructure and Capacity and, together, form the cornerstone of

standardising, and optimising value-for-money outcomes in school infrastructure costing. The space guidelines are recommended to meet these requirements and to accommodate the best practices for delivering school infrastructure.

It is not the intention that this recommendation should be prescriptive within the context of design flair and creativity; however, it is recommended that the relevant DoE must seek prior permission to deviate from the prescriptions of the guideline and standard drawings. It is recommended that this guideline encourage creativity to ensure that each school is built as an expression of the energies invested in it; these will typically include contextual socio-cultural influences, micro and macro climatic conditions, the designers' response to specific site requirements, and the community and user body's aspirations. To ensure value for money and minimal future maintenance requirements, the relevant Department must scrutinise and approve any changes. The recommended purpose of this guideline is to ensure equitable distribution of educational facilities, safety, quality control, and value for money and to measure strategic direction. It is recommended that these guidelines provide standards adaptable to each context's characteristics and the ideals of education to conceptualise a design solution tailored to each school's specific requirements and context.

8.2.3. Recommended design considerations

Public Schools are recommended to be safe, healthy and productive, that education is efficient, effective and fit for purpose, and that delivery of education facilities is cost-effective, sustainable and community-centred.

The design considerations are a detailed set of guiding tools that enhance the effectiveness of the design to address the performance objectives adequately. The design criteria should include functionality in terms of acoustic control, visual comfort, flexibility and adaptability, air quality, and stimulating architecture. All School designs must meet the specific needs of learners, teachers and administrative staff and must allow for access for people with disabilities. To this end, all spaces, indoors and outdoors, should be equally and easily accessible to all individuals. Designers are to ensure multiple movement options for disabled users. The provision of safe learning and teaching environments is a top priority. Security should be enhanced against both external and internal threats. There is the need for design to ensure that crime is discouraged or can be identified through active and passive surveillance, that spaces can be shut-down and rendered defensible, that spaces are easily evacuated, there is a clear distinction between public and private spaces, and to keep access points to a minimum.

The facility should be designed so that the community takes ownership of the education facility and, where possible, can use the facilities like halls, libraries and sports facilities. Notwithstanding these standard designs, design professionals should be encouraged to exercise design flair and develop various configurations while adhering to the design principles. Schools need to be cost-effective to minimise capital and maintenance expenditures to provide the best learning environments at the least cost. In applying the above, design professionals should strive to develop schools that uniquely reflect the values and aspirations of the settings in which they are located.

It is recommended that the standard design considerations should include some of the following elements:

- Designs must be in line with legislative requirements;
- Disabled accessibility infrastructure;
- Consideration of multi-grade spaces for schools that are classified as micro-schools that cannot be closed in line with the rationalisation guidelines;
- Incorporate spaces into the designs that can be utilised for technical and vocational schools;
- Provide spaces that support the curriculum;
- Provides multi-functional space that can double up for alternative functions such as utilising school halls for nutrition centres;
- Provide sufficient open spaces such as courtyards and playgrounds where possible;
- Consider multi-storey only when there are space constraints;
- Consider green alternatives and incorporate solar energy; and
- Incorporate security measures that ensure that infrastructure is protected from vandalism and theft;
- An integrated site development plan is key to ensuring the functionality of an education facility. Placing facilities can minimise the infrastructure requirement, such as the location of the school hall close to the administration facilities for optimal utilisation of the ablution facilities;
- Renewable energy consideration;
- Thermal comfort consideration to be incorporated.

A cost comparison between different provinces is required. It is recommended that this be analysed in depth when specific legislation, regulations and standards for provisioning school infrastructure and the planning and design thereof should be developed as part of mainstream

spatial planning. As an example, the Western Cape Province constructed a 31 Classroom Facility (Mega Primary School) in 2016 for R48,4mil (including professional fees), whilst within the same year, a 25 Classroom Facility (Large Secondary School) for R64,3mil (including professional fees) and a 20 Classroom Facility (Large Primary School) for R67,8mil (including professional fees) was constructed in the Northern Cape. Now in 2022, six (6) years later, the construction cost of schools (excluding professional fees) is more than double the cost of a school in 2016 (excluding professional fees), the recommendation of comparing costing and the standard design considerations that filter into a cost norm will assist in achieving value for money.

Provide clear instructions to all schools on the usage rights of the School Governing Body in respect of the school's immovable property. As indicated in section 3.3.3, a governing body may, with the approval of the Member of the Executive Council - lease, burden, add to, convert or alter the immovable property of the school; any such alternations must be in the best interest of the learners. It is recommended that the application provide adequate details, indicating the possible cost benefit from the projected income or profit; include a maintenance plan for any structure or part of a structure to be leased or burdened. If it concerns the addition, conversion or alteration of any state property, it must be accompanied by building plans, duly cost; include a copy of the agreement for the proposed lease and the school's future demands or sustainability. It, therefore, urged the necessity to research the latest requirements with the ability to deliver results within the shortest timeframe possible. Thus, from a practical perspective, it is of utmost importance for all role players and stakeholders to invest in the best technology within the Education Sector.

8.3. Specific measures should be identified to ensure data accuracy

To plan accurately for infrastructure, a planner has to know what infrastructure is at the education facilities and the granular detail thereof. It is recommended that significant emphasis be placed on data integration, the trackback of history information, whether per individual school, project history, learner and subject enrolment, environmental impact and climate change, infrastructure or statistics related, is significant for the education sector.

A single point of access for enterprise-level “data and shared services will reduce confusion and storage costs of hosting each other’s data and provide access to services like address joins, visualisation tools, and applications that public, private, and governmental entities can benefit from. Shared data will lead to better decision-making as stakeholders work from official versions rather than multiple, unsynchronised or inconsistent versions of data” (Paulus, 2010:3).

A common access point for geospatial data and services increases efficiencies by reducing multiple agencies' duplicate data and associated infrastructure and data storage. Paulus (2010:4) stated that “it also improves data quality through the use and maintenance of shared corporate-level data sets and their associated information.”

Regular condition assessments are key to accurate data, improving the planning and prioritisation of infrastructure. The implementation of the Guidelines for Conducting Condition Assessments of Education Facilities, published in 2019, has not commenced due to the cost implication of these complete condition assessments. The purpose of these Condition Assessments is to have reliable, up-to-date information on the condition, the location, the number and the function of the education facilities. These condition assessment guidelines are recommended to be budgeted for and implemented by the Provincial Departments of Education.

The utilisation of EFMS as the primary data source and the integration and alignment of all data sets to EFMS is vital. It is recommended that a specific workflow for the maintenance and upkeep of data be implemented and adopted by the education sector. NCDoe uses the system to manage Infrastructure Planning and Delivery. The two main components of the EFMS are:

- Projects Module, where all projects are loaded, applicable documentation uploaded, financial information captured, and photo evidence kept.
- Properties, this module is conceptually simple; it is the place where the data relating to the Department's school building infrastructure is captured, viewed and edited. The primary data sources from existing database systems, e.g. EMIS and NEIMS, and from field surveys

The NEIMS assessment forms/EFMS Assess Application are aligned with the Norms and Standards for schools and the provisioning of boarding facilities at schools. Nevertheless, the NCDoe completes NEIMS assessments at facilities where a project reached practical completion, where the Education Infrastructure Grant (EIG) was utilised as the primary funding source, and where facilities were assessed more than five years ago. The NEIMS assessment/EFMS Assess Application has several components the assessor needs to complete while evaluating the facility.

8.4. The demand for school infrastructure should be part of broader spatial planning and decision-making, considering specific needs assessments.

As a holistic approach in the provisioning of Education Facilities, a fragmented approach is recommended, where specific components or required minimum education spaces of an Education Facility are left out for implementation in later years. This approach does not yield a

complete and fully functional facility, and it is not cost-effective, therefore when planning new facilities as well as upgrades and additions to existing facilities, it is recommended that a holistic approach be followed; for example, if the capacity of an existing school is increased with the additional construction of classrooms it is recommended that the ablution facilities required to be provided simultaneously to ensure that the facility is functional.

As recommended in Chapter 6, alternative non-asset solutions are recommended to be considered; these include but are not limited to:

- Learner transport;
- At schools in remote areas where the need for additional infrastructure assets such as computer labs is not a financially viable solution, it is recommended to fully utilise the available learning solutions to turn a classroom into a multi-functional asset;
- Laboratories in a box and Desktop mini science kits. For an ordinary classroom to serve a dual purpose as a classroom and a science laboratory, especially in primary schools;
- Solar-powered e-books (kindles) to bring technology and alternative delivery of library materials to schools; and
- Food gardening as a teaching tool and food security is implemented in many schools on their initiation.

Other alternative solutions and approaches are further elaborated in section 8.4.6, Considering Alternative Solutions to guide planning for Education Facilities as part of a guiding framework.

8.4.1. Recommended Asbestos interventions

A structural engineer is recommended to survey the structures at these schools and recommend whether the structures can be retained and cladded or filled in with bricks, concrete or lightweight materials. The survey outcome can influence the costs and prioritisation of Inappropriate Structures in line with the Norms and Standards and proposed amendments thereof.

It is recommended that the challenge of the asbestos belt, as discussed in this study, receive the required attention and intervention and that other affected departments, as well as the private sector, should be tasked with addressing this challenge. It was identified that the central infrastructure challenge in the Northern Cape is the inappropriate structures that need to be replaced. It was identified that the asbestos challenge does not just affect the NCDoe but that various other departments are affected.

Alternative options are available to reduce the risk associated with Asbestos Containing Material (ACM). Inspections and regular site maintenance are key in controlling the contamination or pollution within the respective sites. It is recommended to replace any Asbestos Containing Material to adhere to the Norms and Standards for public school infrastructure, and only when identified projects fall on private property is it recommended that other options be considered Source: (White, 2020:15)

- Complete Removal – recommended option;
- Encapsulate or seal the asbestos-contaminated material;
- Enclosure; and
- Maintenance and inspection – if one of the above options cannot be done due to budget availability.

The Northern Cape asbestos belt stretches over 450 kilometres and covers areas in the Pixley Ka Seme District Municipality, including Prieska, Niekerkshoop, and Griekwastad. The Asbestos belt then runs up into ZF MgCawu District Municipality, affecting towns such as Daniëlskuil, and John Taolo Gaetsewe, where various towns, including Kuruman, Gamopedi, and Khiba, are affected and ends at the Botswana border, which is the Molopo River.

8.4.2. The construction of multi-functional spaces to optimise education facilities

In line with the recommendations for the standard designs in section 8.2.3, flexibility and adaptability of space should be prioritised, and it is recommended that future designs of education facilities provide for more of these multi-functional spaces. In line with the optimal utilisation of space, “the benefits of schools and communities sharing facilities such as sports fields, halls and other facilities are being recognised” (Qatar National Master Plan, 2017:7). Unless a secondary school can share nearby sports facilities (municipal provision) with the community, it should be provided with a soccer or rugby field and a space for netball or volleyball (0.9 ha). For effectiveness, this minimum should be doubled.

8.4.3. Conversion of under-utilised schools into Technical Vocational and Technical Occupational Schools

It is recommended that the conversion of existing underutilised academic stream schools be converted into technical vocational and technical occupational schools; these schools, when established in existing communities, will have the potential to change the path of education, not just for learners and educators but also for the sustainability and optimal utilisation of these

schools, to ensure that the underutilised schools become relevant again and stay applicable for future use.

8.4.4. Introducing Digital Schools

This recommendation is linked to providing IT-rich learning environments that radically innovate the traditional teaching and learning organisation, thereby identifying effective approaches to embedding ICT in pedagogy, particularly in whole-class activities.

8.4.5. Construction of Digital Hubs at existing facilities

The prevailing situation in the Northern Cape Province, where many viable schools exist on private land, does not allow the department to build permanent structures on this land. These recommended digital hubs can be a sustainable alternative that will allow the department to move forward toward realising its norms and standards. An added benefit is that, should the school become non-viable, the unit can be relocated to another small school in the interim to satisfy the need for a computer lab.

8.4.6. Considering Alternative Solutions to guide planning for Education Facilities

It is recommended that alternatives to basic services and alternative building technologies be implemented as they ensure users' well-being, allow for savings, and have a powerful educational impact.

8.4.6.1. Alternatives to Water Provisioning

Due to its arid climate, water is a scarce commodity in the Northern Cape. Alternative sources for water supply and the innovative use of greywater need to be interrogated to ensure fully functional schools in the Province. The rising costs of water and electricity for schools are a burning issue in the country, and the roll-out of drilling and equipping boreholes as an alternative source at schools where there is a sustainable water table will increase the reliability of water provisioning.

- The use of push pillar taps and water-saving showerheads in hostels are also being implemented and specified in the standard designs for ablution facilities.
- Solar-powered borehole pumps, treatment plants, and water storage facilities are critical to rural schools where the electricity supply poses a problem.
- Grey water is the untreated effluent from baths, showers, kitchen and hand-wash basins, and laundry (i.e. all non-toilet uses).

- The potential contribution of food gardens to food security is limited by a shortage of water which can be used to supplement rainfall. Grey water may help overcome this limitation by providing a dependable water source under the gardener's control.
- Another alternative source of water is harvesting rainwater from the roofs of school buildings.
- As indicated in section 6.22 Alternative Solutions, play pumps are a “piece of playground equipment at a school and provide the children with a constructive and rewarding way to use their energy” (PlayPumps, 2018:online). These play pumps have a maintenance aspect, but the benefits far exceed the cost implications.

8.4.6.2. Alternatives to Sanitation Provisioning

Although tested means of disposal like separation toilets can be a solution, training users in terms of maintenance and cleaning these types of toilets is not always executed to benefit the best utilisation of the system. Redesigning the ablution blocks is recommended to be vandal-proof; this can be achieved by placing pipes and cisterns in lockable ducts. Replacing the ordinary hand washing basin with a concrete slab and taps will minimise the maintenance requirement due to higher durability.

There are several innovative products available in the market and other proven solutions that can be sourced to ensure reliable basic services. Such as, the Biorock system may require a maintenance contract for annual or bi-annual servicing of the system necessary to ensure proper performance and prevent complete plant failure.

Another recommended form of treating sewerage on-site is utilising a solar-assisted composting tank. In this instance, it is advisable to bypass the system with the grey water by disposing of it directly into a soakaway. This system removes moisture through evaporation. Microbes thrive in warm temperatures and help compost, leaving only a small amount of solids that become a fluffy clean-smelling fertiliser. The composted material can be emptied using the compost door and applied to fruit trees and shrubs.

A third recommended option is the aerobic septic tank which “works like a septic tank but can be smaller because the system does not depend on a long settlement time to remove solids and grease as in a conventional septic tank” (WasteNotSeptic, n.d.). An aerator or air pump generally “installed in a chamber atop or close to the septic tank pumps air into the septic tanks aeration compartment using several methods to aerate the wastewater.”

In particular, the villages in the John Taolo Gaetsewe District experience problems with bulk services, particularly related to water and sanitation infrastructure. Kgotatsano Primary School is situated in a rural village approximately 72km South-East of Kuruman and 152 km North-West of Kimberley. There are approximately 122 learners, and this number is inclusive of borders. Two projects were recently completed at the school, including significant repairs and renovations to the hostel and the supply and installation of a water purification plant. Although groundwater is often found in these remote villages, the water requires some form of purification before it can be potable for humans. The absence of water compounded the sanitation issues at the school to enable a waterborne sanitation system.

The Bubbler System is ideal for rural areas because it uses naturally occurring microorganisms to degrade the organic matter in the primary tank without using any chemicals. The Biological process in the primary tank converts raw sewage into usable filtered greywater, ready for reuse in the toilet cistern or landfill. The Bubbler System consists of an oxygen pump that pumps oxygen into the tank to add dissolved oxygen to the system, a key element in aerobic digestion. The system can replace or convert any septic system into a water efficiency system, ensuring a self-sustainable sanitation solution with low maintenance and easy operations. The system can be single or multiple tanks, but in the case of the school, two tanks are used. The effluent produced by this system is almost transparent grey water, which is then re-used for irrigation at the school. The school could save water and money as they no longer need to rely on the Municipality to pump out their full septic tank when full.

8.4.6.3. Alternatives to Electricity Provisioning

Passive heating and cooling can be done first through orientation. The sun's path varies in the different seasons, and temperature variations, especially in the Northern Cape with its arid climate, are eminent. Examples of passive heating methods that will be included in the standard design of school buildings are:

- Passive heating and cooling can be done first through orientation. The sun's path varies in the different seasons, and temperature variations, especially in the Northern Cape with its arid climate, are eminent. Examples of passive heating methods are:
 - By orienting the building to face the equator –7 degrees to the East from the North to capture the morning sun and extend the building along the North axis.
 - Adequate sizing of windows and windows facing the sun and big windows to the south will stimulate the learning environment. Double glazing prevents heat loss and

provides insulation in summer. Over-glazing can result in overheating or excessive heat loss.

- Minimising windows on the western side as the sun is harsh on the western side and where this is not possible, providing shading elements like shutters or canopies.
- Big roof overhangs to shade windows in summer. An appropriate amount of insulation to minimise seasonal heat gain or loss. It uses Thermal mass to store excess solar energy during the winter and includes cavity walls.
- Materials or colours can be chosen to reflect or absorb solar thermal energy. The painting of the roofs, white or silver, results in at least a drop of 7°C inside the buildings. Using a dark brick on the exterior of the building that absorbs solar energy can result in a much hotter building in summer.
- Earth-heat exchange is a system usually constructed from 100 to 600 mm diameter, smooth-walled (so they do not easily trap condensation moisture and mould), rigid or semi-rigid plastic pipes, buried 1.5 to 3 m underground the ambient earth temperature is typically about 23 °C. Ground temperature becomes more stable with depth. The air in the building is then circulated through the network of pipes, where depending on the season, it is either heated or cooled by the earth to keep the air constant inside the buildings.
- The construction of a passive air cool tower can also be a solution to cool down school buildings in the scorching summers in the Northern Cape. These towers will need a certain amount of maintenance, but not as much as air conditioners and the running costs of these towers are much less than that of air conditioners.

Solar energy is the most feasible recommended alternative for schools as an alternative power option. Several products are available, like solar plants where the roofs of buildings can be utilised for the receiving panels. The problem with these "solar stations" is the storage requirement for the energy produced, and these require secure storage and regular maintenance.

Stand-alone solar units like Solar geysers and area lighting are being developed rapidly, and new products appear daily on the market. Other Innovative solar solutions like solar ivy that look like ivy leaves and spray-on solar that can be sprayed onto existing windows are being developed and may be viable options in the future. Wind energy solutions, as with solar, also need storage facilities for the energy generated. This field of alternative energy solutions is also rapidly growing.

LED (light-emitting diode) lamps have a lifespan and electrical efficiency significantly better than CFL (compact fluorescent) and several times better than incandescent lamps. The initial cost of

LED lamps is usually higher, but switching to LED is cost-effective because the lifespan is prolonged. “Most LEDs do not emit light in all directions, and their directional characteristics affect the design of lamps” (Vilux-admin, 2018:online). Although omnidirectional lamps are becoming more common over time, allowing for 360° light spread.

8.5. The role and function of planning should be strengthened to inform Education Infrastructure better

It is recommended that planners play a role in, where applicable, Municipal By-laws that must be observed and adhered to by the town planning and architectural standards to be met. Planning for and choosing a specific site and architectural design will impact the type of building materials to be used, the constructability of the structures, total costs and maintainability of the facility, and it is recommended that the most cost-effective approach be pursued without compromising quality. The goal is to plan for facilities that are energy efficient, easy to maintain and look after, and maintained cost-effectively.

It is recommended that the school property size configuration should be eliminated as it forces designs into boxes. An increased focus should be placed on bus schemes and enabling safe walking areas to integrate education facilities into the neighbourhoods. When planning a new township establishment, planners are encouraged to consider the location of a new or replacement school and not place these education facilities close to any incompatible land uses. The informal part of the learning experience can be enhanced by integrating educational facilities with the broader settlement structure.

8.6. Spatial and structural principles should be utilised when planning for education facilities

It is recommended that the principles of continuity, green space, sameness and diversity, and scale should find expression in planning for education facilities be incorporated into planning. The spatial principles will assist in creating favourable education facilities. The principle of scale ensures that buildings are placed spatially to scale to ensure a sense of enclosure; the principle ensures that the relationship between size, distance and height is contented. Education facilities must reflect spatial flexibility to accommodate the demand on the infrastructure for future use and to ensure sustainability. The spatial principle of the intensity of space use should be utilised when planning new facilities to ensure a positive environment; this will ensure that the land is optimally utilised.

Planning new facilities should prioritise intensification and not imply a standardisation of living conditions or uniform densities. It is important to encourage the development of areas of different character throughout the settlement concerning the natural development or evolution of a range of urban densities, shapes and sizes.

8.7. The ideal locations of school infrastructure should be prioritised as part of spatial planning and design

It is recommended that when planning the ideal location for new proposed schools as indicated in sections 4.5, 4.6 and 4.7, the provincial, district, local, and ward population statistics be considered, as the catchment area of the proposed school, the number of learners in that area that are being transported to other schools, the interprovincial learner migration patterns and the geographic area of the Province.

The reduction of the schools in the system, as part of the School Rationalisation Process (section 3.3.4.3), should focus on micro-schools only and should be carried out in terms of sections 12A and 33 of SASA, following the Guidelines for Rationalisation and Re-alignment of Micro Public Schools (2018) and needs is important to consider when planning the location of the proposed school.

It is recommended that, where practically possible new or replacement schools be located within 5km of the main catchment area, they serve beyond which either Learner Transport or Learner Boarding Facilities should be provided subject to the provisions of section 13 of the *Guidelines for Rationalisation and Realignment of Public Schools*. Where Learner Transport would be provided, the location of a school relative to the feeder catchment areas should be such that a reasonable travelling time by transport is afforded.

It is recommended that schools should not be located close to the following establishments, among others, airports, bottle stores and shebeens, business centres, cemeteries, sewerage treatment works, refuse dumps and landfill sites.

It is recommended that in identifying an ideal location for a new or replacement school, it must be located in the vicinity of existing social services such as clinics, police stations, and public libraries.

It is suggested that the size of the identified land be considered to ensure it adheres to minimum site requirements and also to be able to accommodate all the Functional Spaces, sufficient circulation spaces and outdoor amenities; the site should be identified and planned for in the

development plans of the municipality and in line with the development trends in of the area. The population growth rates in the catchment areas must inform the location. The topography of the site should have an average slop that is not steeper than 1:4 (15°) to allow for adequate drainage to enable ease and safe drainage of stormwater and disposal of wastewater, and the site should be located outside of the 1:100-year flood line, flood plain or marsh areas.

Geotechnical conditions such as dolomitic and clay areas should be avoided, or designs should be adapted if no other sites are available to adhere to Geo-technical recommendations. Site location is ideally recommended where utilities such as water, sewerage system, power and telecommunication connectivity are available.

It is recommended that the terrain that learners will have to cross to get to school be secure and safe and, ideally, not have crossing rivers or national freeways unless pedestrian bridges or subways have been provided.

8.8. Identification and forecasting of changing needs should be conducted on an annual basis as part of spatial development frameworks

It is recommended that new schools and, where possible, expansion of existing schools, replacement and relocation schools be located close to places of intensive urban activities; this will ensure that the schools are feasible and sustainable.

8.9. A framework to guide the planning of Educational Infrastructure is proposed

A framework is recommended to be developed to guide the planning and prioritisation of education infrastructure. The framework should guide the prioritised of infrastructure in the following order: general upkeep and maintenance interventions; upgrades and additions; total replacements except for inappropriate structures; and new facilities. It is proposed that this framework guide the identification, prioritisation, design, efficiency and effectiveness of required infrastructure to address it. The framework, as a minimum, should be developed to guide the following:

- A Standard for the need-based planning process.
- Planning of School Infrastructure and Facilities
 - Guide on the assessing of school infrastructure in terms of condition assessments and what they should entail ensuring that they can inform planning;
 - Guide on data management;
 - Planning should be flexible and based on a needs assessment;

- Guide on the decision-making process;
- Guide on strategic, tactical, contingency and operational planning;
- Guide on capital planning;
- Guide on planning to ensure resilience (Section 8.9.1);
- Guide on stakeholder engagement;
- Guide on the integration between municipal and provincial planning processes and service delivery; and
- Guide on education facility integration in communities.
- Framework for accurate prioritisation
 - Prioritisation in line with the Norms and Standards but also in line with client needs; and
 - Guide on prioritisation criteria.
- Framework for optimal and sustainable design of education facilities
 - Construction types acceptable for education facilities;
 - Furniture provisioning guidelines;
 - Provide size norms;
 - Design requirements and ensure that designs cater for future needs;
 - Recommendations on the placement and scale of buildings;
 - Recommendations on shared facilities and the management thereof; and
 - Guide on the harmonious integration of old and new buildings;
- Optimal and sustainable Education Infrastructure Planning
 - Framework for the development of a master plan for each of the school facilities;
 - Master Plan template to be developed (See Section 8.9.2 & Annexure B); and
 - Developing a Master Plan.
- Guide on Occupational Health and Safety of education facilities.
- Guide on Implementation and Evaluation.

8.9.1. Project planning to ensure Resilience

It is proposed that there are peer reviews of the feasibility studies to ensure that the feasibility studies are appropriately prepared, that the proposed projects are planned optimally, and that all options are investigated to ensure that the project is planned for resilience to improve the new project feasibility studies. Hyari *et al.* (2009:75) recommended that pre- and post-feasibilities be conducted as various factors and assumptions are used when compiling a feasibility report. A post-feasibility report will include actual data. Therefore, it can be analysed if the best-preferred option was implemented or if any alternative approaches would have been implemented had the

actual data been known. These post-feasibility studies will then inform future projects of the same scope and nature to improve the planning process.

It is recommended that the Sustainable Development Goals (SDGs) be considered when specific standards are developed to ensure the improvement of the country, its inhabitants and biodiversity. Therefore, it is recommended that when planning, designing, constructing and operating Education Facilities, the planners, designers, contractors and end-users should, where possible, opt for construction sites where there would be less impact on the natural environment; sustainable construction materials, use of indigenous materials, use of renewable energy where viable, sustainable construction methods and alternative solution consideration to minimise the impact on the environment. In pursuit of Sustainability and Environmental objectives, planners and designers must balance affordability and minimisation of maintenance and operational cost.

8.9.2. Developing a Master Plan for each facility

As a sector, follow the approach to developing a Master Plan per facility in line with the existing infrastructure and the required infrastructure in line with the Norms and Standards. Then the determination of the gap analysis or need enables the department to plan for the full extent of infrastructure required at each facility and to determine a cost implication. Annexure B: Master Plan Example indicates the proposed sections that are recommended to form part of the master plan for each facility. For example, Gakgatsana Primary School in John Taolo Gaetsewe District was utilised.

8.9.2.1. Level Classification

Instead of classifying schools as Micro, Small, Medium, Large and Mega Schools, where the schools are planned for the current learner numbers, the schools are now classified as levels indicating the classes per grade. The former method allowed for the learner numbers to be divided by 40 learners per classroom, not taking into account the classes per grade, resulting in a shortage of classrooms in the long run.

The classification of levels indicates how many classrooms the school will host per grade, e.g. a level 3 Primary school will have three classrooms for each grade (Grades 1-7), which equals 21 classrooms, and a level 4 Secondary School will have four classrooms per grade (Grades 8-12), which equals 20 classrooms. Classifying the schools as levels allows for enough classrooms for growth, double medium language teaching, and enough classrooms for learners' progress to the next grade.

A needs analysis for Gakgatsana Primary School was identified in Annexure B for the school in line with the Norms and Standards; however, taking into consideration that the facility is currently located on two properties, it is recommended that a feasibility study be conducted to determine which site is most feasible for the future use of the school. The other school can then be returned to the Department of Roads and Public Works as part of GIAMA requirements if Site A or B is returned to the community for use. Alternatively, options can be to utilise one of the facilities for a Crèche or Pre-primary school.

The recommended Master Plan should analyse the Learner Numbers of a facility over the last 5 to 10 years, as it will assist with prioritising the infrastructure requirements for a particular facility.

- **Decline:** If a facility's learner numbers decline from year to year, it is evident that the school requires intervention and that there is a risk in providing additional infrastructure that will not be utilised;
- **Stagnant:** If a facility's learner numbers remain more or less the same and with the current learner numbers have a shortage of infrastructure, it is considered;
- **Increase:** If a facility's learner numbers year on year increase, it is evident that this facility must be prioritised, especially if a shortage of classrooms and the ever-increasing numbers put an additional strain on the existing infrastructure.

8.9.2.2. Site Considerations

The following should be a consideration when determining the preferred site:

- **Site Size:** In terms of the Norms and Standards, the minimum size for a primary school is 2,8ha; therefore, Site B does not meet the minimum requirement;
- **Location and Accessibility:** Both these sites are accessible by the Kamden community, which these sites service;
- **Topography:** Both these sites meet the requirement
- **Vegetation:** None of these sites has any indigenous plants
- **Condition:** The buildings on Site B are in better condition than the buildings on Site A where additional funding will have to be invested in refurbishing these buildings. The refurbishment will, however, still be more cost-effective than the construction of new facilities, as will be the case for Site B;
- **Existing Facilities:** Taking into consideration that there are currently more existing facilities on Site A the additional requirement for facilities will be less than that of Site B

- **Soil Conditions:** This area is known for its dolomite, and there is a high possibility that both these sites will be affected by these soil conditions – a Geo-technical investigation will be required before construction commence.
- **Community involvement:** The department and the district are to engage with the community, as the community will be the end user of the facility.

8.10. Specific standards need to be formulated to ensure that physical resources are planned successful and sustainable

The recommendation is to define critical design aspects that the planners and designers must incorporate when planning, designing and implementing basic education infrastructure projects. These recommended design aspects are intended to ensure a holistic and integrated design approach and eliminate any changes that come as an afterthought, reduce the overall costs associated with the changes, and thereby require that meaningful, functional and cost-effective design solutions are pursued. These aspects should include standard designs that adhere to the Norms and Standards, and Functional Requirements should include energy efficiency, sustainability, and maintainability.

Sufficient time must be allocated to the planning processes to enable all the Mandatory Design Aspects to be attended to and accommodate all the necessary design iterative processes. Due considerations must be made on the exposure conditions as they pertain to the selection of construction sites, considering ground conditions and environmental exposure conditions.

8.10.1. Proposed Risk Management Plan

A Risk Management Plan is an important planning tool for Infrastructure implementation. It is an analysis and problem-solving technique designed to provide a logical process for selecting treatment plans and management actions to protect the institution against unacceptable risks. Table 8-1 indicates identified recommended risks with the delivery of education infrastructure:

Table 8-1: Identified risks associated with the Infrastructure Programme

RISK CATEGORY	RISK DESCRIPTION	LIKELY IMPACT	RESPONSE
Human Resources	Integrity and honesty	Poor value for money, probable mitigation	Proper monitoring systems and disciplinary procedures are in place
	Skills and competence	Extra costs can occur, and inferior project execution	Proper monitoring systems, training
Knowledge and information management	Availability of information	If all information is not available, wrong decisions can be made	Make sure all information is available through plans and policies
	Safeguarding of information	Loss of information	All information to be uploaded on EFMS

RISK CATEGORY	RISK DESCRIPTION	LIKELY IMPACT	RESPONSE
Service delivery	Poor value for money and poor quality	Paying too much for a project utilising variation orders or escalation, poor quality of work	Proper monitoring systems and accountability
	Delays in the payment process	Resulting claims	Improve efficiency, set timelines
Information Technology	Inability to use the system on the part of project office staff	Loss of information, improper management	Training and motivation
	High volumes of documentation and contractual documents that require a signature	Project delays, under-expenditure, claims	Delegation where possible
Institutional arrangements	Delay in the transfer of funds	Resulting claims	Improve efficiency, set timelines
	Delayed decision-making turnaround times	Project delays, under-expenditure, claims	Timely submissions, delegations, and communication improvement
	Inadequate preparation of community and consultants	Project delays and increase in costs	Develop proper guidelines
	Poorly defined responsibilities between the role players	Project delays and increase in costs	Communication improvement
Third-party performance (Implementers)	Risks related to the dependence on the performance of a third party by not performing according to the service level agreement by failure to perform, Not rendering the required service in time, Not rendering the correct service or Inadequate/poor quality of performance	Project delays, increase in costs, poor quality of product	Proper monitoring systems, set timelines, improvement of communication
Project procurement	Poor project designs and specifications	Inadequate facilities	Develop proper guidelines, set procurement guidelines
	Poor budgeting	Inadequate funding	Improve costing
	Quality of performance of consultants	Project delays, increase in costs, poor quality of product	Proper monitoring systems, set timelines, improvement of communication, consultation with implementers
	Delays within the implementer procurement process	Project delays, under-expenditure, accruals	Consultation with implementers
Compliance	The failure to adhere to monitor or enforce compliance requirements	Poor Audits, Withholding of funding, irregular expenditure	Internal Audits and adequate systems put in place

(Source: Author's creation, 2022)

8.10.2. The standard for Value Engineering

Value Engineering must be conducted on all the projects for new facilities, all replacement projects, and upgrades and additions projects whose construction costs are estimated at R50 million.

8.10.3. The standard for Alternative building technologies

There are various options for alternative building technologies on the market, some more cost-effective, some time-efficient, and others both. It is recommended that alternative building technologies be standardised and implemented to ensure that the sector can adhere to the

timeframes set in the Norms and Standards and, if amended, the alignment of these timeframes to the National Development Plan. There should be proper feasibility studies, and the project planning should include the cost-benefit or cost-effective analysis to determine which building technology should be opted for or if the traditional route of brick and mortar is the preferred option. It is recommended that the type of building materials to be used must be of high-quality standards and robust, taking into consideration their exposure conditions, especially abuse and vandalism by learners, be available locally, and where possible, South African products must be used at all times, be maintainable with relative ease and cost-effectively.

8.10.4. The standard for approaching Alternative Funding

It is recommended that a standard be developed for the approaching alternative funding; this standard should include some of the following:

- A clear development proposal for the school infrastructure and the recommended Master Plan can be utilised to prepare the proposal.
- Necessary approvals will be given for the process to continue
- A Memorandum of Agreement (MOA) will be signed between the Department and the client, extending beyond the project's initial year.
- The Department and the donor will consult with the community involved to ensure that the project is not only implemented successfully but that there is holistic communal ownership of the infrastructure provided; and
- Designs will be aligned with norms and standards as stated in the MOA and should include operations and maintenance components.

The NCDDoE identified the Inappropriate Structure Programme for the Budget Facility for Infrastructure (BFI) process as a sizeable Strategic Infrastructure Programme for the 2023 MTEF. If approved, this will assist the department in adhering to the Norms and Standards requirements; where possible more of these avenues should be explored to address national priorities and ensure infrastructure delivery.

It is recommended that the sector approach mines, businesses and entities to contribute to the education infrastructure as their social responsibility; this will assist in addressing the gap identified throughout this study. The recommended Master Plans of schools within the vicinity can then be availed to these companies for their intervention and assistance in eradicating the backlog.

8.10.5. A standard for implementing Maintenance

8.10.5.1. Section 21 Maintenance Allocation – A Maintenance Manual

It is recommended that on a national level, there should be an increased focus on the maintenance activities that are the responsibility of schools. There is an increased focus on maintenance as per the condition that 60% of the Education Infrastructure Grant be ring-fenced for maintenance; however, this will still not resolve the challenges of education facilities' disrepair status. It is recommended that the maintenance portion being ring-fenced from the Education Infrastructure Grant be capped at 40% and that through the Norms and Standards Funding received, a specific portion should be ring-fenced for maintenance to infrastructure only. This portion will alleviate the pressure on the Education Infrastructure Grant and ensure that facilities are in an acceptable maintainable condition. Therefore, as indicated in section 6.15.1, Maintenance Manual, it is recommended that a national Maintenance Manual be developed and rolled out for implementation. This Manual will assist and guide the School Principal, the School Governing Body (SGB) and officials in terms of the processes that need to be followed to maximise the benefit of the Norms and Standards funds allocated for the Day to Day maintenance of their school facilities.

8.10.5.2. Implementation of Maintenance through Framework Agreements

It is recommended that a framework agreement approach be considered when implementing maintenance projects; this will reduce the Department's supply chain processes and the need to re-advertise services or works within the same scope as the agreement. It is a flexible method to manage expenditure over time and enable cooperative relationships to develop to deliver value for money, particularly concerning contractor development, community participation and skills development. It will also provide an opportunity for contractors to improve their internal management systems, develop their supply chains and improve their status during the contract term through continuity of work over a more extended period than in non-framework contracts.

The framework agreements approach enables lessons learned in one package or task order to be taken to the next and enable a team to work together on an integrated approach over time. The promotion of secondary (developmental) procurement objectives in this contracting arrangement is also very flexible and, unlike most other delivery models, allows the employer to change the deliverables associated with such a policy over time in response to emerging needs and changing circumstances. This recommendation will enable meaningful development of local enterprises and labour to take place over the term of the contract.

8.11. Conclusion on recommendations

In this chapter, there were many recommendations made; however, it can be concluded that the main recommendations that will affect the education sector are data, the integration of various sets of data, the accuracy of data, the regular updating of data that is required to ensure that planning and prioritisation are done as accurate as possible. A comprehensive, accurate, up-to-date data set from which a planner can work is vital in decision-making. As crucial as the upkeep of this data, ensuring quality control and verification of all data that filter into the system, putting systems in place to enable recordkeeping will enable the department to plan and report accurately. Further developing the data to determine estimated cost implications opens up opportunities to bid and apply for additional funding, as it creates credibility in the system.

It is one thing to be able to plan and report accurately, but if implementation that is value for money does not follow the planning, it does not fulfil its purpose. Overall, infrastructure implemented through the government is rarely implemented within time and budget, which has a ripple effect on planning. In the end, projects planned, targeted and budgeted for implementation within a specific financial year that do not reach completion have an impact on the coming financial year in terms of commitments and result in departments re-prioritising projects within the current financial year, therefore the money is not spent where it was initially planned for and results in a list of deviations that follows annual reporting on targets.

The implementation of the recommendations made as a result of this research depends on capable professionals in the planning and delivery of education facilities that know the environment that can gather relevant data, analyse data, spatially present the data and make prioritised recommendations for the decision-makers. Planners involved in the planning process of municipalities can guide and influence planning at the ward, municipal, district and national levels. Professionals must manage implementers to deliver value for money within the required timeframes and budget. Best practices and knowledge sharing should occur regularly between the different stakeholders.

CHAPTER 9 NEW KNOWLEDGE CONTRIBUTION

9.1. Chapter Introduction

Education is the foundation of a nation as it can affect the quality of life, skill the workforce and ensure better work opportunities; therefore, it is a significant long-term investment for a country. Strategic and operational policy statements guide the investment in education facilities; it is embraced as a set of policy norms and standards referred to as Regulations Relating to Minimum Uniform Norms and Standards for Public School infrastructure, standardised architectural designs and a school's Cost Model to reflect the costing realities.

This research reflected on the existing asset base of the Northern Cape province, determined the existing supply of school infrastructure within the province, the functional performance, condition and utilisation of each of the facilities and identified aspects such as the life cycle costing and Infrastructure needs and made a significant contribution in terms of the link between the supply, the need requirement in terms of the Norms and Standards and the demand as the gap of the required infrastructure. It assessed the legislation, policies, guidelines and plans that impact education facilities. It provided recommendations to ensure that educational facilities remain relevant when planned sustainably. It unpacked the planning behind new schools and gave recommendations on the ideal location of new schools. It contributes to stating the role of different stakeholders and the role of planners and designers in the designing of educational spaces.

In an attempt to provide recommendations for a standard framework that will guide education facility planning and provisioning, it can be concluded that there is a need for a more resilient education sector and that alternative solutions will have to be investigated further to ensure that education facilities receive the required infrastructure to be able to achieve its core purpose of teaching and learning. A resilient education sector can ensure that the learners of today are educated in an enabling environment that is innovative and sustainable and strives to give a better future for each child that passes through its halls, sits in its classrooms, that plays on its sports fields because they are the future of the province and the future of our country.

In closing, this research contributed valuably to understanding the factors required to ensure that education facilities are optimally planned and sustainably integrated to remain relevant.

9.2. New knowledge contribution

To link the first and last chapters of this study, Table 9-1 connects the research objectives to the recommendations made and cites the new contributions generated by this research.

Table 9-1: Linking research objectives, recommendations and new knowledge contributions

Research Objectives	Primary research question	Associated chapter(s)	Associated Recommendations	New knowledge contribution based on research findings
Investigate the current legislation, regulations and standards for the provisioning of school infrastructure and the planning and design behind it.	How did planning theories, including development theories and sustainable development theories, impact on education facilities planning?	Chapter 2	Section 8.2	Complete analysis of all legislation, regulations and standards that impact the provisioning of school infrastructure and the implication thereof for planning
To determine the role and function of planning in Education Infrastructure	What spatial principles are applicable when planning optimally for education facilities?	Chapter 4	Section 8.4 and Section 8.5	Relating education infrastructure to spatial principles
To investigate the ideal locations of school infrastructure	What is the ideal location for school infrastructure?	Chapter 4	Section 8.7	Relating norms and standards, legislation, and designs to determine the ideal location for school infrastructure Considering the different impacts on site allocation
To identify and forecast changing needs	What services can education infrastructure be combined with to improve integrated planning?	Chapter 4	Section 8.8	Determine the factors that have an implication for forecasting changing needs
	How does legislation on a global, national, provincial and municipal level impact how and when education facilities are planned for?	Chapter 3	Section 8.2	Relating the South African sector to Global, National, Provincial and Municipal level Providing a comparison between South Africa and two other 3 rd World Countries
To improve on standards that will ensure that physical resources are planned successful and sustainable	Are there acceptable norms, standards, and guidelines to assist in the uniform planning of education facilities?	Chapters 3 and 5	Section 8.9 and Section 8.9	Providing a guideline that can be utilised to improve on standards that will ensure functional, viable, sustainable education areas Providing alternative approaches to address infrastructure at existing schools and when planning for new schools
To conduct empirical research on the physical resources within the Northern Cape Department of Education	What existing education infrastructure (current supply) forms part of the Northern Cape assets, and what measures can be	Chapter 6	Section 8.9	Analyse the current supply, the required infrastructure (demand) Conduct a complete Gap Analysis to determine the required infrastructure

Research Objectives	Primary research question	Associated chapter(s)	Associated Recommendations	New knowledge contribution based on research findings
Identify measures to determine the existing school infrastructure (supply) within the Northern Cape Province To investigate characteristics of the physical resources within the education sector of the Northern Cape	utilised to determine the characteristics?			Providing cost estimates for providing the required infrastructure to determine the cost implication of adhering to the Norms and Standards Findings on Inappropriate Structures and the implications of Asbestos in the Northern Cape for education facilities – there is, however, a need to further investigate this as this challenge does not only affect the Department of Education
Determine the demand for school infrastructure. Determine what school infrastructure is required based on needs assessments;	What education infrastructure is currently needed (demand)?	Chapter 6	Section 8.4	Determining the demand for schools through an analysis of population, migration, and growth and analysing the learner enrolment to determine the viability of existing infrastructure
	How can the sector ensure that existing assets are maintained and utilised to their full potential?	Chapters 5 and 6	Section 8.10.5	Providing guidelines on the utilisation of the Section 21 Maintenance Allocation in terms of a maintenance manual Providing a guideline for the implementation of the maintenance programme through the Education Infrastructure Grant
Investigate the sustainability of existing physical resources	Will it be more cost-effective to plan new facilities to address the demand or improve the existing education infrastructure?	Chapters 5 and 6	Section 5.9, 6.22	Investigating possible and tested alternative approaches to ensure sustainability not only of the facilities but also of the resources and services utilised at schools

(Source: Author's creation, 2022)

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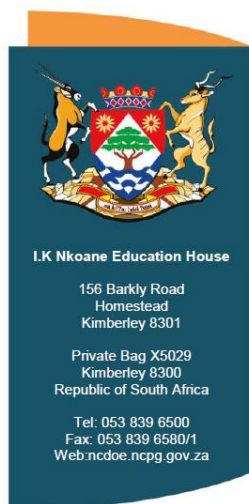
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ANNEXURE A: NCDOE LETTER OF CONSENT



DEPARTMENT OF EDUCATION

Enquiries: MR. G.B. OLIPHANT
Ref No: HR – BRITZ THESIS
Date: 08 MARCH 2019

**TO: MS. J.J. BRITZ
PO BOX 997
KIMBERLEY
8301**

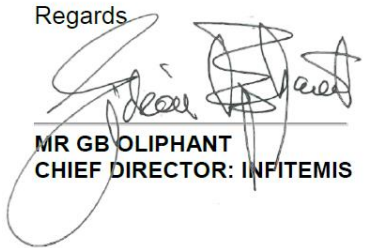
SUBJECT: APPROVAL TO UTILISE NORTHERN CAPE DEPARTMENT OF EDUCATION DATA FOR RESEARCH PURPOSES IN COMPLETION OF DOCTORS DEGREE AT NORTH WEST UNIVERSITY

Your letter dated 13 February 2019 has reference:

As indicated the thesis title is aimed at "Optimising the planning of educational facilities: reflecting on the integration of asset base assessment and land use planning" and was ethically cleared under the minimal risk category at the North-West University (NWU). The Department herewith approves the request to utilize the following data to conduct the research:

- Site Visits conducted during research period;
- NEIMS Assessment data on the Education Facility Management System;
- EMIS Data; and
- Condition Assessments

Regards


**MR GB OLIPHANT
CHIEF DIRECTOR: INFITEMIS**



J.J. BRITZ

PO Box 977 Kimberley, 8301
Cell: 082 4979 546
Email: britzjanette@gmail.com

**CHIEF DIRECTOR: INFRASTRUCTURE, ICT & EMIS
NORTHERN CAPE DEPARTMENT OF EDUCATION
PRIVATE BAG X5029
KIMBERLEY
8301**

ATTENTION: MR. G.B. OLIPHANT

SUBJECT: PERMISSION TO UTILISE NORTHERN CAPE DEPARTMENT OF EDUCATION DATA FOR RESEARCH

I am currently enrolled for my Doctor of Philosophy in Science with Urban and Regional Planning degree at the North-West University where I have to submit a thesis in fulfilment of the requirements for the degree at the North-West University with the following title:

OPTIMISING THE PLANNING OF EDUCATIONAL FACILITIES: REFLECTING ON THE INTEGRATION OF ASSET BASE ASSESSMENT AND LAND USE PLANNING

The study was ethically cleared under the minimal risk category at the North-West University (NWU) with the following ethical clearance number: NWU-01168-19-A9. The following table indicates the different data that will be utilised from the Department to conduct the research:

Data Description	Data Source	Method/ technique	Description of method	Associated chapter(s)
Site Visits at 205 Northern Cape Schools to gather primary and secondary data	Secondary Source	Personal Observation	Site Visits were conducted at 205 Northern Cape Schools to comprehend the quantitative data collected for this research	Chapter 6
NEIMS Assessment data on the Education Facility Management System	Primary Source	Document Review	Sourced from the Education Facilities Management System as captured by the Northern Cape Department of Education quarterly	Chapters 1 and 6
EMIS Data	Secondary Source	Document Review	Sourced from the Northern Cape Department of Education EMIS database	Chapter 6
Condition Assessments	Secondary Source	Document Review	Sourced from the Northern Cape Department of Education Condition Assessments as was conducted by the Northern Cape Department of Roads and Public Works	Chapter 6

Through this research recommendations will be made to assist the Department with planning for social infrastructure, integrating planning, education facility planning for resilience, alternative funding, multi-functional spaces, bio-architecture, asbestos intervention projects, digital schools, occupational schools, and data quality improvement.

Therefore, I request permission from the Department to utilise this data for my degree to ensure for a comprehensive understanding of the social infrastructure in the educational facilities in the Northern Cape.

Thank you for your time and consideration; I hope to hear from you soon.

Faithfully

A handwritten signature in cursive script, appearing to read 'Britz', is written over a horizontal line.

MS J.J. BRITZ
PR. PLN A/1982/2014
DATE: 13 FEBRUARY 2019

ANNEXURE B: MASTER PLAN EXAMPLE

GENERAL INFORMATION

The following section indicates the current supply recommended for a master plan as an example for Gakgatsana Primary School, John Taolo Gaetsewe District Municipality, Northern Cape.

Gakgatsana Primary School – General Information

GENERAL INFORMATION	
EMIS NUMBER	300100395
SCHOOL NAME	GAKGATSANA PRIMARY SCHOOL
SCHOOL HOSTEL	NO
DISTRICT MUNICIPALITY	JOHN TAOLO GAETSEWE
LOCAL MUNICIPALITY	JOE MOROLONG
TOWN	KURUMAN
SUBURB	KAMDEN
SCHOOL STATUS	OPERATIONAL (LEARNERS AT THE SCHOOL)
SCHOOL TYPE	PUBLIC ORDINARY SCHOOL
SECTOR	PUBLIC
PHASE	PRIMARY
SCHOOL CLASSIFICATION WITH PHASE	LARGE PRIMARY
LEVEL CLASSIFICATION	LEVEL 3 PRIMARY SCHOOL
LOWEST GRADE	GRADE R
HIGHEST GRADE	GRADE 6
LATEST LEARNER NUMBERS [TOTAL]	762
LATEST LEARNER NUMBERS [GRADE R]	66

(Source: Author's creation, 2022)

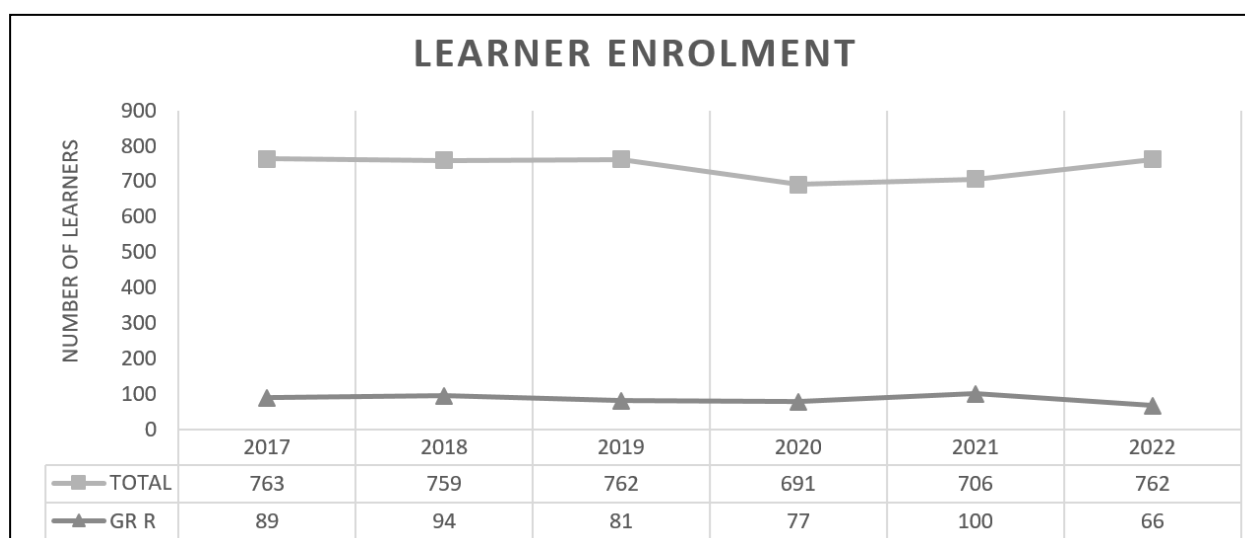
Gakgatsana Primary School is a unique school located within the Northern Cape due to the school being located and operated from two sites which are 1.29 km from one another. The following indicates the location and property details of both these sites:

Gakgatsana Primary School – Property Information

LOCATION AND PROPERTY DETAILS	SITE A	SITE B
STREET ADDRESS	KAMDEN VILLAGE, KURUMAN	KAMDEN VILLAGE, KURUMAN
LONGITUDE	-27.359285	-27.363908
LATITUDE	23.889281	23.895855
LAND DESCRIPTION	ERF 5	BUSHY PARK No. 117
LAND OWNERSHIP	PROVINCIAL	TRIBAL
LAND AREA (Ha)	4,0419	2.63
REQUIRED AREA (Ha)	2,8	2,8
LAND AREA GAP (Ha)	SURPLUS -2,371	GAP 0,17ha
BUILDING AREA (m2)	682,0	655,0
MOBILE FACILITIES	YES	NO
BOREHOLE	YES	YES
QUINTILE	1	1
HERITAGE STATUS	NO	NO
URBAN / RURAL	RURAL	RURAL
GRADES OFFERED	GR 3-6	Gr R-2

(Source: Author's creation, 2022)

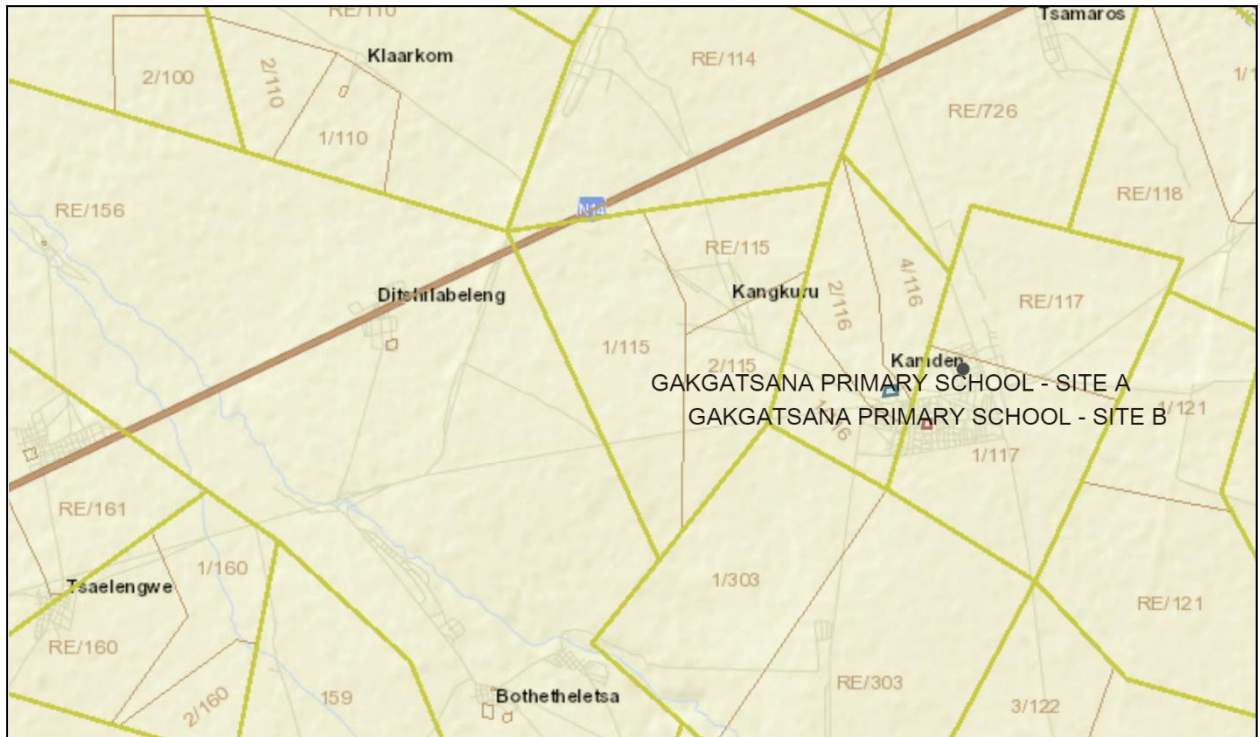
The learner enrolment for Gakgatsana Primary School is indicated in the following graph.



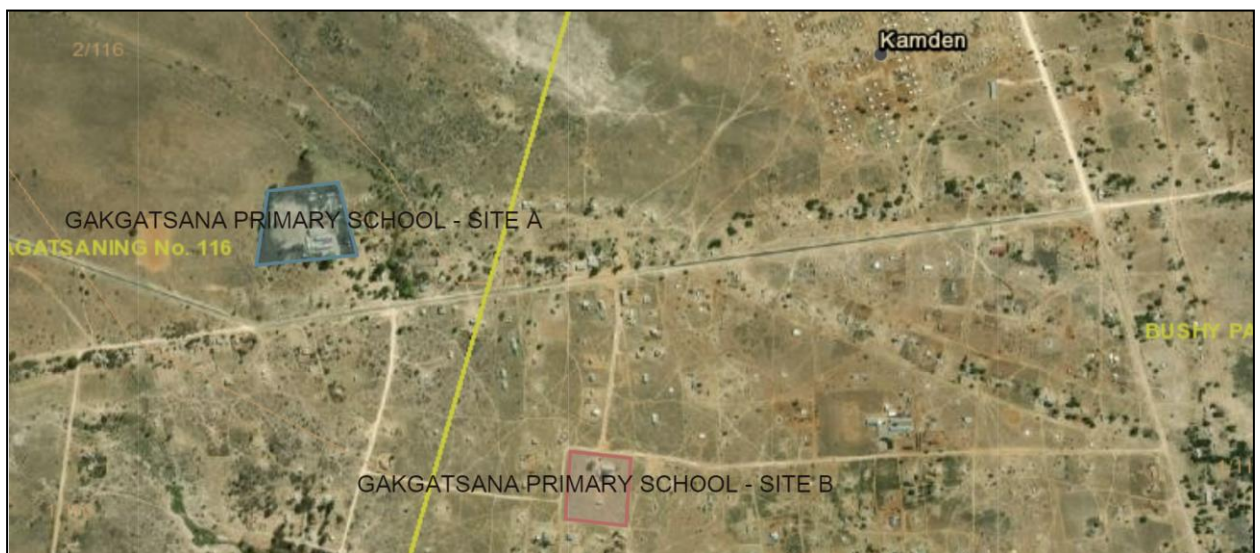
Learner Enrolment Gakgatsana Primary School

(Source: Author's creation, 2022) utilising EMIS Data

The following locality and aerial maps indicate the location of the properties of Gakgatsana Primary School:

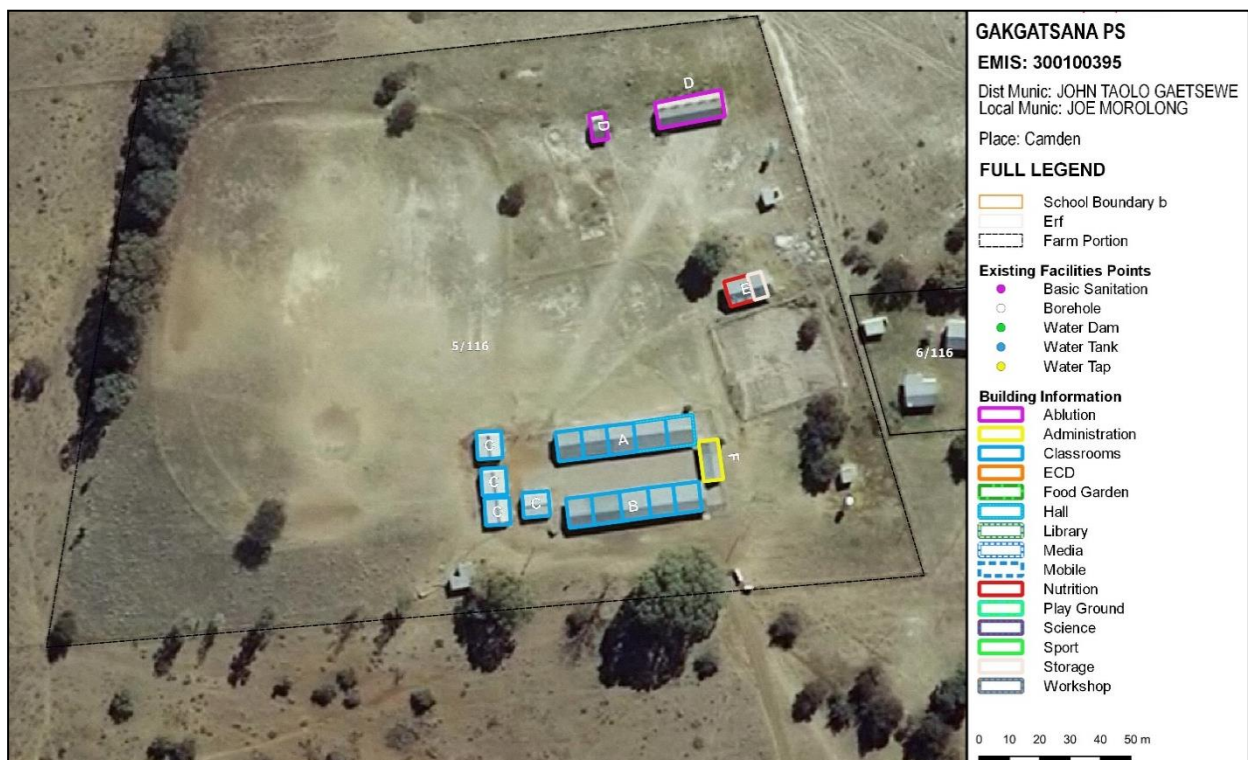


Locality Plan Gakgatsana Primary School
(Source: Chief Surveyor General, 2022)



Locality Plan Gakgatsana Primary School
(Source: Chief Surveyor General, 2022)

The following map indicates the existing facilities at Site A for Gakgatsana Primary School:



Gakgatsana Primary School - Site A
(Source: Wells, 2022)

Gakgatsana Primary School – Site A is 4.03 ha, and the building area is 682m², the primary site utilised for the school. The principal's office is situated at this site, and there are ten ordinary brick-and-mortar classrooms, four mobile classrooms, enviro loo ablution facilities including disabled ablution facilities, a nutrition centre and storage facilities. The site accommodates Grades 3-6 learners. The department prioritised a project to construct five classrooms, two offices, two storerooms, one large ablution facility, a medium administration block, a double ECD classroom and the conversion of the Enviro Loo ablution to waterborne. The buildings on this site are at a condition 2 level, except for the mobile classrooms. Even though there are ablution facilities for disabled learners, these facilities are not accessible in a wheelchair. The following photographs indicate the current condition of the existing buildings at Gakgatsana Primary School – Site A:



Gakgatsana Primary School – Site A Photo's
(Source: Author's creation, 2022)

Gakgatsana Primary School – Site B is 2.63 ha, and the building area is 655m², the secondary site utilised for the school. Seven ordinary brick-and-mortar classrooms, flush ablution facilities, office space and storage facilities are located on this site. The site accommodates the Gr R-2 learners. The buildings on this site are at a condition 3 level, except for the ablution facilities. The following map indicates the existing facilities at Site B for Gakgatsana Primary School:



Gakgatsana Primary School - Site B
 (Source: Wells, 2022)

The following photographs indicate the current condition of the existing buildings at Gakgatsana Primary School – Site B:



Gakgatsana Primary School – Site B Photos
 (Source: Author's creation, 2022)



Gakgatsana Primary School – Site B Photos
(Source: Author's creation, 2022)

The following table indicates the buildings and rooms required, the school's current infrastructure, the gap/need aligned to the school's learner enrolment, and the Norms and Standards for Public School Infrastructure. The estimated prices are aligned with the Cost and Accommodation Estimates revised annually. According to the level classification and the Norms and Standards. Gakgatsana Primary School is classified as a Level 3 Primary School:

Gakgatsana Primary School Level Classification

INFRASTRUCTURE SPACE/FACILITY	STANDARDS	CURRENT	NEED
ADMINISTRATION BLOCK			
	LARGE		
PRINCIPAL	1	1	
DEPUTY	2	0	2
HOD	1	0	1
ADMIN	1	1	
COUNSELLING	1	0	1

INFRASTRUCTURE SPACE/FACILITY	STANDARDS	CURRENT	NEED
RECEPTION	1	0	1
WAITING	1	0	1
STAFF ROOM	1	1	
KITCHENETTE	2	0	2
SICK BAY	1	0	1
PRINT ROOM	1	1	
STRONG ROOM	1	0	1
STORE ADMIN	1	1	
MOBILE ADMINISTRATION BLOCK	0	0	
CONSTRUCTION OF THE FOLLOWING FACILITIES			
ADMINISTRATION BLOCK (LARGE)		1	R 3 461 379
ECD FACILITIES			
0-4 YEARS OLD CLASSROOMS	0	0	
GRADE RR CLASSROOMS	0	0	
GRADE R CLASSROOMS	4	0	4
MOBILE GRADE R CLASSROOM(S)		0	
OVERALL NEED TAKING INTO CONSIDERATION THAT MOBILES SHOULD BE REPLACED			4
CONSTRUCTION OF THE FOLLOWING FACILITIES			
ECD (DOUBLE)		2	R 6 958 298
CLASSROOMS			
FOUNDATION CLASSROOMS	9	0	9
ORDINARY CLASSROOMS	12	20	-8
MOBILE CLASSROOMS		4	
OVERALL NEED TAKING INTO CONSIDERATION THAT MOBILES SHOULD BE REPLACED		Mobiles Included in ordinary classrooms	1
CONSTRUCTION OF THE FOLLOWING FACILITIES			
CLASSROOM (FOUNDATION)		1	R 756 964
SPECIALIST CLASSROOMS			
MULTI-PURPOSE CLASSROOMS	1	0	1
SCIENCE LABS	2	0	2
ICT CLASSROOMS	1	0	1
LIBRARY	1	0	1
MOBILE/CONTAINER LIBRARY		0	
ENGINEERING WORKSHOPS		0	

INFRASTRUCTURE SPACE/FACILITY	STANDARDS	CURRENT	NEED
SPECIALIST CLASSROOMS		0	
CONSTRUCTION OF THE FOLLOWING FACILITIES			
MULTI-PURPOSE CLASSROOM (WITH SINK AND STORE 13SQM)		1	R 1 092 304
SCIENCE LAB AND STORE (WITH STORE 13SQM)		2	R 2 273 561
MEDIA CENTRE (WITH 2 X STORE 13SQM AND OFFICE 9SQM)		1	R 2 568 479
ABLUTION			
TYPE OF SANITATION INFRASTRUCTURE AT SCHOOL		Enviro Loo	
ECD TOILETS	16	0	16
FOUNDATION GIRLS' TOILETS	11	0	11
FOUNDATION BOYS' TOILETS	11	0	11
GIRLS TOILETS	11	2	9
BOYS TOILETS	11	2	9
LADIES TOILETS	2	1	1
MEN TOILETS	2	1	1
ACCESSIBLE TOILETS	2	0	2
MOBILE ABLUTION BLOCK(S)		0	
MOBILE ABLUTION TOILET SEATS		0	
OVERALL NEED TAKING INTO CONSIDERATION THAT MOBILES SHOULD BE REPLACED		Mobile seats not included	60
CONSTRUCTION OF THE FOLLOWING FACILITIES			
ABLUTION BLOCK (LARGE)		2	R 3 177 200
NUTRITION KITCHEN			
NUTRITION KITCHEN	1	1	
MOBILE NUTRITION KITCHEN		0	
CONSTRUCTION OF THE FOLLOWING FACILITIES			ESTIMATE
NUTRITION CENTRE WITH LARGE DINING HALL (200SQM)		1	R 1 935 588
ASSEMBLY			
FORUM	1	0	1
HALL	1	0	1
OPEN ASSEMBLY AREA	0	0	
COVERED WALKWAYS	0	0	
CONSTRUCTION OF THE FOLLOWING FACILITIES			
OPEN ASSEMBLY AREA (FORUM)		1	R 347 300
SECURITY			
GUARD HOUSE	1	0	1

INFRASTRUCTURE SPACE/FACILITY	STANDARDS	CURRENT	NEED
BURGLAR PROOFING	YES	NO	YES
STONE GUARDS	YES	NO	YES
TYPE OF FENCING AT SCHOOL		Wire Fence	
SCHOOL FENCE	1	620	
ECD FENCE	1		
CONSTRUCTION OF THE FOLLOWING FACILITIES			
GUARD HOUSE		1	R 53 406
FENCE ECD - PALISADE		4	R 253 000
PALISADE FENCE /M		620	R 784 300
UTILITY			
COVERED PARKING	16	0	16
OPEN PAVED PARKING	16	0	16
CONSTRUCTION OF THE FOLLOWING FACILITIES			
CARPORT PER CAR		16	R 99 360
PARKING PAVED AREAS PER CAR		16	R 179 400
PLAYGROUND			
PLAYGROUND ECD	1	None	YES
PLAYGROUND FOUNDATION	1		YES
SPORTS FIELD	1	Netball: 1 Soccer: 1	
COMBI COURTS	2		YES
CONSTRUCTION OF THE FOLLOWING FACILITIES			
SOCCER FIELD WITH LOOSE PAVILIONS		1	R 750 000
COMBI COURT WITH FENCE		2	R 700 000
WATER			
TYPE OF WATER INFRASTRUCTURE AT SCHOOL		Borehole	
DRINKING FOUNTAINS	27	3	24
WATER STORAGE	1	0	1
WATER PURIFICATION	1		1
BOREHOLE	2	Yes	
CONSTRUCTION OF THE FOLLOWING FACILITIES			
DRINKING FOUNTAIN		24	R 8 280
OTHER			
TOTAL MOBILES AT SCHOOL		4	

(Source: Author's creation, 2022)

PROJECTS IDENTIFIED FOR IMPLEMENTATION WITH BUDGET ESTIMATES

The following table indicates the proposed Project Implementation template as an Annexure to the recommended Master Plan:

Projects identified – Gakgatsana Primary School: Site A

PROJECTS TO BE IMPLEMENTED			
PROJECT ASPIRATIONS:			
Adequate accommodation for foundation and intermediate phases at Gakgatsana Primary Schools			
PROJECT OBJECTIVES:			
A School with accommodation as per the Norms and Standards			
PRIORITY AREA:			
1.	Inappropriate structures: Asbestos, wood, metal, and mud/pit toilets		n/a
2.	2.1	Classroom shortages	11
	2.2	Classroom shortages – Grade R	4
	2.3	Ablution shortages and eradication	60
	2.4	Security shortages – Fences, guard houses and burglar proofing	See Needs Analysis
	2.5	Inadequate services	See Needs Analysis
3.	Learner resources:		
	3.1	Science Labs	2
	3.2	ICT Labs (Computer)	1
	3.3	Libraries	1
4.	All other Norms and Standards:		
	4.1	Special Schools in all Districts	n/a
	4.2	Nutrition Kitchens	See Needs Analysis
	4.3	Administration Areas	LARGE
	4.4	High school Halls	n/a
	4.5	Sports facilities:	
		Soccer field	See Needs Analysis
		Combi-Courts	See Needs Analysis
		Playgrounds	See Needs Analysis
	4.6	Grade RR Classrooms	See Needs Analysis
	4.7	Amenities:	
		Multi-Purpose classroom	See Needs Analysis
		Assembly areas	See Needs Analysis
		Janitor facilities	See Needs Analysis

PROJECTS TO BE IMPLEMENTED			
		Parking	32
		Refuse area	See Needs Analysis
		Condemnation area	See Needs Analysis
		Covered Walkways	See Needs Analysis
		Flagpoles	See Needs Analysis
		Drinking fountains	See Needs Analysis
	4.8	Facilities for 1-4-Year-olds	See Needs Analysis
GOALS:			

Construction of quality infrastructure within budget and within the prescribed timeline

INFRASTRUCTURE REQUIRED TO ADHERE TO NORMS AND STANDARDS				
KEY PERFORMANCE AREAS:			QUANTITY	BUDGET ESTIMATE
ADMINISTRATION BLOCK (LARGE)			1	R 3 461 379,25
ABLUTION BLOCK (LARGE)			2	R 3 177 200,00
ECD (DOUBLE)			2	R 6 958 298,56
CLASSROOM (FOUNDATION)			9	R 6 812 680,50
CLASSROOM ORDINARY			2	R 1 494 609,00
MEDIA CENTRE (WITH 2 X STORE 13SQM AND OFFICE 9SQM) AND HIGH SECURITY			1	R 2 568 479,00
SCIENCE LAB AND STORE (WITH STORE 13SQM)			2	R 2 273 561,50
OPEN ASSEMBLY AREA (FORUM)			1	R 347 300,00
GUARD HOUSE			2	R 106 812,00
CARPORT PER CAR			32	R 198 720,00
FENCE ECD - PALISADE			4	R 253 000,00
FENCE SECURITY - PALISADE			620	R 15 685 999,94
SOCCER FIELD WITH LOOSE PAVILIONS			1	R 750 000,00
STRUCTURAL DAMAGES MEDIUM			1	R 1 840 000,00
LEVEL 3 - PRIMARY - MAJOR MAINTENANCE			1	R 2 041 762,97
ESTIMATE PROJECT BUDGET		R 47 969 802,71	CONSTRUCTION PERIOD	18 MONTHS
QUALITY		A sturdy, permanent building that caters for the need with a lifespan of at least 100 years with a low maintenance footprint that adheres to the National Building Regulations		
CURRENT CONDITION:				

The facility, Gakgatsana Primary School, is used as a school. The school have two sites currently. The structure is a single-storey building. The buildings are constructed with face brick, plaster, and paint. The roof is corrugated iron. Internal walls are plastered and painted. Floors are concrete in the classrooms; the Administration block has ceramic tiles. The ceiling is board ceilings in the administration block; classrooms do not have ceilings and all rooms with mostly fluorescent tubes. Glazing is steel framed windows with burglar proofing. Air conditioners are split units in an office block. The accommodation comprises the following: · Offices· Safe Room· Room· Disabled Ablutions· Sick Bay· Storeroom· Classrooms· Computer Lab· Ablutions· Kitchen· Pump HouseThe perimeter fence is a 1.8m diamond mesh fence with barbed wire.

DESIRED CONDITION:

PROJECTS TO BE IMPLEMENTED

The buildings, whether construction, mobile or conversion, are delivered as safe buildings or structures that protect from the elements; provide hygienic sanitation facilities, clean potable water, access to safe energy sources, provide indoor and outdoor spaces suited to the provision of relevant programme activities and large enough to accommodate all children making use of the programme.

ACCEPTANCE CRITERIA:

Fully furnished Primary School on the specified level.
Loose furniture as per the latest list.
Safe disposal of inappropriate materials.

NORMS AND STANDARDS PRIORITY:

1.	Three years from the date of publication	
2.	Seven years from the date of publication	X
3.	Ten years from the date of publication	X
4.	Before 31 December 2030	

PROCUREMENT STRATEGIES:

IMPLEMENTATION	DRPW	PROCUREMENT	DRPW
COST	Within 20% of the estimated budget of the project Investigation of alternative construction methods in the case of exceeding the 20%		

MANAGING QUALITY

Consequences, mitigation, and responsibilities to be managed

Institutional arrangements to be enforced

Human Resources to be enhanced

Budget inputs to be monitored

Reporting and Documentation to be managed

Mitigation of risks must be communicated, and impact assessment is done as soon as they occur

MITIGATING RISKS

RISK CATEGORY	RISK DESCRIPTION	LIKELY IMPACT	RESPONSE
Human Resources	Integrity and honesty	Favouritism	Proper monitoring systems in place
	Lack of Human Resources	Mistakes can be made because of overloading	Appoint adequate and relevant human resources
	Skills and competence	Mistakes because of a lack of competence	Proper monitoring systems, training
Knowledge and information management	Availability of information	Poor decision-making due to a lack of information	Put procedures in place for information sharing and capturing
	Credibility of information	Correct information captured	Monitoring and evaluation
	Strategic planning	Seeing the bigger picture concerning rationalisation and land availability	Procedures to make sure everything is included
	Safeguarding of information	Loss of information	All information to be uploaded on EFMS
Service delivery	Budget	Inadequate budget allowance	Gateway reviews, Proper monitoring systems and regular research and updating
Information Technology	Monitoring and evaluation	Outdated information	Regular monitoring
	Inability to use the system	Loss of information, outdated information	Monitoring, Training, and motivation
Institutional arrangements	Rationalisation	Lack of Rationalisation results in unnecessary projects and fruitless expenditure	Get processes in place to start rationalisation processes, update information where available
	Prioritisation	Projects not executed in order of priority	Regular evaluation

PROJECTS TO BE IMPLEMENTED			
	Vision	Relations between role players	Strategic planning
Third-party performance (Implementers)	Changes in circumstances	Migration patterns, learner enrolment	Regular analysis and evaluation of future projects
	Dependence on the performance of a third party	The rationalisation is not considered, and information is not shared	Proper monitoring systems, set timelines, improvement of communication and accountability
Compliance \ Regulatory	Compliance requirements	Lack of quality education, poor hygiene, etc.	Strategic planning

(Source: Author's creation, 2022)

DESIGN OF PROJECT

The following table indicates the proposed design implications and requirements for this project as part of an Annexure for the recommended Master Plan:

Design of project – Gakgatsana Primary School: Site A

PROPOSED SCHEDULE		
PROPOSED DATES		ITEM
2022-09-01		ALLOCATION TO IMPLEMENTER
2022-09-30		IMPLEMENTATION PLAN APPROVAL
2022-10-14		STAGE 1 APPROVAL
2022-11-13		STAGE 2 APPROVAL
2022-10-30		STAGE 3 APPROVAL
2022-12-29		TENDERS / QUOTATIONS
2023-03-29		SITE HANDOVER
18	MONTHS	PROJECT DURATION
2024-09-19		PRACTICAL COMPLETION
2024-12-18		PROJECT CLOSEOUT

STANDARD DRAWINGS		
DRAWING DESCRIPTION	DRAWING NUMBER	ISSUED
ADMINISTRATION BLOCK (LARGE)	ADM-L	X
HOD OFFICE	HOD	
ECD (SINGLE)	ECD-S	
ECD (DOUBLE)	ECD-D	X
CLASSROOM (FOUNDATION)	CLS -F	X
CLASSROOM ORDINARY	CLS - S	X
ABLUTION BLOCK (LARGE)	ABL-L	X
ABLUTION BLOCK (MEDIUM)	ABL-M	
CHANGE ROOMS	CHR	
COMPUTER CLASSROOM (WITH STORE 13SQM) AND HIGH SECURITY	CMP	
SCIENCE LAB AND STORE (WITH STORE 13SQM)	LAB	X
MULTI-MEDIA LIBRARY (WITH STORE 13SQM) WITH HIGH SECURITY	LBR	
MEDIA CENTRE (WITH 2 X STORE 13SQM AND OFFICE 9SQM) AND HIGH SECURITY	MED	X
SPECIALIST CLASSROOM	SPC	
WORKSHOP	WSP	

STANDARD DRAWINGS		
DRAWING DESCRIPTION	DRAWING NUMBER	ISSUED
MULTI-PURPOSE CLASSROOM (WITH SINK AND STORE 13SQM)	MPC	
HALL (LARGE SCHOOLS WITH MORE THAN 900 LEARNERS) & (CHAIR STORE 40SQM)	HAL-L	
HALL (MEDIUM SCHOOLS LESS THAN 900 LEARNERS) & (CHAIR STORE 25SQM)	HAL-M	
OPEN ASSEMBLY AREA (FORUM)	FOR	X
NUTRITION CENTRE WITH LARGE DINING HALL (200SQM)	NTR-L	
NUTRITION CENTRE (100SQM DINING HALL)	NTR-C	
NUTRITION KITCHEN	NTR-K	
GUARD HOUSE	GRD	X
JANITOR QUARTERS	JNT	
REFUSE AREA	REF	
CONDEMNATION ROOM	CON	
CARPORT PER CAR	CAR	X
COVERED WALKWAYS /10M	WKW	X
HIGH-SECURITY FENCE /M	PER SQM	
PALISADE FENCE /M	PER SQM	X
WELDED MESH FENCE /M	PER SQM	
PROPOSED CONSULTANTS TO BE INVOLVED		
MAIN CONSULTANTS		OTHER CONSULTANTS
REQUIRED	TYPE	REQUIRED TYPE
X	Professional Architect	Town and Regional Planner
X	Professional Quantity Surveyor	Geotechnical Engineer
X	Professional Civil and Structural Engineer	Landscape Architect
X	Professional Electrical Engineer	Social Facilitator
X	Professional Mechanical Engineer	X Health and Safety Consultant
		X Resident Engineer / Clerk of Works
		Environmental Specialist

POSSIBLE CHALLENGES		
REQUIRED	CHALLENGE	POSSIBLE MITIGATION
X	Community Interference	Appointment of a Social facilitator
X	Geotech challenges	Do it as early in the project as possible
X	Incompetent Contractors	Close monitoring of the contracts
X	Inclement Weather	Extension of time

STATUARY PERMISSIONS BY CONSULTANTS	
REQUIRED	TYPE
X	Municipal Approval
N/A	Environmental Affairs
N/A	Heritage permission
N/A	Land Use Application

(Source: Author's creation, 2022)

EXPECTATIONS

The following table indicates the proposed expectations and documentation requirements for this project as part of an Annexure for the recommended Master Plan:

Expectations of the project – Gakgatsana Primary School: Site A

EXPECTATIONS

IMPORTANT TO NOTE:

ALL DRAWINGS, SPECIFICATIONS AND PROCESSES ARE TO BE IN LINE WITH THE STANDARD DRAWINGS, SPECIFICATIONS AND PROCESSES. ANY DEVIATIONS TO BE APPLIED FOR AND APPROVED BY THE DEPARTMENT IN WRITING

Please note that if, for some reason, there is to deviate from the standards and notes, written permission is to be attained from the NCDoe.

Any costs that may occur because of not getting approval may be recovered from the Implementer/Consultant

DOCUMENT REQUIREMENTS

- 1 Implementation Plan
- 2 Appointment letters of external consultants, contracts, and indemnity for the duration of the contract
- 3 A monthly progress report from the Implementer, including cashflows and a separate indication of construction and different consultancy fees
- 4 An End of year report indicating the status of the project as of the 31 of March of each year the project is ongoing
- 5 Minutes and attendance of all pre-construction meetings, including briefing and stage presentation meetings
- 6 Stage 1 Approved Pre-feasibility Plan
- 7 Stage 2 Approved Feasibility Plan
- 8 Stage 3 Approved Design Documentation
- 9 All site investigation reports
- 10 All statutory approvals, including Municipal approval
- 11 Tender documentation, including drawings, Bill of Quantities, Deliverables, Advertisements, Attendance Registers of Specification, Evaluation and Adjudication Meetings, Minutes and Attendance of Site briefing meetings
- 12 Appointment letters of the contractor and nominated sub-contractors, as well as securities and indemnities of these contractors
- 13 Signed contract documents
- 14 Site handover certificate and site handover minutes
- 15 List of all role players with contact details
- 16 Approved programme
- 17 A site progress report from the Contractor
- 18 Monthly labour statistics, including the prescribed report, id copies, contracts, payment records, attendance records and photos of labourers' faces showing pupils clearly
- 19 Signed minutes and attendance registers of all site and technical meetings
- 20 Health and Safety Plan
- 21 Monthly Health and Safety reports

DOCUMENT REQUIREMENTS

22	List of sub-contractors with contact details
23	All approved Extensions of time and variation orders
24	Payment certificates, including a summary as prepared by the QS
25	All site instructions
26	Works Completion Report
27	Practical completion Certificate, snag list, Works completion certificate
28	All documentation relating to the project, including maintenance manuals, COC, and instruction manuals
29	As built drawings
30	Hand Over Report
31	NEIMS report
32	Final payment Certificate and QS summary
33	Final Completion Certificate
34	Close-out report

STAGE APPROVALS

THE FOLLOWING STAGE APPROVALS MUST BE DONE BY THE DEPARTMENT IN LINE WITH FIDPM

CONTROL 4: IPIP

STAGE 1: PRE-FEASIBILITY

STAGE 2: FEASIBILITY

STAGE 3: DESIGN DEVELOPMENT

STAGE 4: DESIGN DOCUMENTATION

ALL VARIATIONS REGARDING TIME AND COST

WORKS COMPLETION REPORT

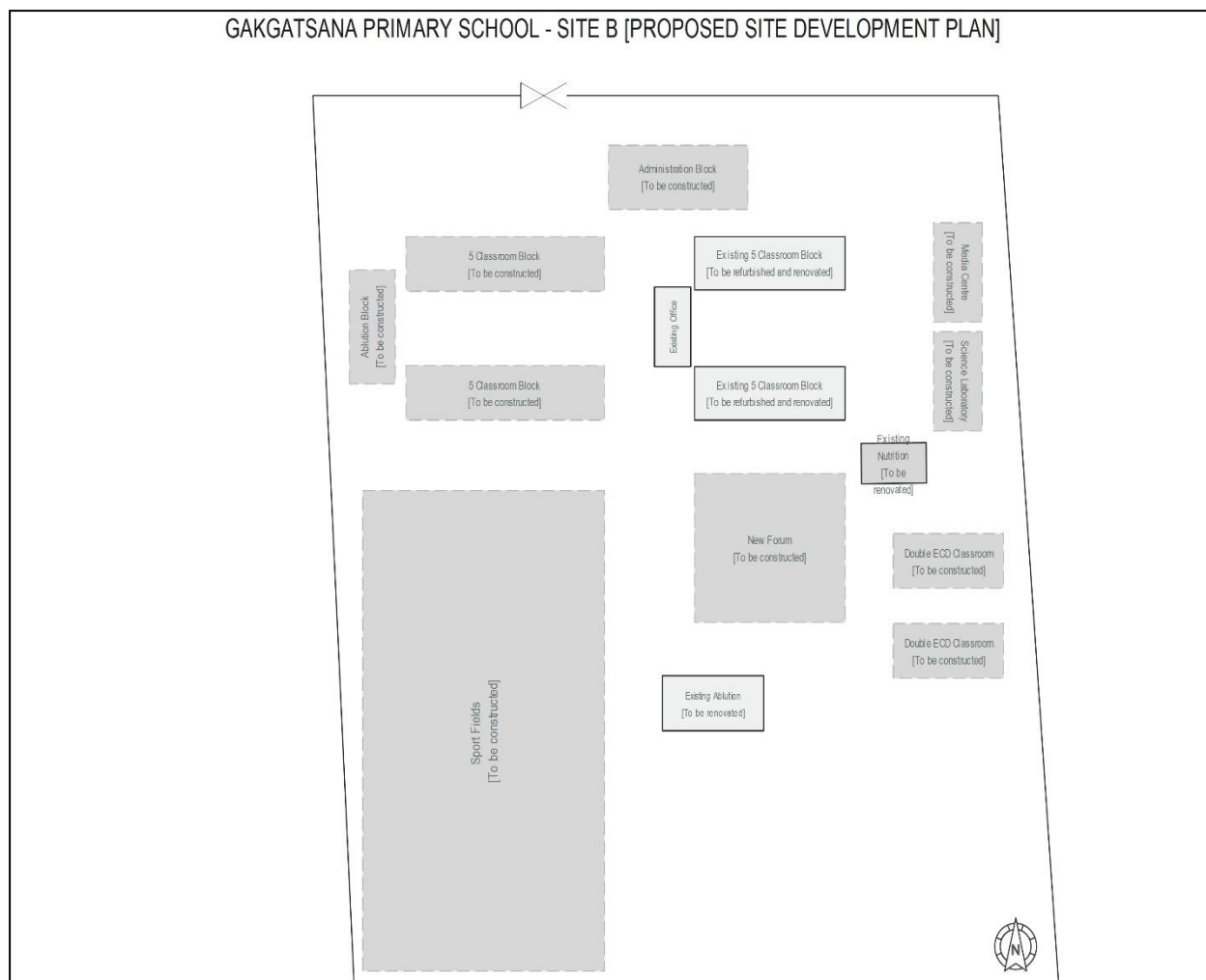
HANDOVER REPORT

CLOSE OUT REPORT

FEE STRUCTURE

THE FOLLOWING FEE STRUCTURE APPLIES FOR THE IMPLEMENTATION OF THIS PROJECT

% CLAIM	STAGE		SACAP STAGE		%
5%	1	Pre-feasibility	1	Inception	2%
10%	2	Feasibility	2	Concept	15%
10%	3	Design Development	3	Design Development	20%
10%	4	Design Documentation and Procurement	4.1	Documentation and	10%



Gakgatsana Primary School - Site B [Proposed Site Development Plan]

(Source: Author's creation, 2022)

ANNEXURE C: CERTIFICATE OF EDITING



EDITING SERVICES

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✉️ carmen@ufs.ac.za

CERTIFICATE OF EDITING

This letter certifies that I have edited the thesis detailed below for both language and technical faults.

Title:

OPTIMISING THE PLANNING OF EDUCATIONAL FACILITIES: REFLECTING ON THE INTEGRATION OF ASSET BASE ASSESSMENT AND LAND USE PLANNING

Author:

J.J. Britz

Student no. 21152632

Regards

A handwritten signature in blue ink, appearing to read 'Carmen Nel'.

Carmen Nel

30 October 2022

LAST UPDATED: 05 FEBRUARY 2023