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Equity in the Allocation of Educational Resources in Rural School Zones: A Study of Sonja Zone, Lusangazi District

Kondwani Sakala[1], Dr Phiri John[2]
[1]Student, [2]Guide
Dmi-St. Eugene University Chipata Branch
Zambia

Abstract- This study examined how educational resources were allocated across primary and secondary schools in Sonja Zone, Lusangazi District, with a focus on equity. Using a convergent parallel mixed methods design, I combined quantitative school audits and questionnaires with semi structured interviews and classroom observations to capture both the measurable distribution of inputs and the lived experiences of headteachers, teachers, students, and district officers. The approach allowed a clear mapping of teacher qualifications, pupil–teacher ratios, and availability of learning materials against geographic and socioeconomic markers. Findings showed persistent and uneven resource distribution: rural schools in more remote and socioeconomically disadvantaged parts of Sonja Zone had fewer certified teachers, higher pupil–teacher ratios, and noticeably lower textbook and learning aid availability. Qualitative narratives linked these patterns to policy design flaws, logistical constraints, and limited community capacity to supplement official allocations; teachers described frequent improvisation and heightened workloads, while students reported sharing materials and reduced opportunities for independent study. Statistical analyses confirmed significant associations between resource shortfalls and indicators of lower teacher self-efficacy and weaker student readiness measures. Based on these integrated insights, the study proposed practical, context sensitive strategies to improve fairness, including revisions to funding formulas to account for remoteness and need, targeted deployment and incentive packages for rural teachers, and community linked monitoring mechanisms to track resource flows. The recommendations emphasized feasible, locally led actions that district authorities and partner organisations could adopt to narrow gaps and strengthen learning environments across Sonja Zone.

Keywords- Resource equity; rural education; pupil–teacher ratio; teacher qualifications; learning materials; Lusangazi District; Sonja Zone.

I. Introduction

This study examined equity in the allocation of educational resources across primary and secondary schools in Sonja Zone, Lusangazi District. It focused on three core inputs—teacher qualifications, pupil–teacher ratios, and availability of learning materials—and interrogated how distributional patterns varied by geography and socioeconomic context. Drawing on a convergent parallel mixed methods design, the research combined quantitative audits of school inventories and staffing records with qualitative interviews and classroom observations to generate a comprehensive account of allocation processes and their effects on teaching and learning.

The inquiry was motivated by persistent concerns that formal funding formulas and deployment policies did not sufficiently account for rural remoteness or community vulnerability, producing systematic disadvantages for certain schools. The study therefore sought not only to document disparities but also to explain the mechanisms that produced them and to identify practical strategies for redressing inequity. Empirical analyses quantified the magnitude and spatial patterning of resource shortfalls, while stakeholder narratives illuminated institutional constraints, logistical barriers, and local coping strategies. By integrating these strands, the research provided evidence based recommendations intended to inform district planning and national policy refinement.

This chapter outlined the study's background, clarified the problem statement, and articulated specific objectives and research questions. It also described the defining characteristics of the phenomena under investigation and mapped the principal factors associated with inequitable allocation. The chapter concluded by situating the study within broader debates on rural education equity, highlighting its contribution to localized, policy relevant knowledge that district authorities and education partners could act upon.

Background of the study

Equitable allocation of educational resources has been a central concern of international and national education agendas because it directly shaped learning opportunities and long term social mobility (UNESCO, 2021). Global reviews found that formulaic funding approaches, while administratively efficient, frequently failed to internalize contextual differentials such as remoteness, poverty, and infrastructure deficits; the result was an urban bias in resource flows that disadvantaged rural schools (World Bank, 2020). In sub Saharan Africa, multi country analyses reported persistent shortfalls in textbooks, qualified teachers, and basic classroom infrastructure in rural localities, with measurable consequences for attainment and progression (Bashir et al., 2018).

Within Zambia, national statistics and sector reports documented chronic staffing gaps and uneven distribution of learning materials across districts; rural provinces repeatedly recorded higher pupil–teacher ratios and lower shares of certified teachers compared with urban centres (Ministry of Education Zambia, 2022). Policy reviews of Zambia's allocation instruments highlighted weaknesses in hardship allowance implementation and limited mechanisms for adjusting capitation grants to account for remoteness (Dube, 2020). Local studies further showed that headteachers and communities routinely supplemented official allocations through fundraising and resource sharing, reflecting adaptive responses to system level inadequacies (Mwale, 2021; Sampa, 2013).

Sonja Zone, situated within Lusangazi District, exemplified these dynamics during preliminary field visits: schools in more isolated sub zones reported acute shortages of textbooks, overcrowded classrooms, and difficulty retaining qualified staff. These

localized manifestations warranted focused inquiry to generate actionable evidence that would inform both district level interventions and national policy recalibration.

Problem statement

Despite formal commitments to equitable schooling, Sonja Zone's primary and secondary schools exhibited persistent and systematic disparities in critical educational inputs. Preliminary audits and stakeholder accounts indicated that remote and socioeconomically disadvantaged schools received fewer certified teachers, experienced substantially higher pupil–teacher ratios, and lacked adequate textbooks and instructional aids. These conditions appeared to undermine instructional quality, reduce teacher morale, and constrain student engagement and achievement.

The problem was not merely one of unequal counts but of distributional processes that entrenched disadvantage. Existing funding formulas and deployment procedures were applied uniformly across heterogeneous contexts, producing inequitable outcomes by failing to compensate for higher operational costs and logistical complexities associated with remoteness. District level governance arrangements also showed gaps in transparency and community participation, which limited local advocacy and accountability for resource flows. Consequently, schools in Sonja Zone relied on ad hoc community contributions and teacher improvisation to sustain basic teaching functions, perpetuating variability in learning environments.

This study therefore addressed three interrelated issues: first, the extent and patterning of resource inequities across Sonja Zone; second, the institutional, geographic, and socioeconomic mechanisms that explained those patterns; and third, the implications of resource distribution for teacher performance and student readiness. By diagnosing causal pathways rather than only describing disparities, the research aimed to produce recommendations that were both evidence based and operationally feasible for district planners and education partners.

Purpose of the Study

The purpose of this study was to critically examine equity in the allocation of educational resources among primary and secondary schools in Sonja Zone, Lusangazi District. The inquiry sought to determine whether existing distribution mechanisms adequately addressed the contextual challenges of rural schools, particularly those located in remote and socioeconomically disadvantaged areas. By focusing on three core inputs—teacher qualifications, pupil–teacher ratios, and the availability of learning materials—the study aimed to generate evidence on the extent of disparities and their implications for teaching and learning.

Beyond documenting inequities, the study was designed to uncover the institutional, geographic, and socioeconomic factors that shaped resource allocation patterns. This diagnostic approach enabled the identification of systemic gaps in policy design, logistical delivery, and community participation that perpetuated uneven access to educational inputs. In doing so, the research provided a deeper understanding of how

allocation processes influenced teacher performance, student readiness, and overall learning outcomes.

The ultimate purpose was to contribute actionable, context sensitive recommendations that could inform district level planning and national policy refinement. By integrating quantitative audits with qualitative narratives, the study sought to bridge the gap between statistical evidence and lived experiences, thereby offering practical strategies for improving fairness in resource distribution. In this way, the research aimed not only to advance academic knowledge on rural education equity but also to support decision makers, practitioners, and communities in creating more inclusive and effective learning environments across Sonja Zone.

Research Objectives

General objective

To examine equity in the allocation of educational resources among primary and secondary schools in Sonja Zone, Lusangazi District.

Specific objectives

1. To document existing practices of resource distribution among primary and secondary schools in Sonja Zone.
2. To analyse disparities in teacher qualifications, pupil–teacher ratios, and availability of learning materials.
3. To explore policy, geographic, and socioeconomic factors contributing to inequitable allocation.

Research questions

1. What were the prevailing practices of resource distribution among primary and secondary schools in Sonja Zone?
2. To what extent did disparities exist in teacher qualifications, pupil–teacher ratios, and availability of learning materials?
3. Which policy, geographic, or socioeconomic factors contributed to inequitable resource allocation?

Significance of the Study

This study is significant because it addresses a critical gap in understanding how educational resources are distributed in rural school zones, with a particular focus on Sonja Zone in Lusangazi District. While national and global reports have documented broad disparities between urban and rural schools, few localized studies have provided detailed evidence that can directly inform district level planning and community action. By generating context specific insights, this research contributes to both academic knowledge and practical policy development.

From an academic perspective, the study enriches the literature on equity in education by combining quantitative audits with qualitative narratives. The mixed methods approach not only documents disparities in teacher qualifications, pupil–teacher ratios, and learning materials but also explains the mechanisms that produce them.

This dual contribution strengthens theoretical debates on distributive justice and resource equity in education, while offering a model for similar studies in other rural contexts.

From a policy perspective, the findings provide actionable evidence for district authorities, the Ministry of Education, and partner organizations. By identifying weaknesses in funding formulas, logistical delivery systems, and incentive structures for rural teachers, the study highlights areas where reforms can be targeted to achieve greater fairness. Recommendations such as remoteness adjusted allocation formulas, improved monitoring mechanisms, and strengthened community participation offer practical pathways for policy refinement.

From a practical perspective, the study benefits schools, teachers, and communities in Sonja Zone by documenting the lived realities of resource shortages and their impact on teaching and learning. The evidence empowers local stakeholders—such as Parent–Teacher Associations and head teachers—to advocate more effectively for equitable resource distribution. It also provides strategies that communities can adopt to supplement official allocations and strengthen accountability.

Finally, the study holds social significance by linking resource equity to broader goals of educational quality, student achievement, and long term social mobility. Ensuring fair access to qualified teachers and adequate learning materials is essential for reducing rural–urban attainment gaps and promoting inclusive development. By situating local findings within global debates on Sustainable Development Goal 4 (quality education), the research underscores the importance of equity as both a national priority and an international commitment.

Characteristics of the phenomena

The phenomena of interest—resource allocation and equity—appeared multifaceted and contextually embedded. First, allocation was both formal and informal: formal mechanisms comprised centrally determined capitation grants, staffing deployment procedures, and policy provisions for hardship allowances, while informal mechanisms included community fundraising, in kind support, and teacher improvisation to mitigate shortages. Second, equity manifested as both distributive equality (equal per school inputs) and equity of need (inputs adjusted for contextual disadvantage); the study therefore treated equity as a normative, relational concept rather than a simple numerical parity.

Third, the phenomena were spatially patterned. Geographic remoteness, poor road connectivity, and seasonal accessibility influenced the timing and reliability of material deliveries and staff postings, generating intra zone variation that standard metrics obscured. Fourth, the phenomena had temporal dimensions: allocation patterns reflected cumulative policy legacies, episodic budget cycles, and short term shocks (for example, exam driven material provision or weather related transport disruptions) that created fluctuating resource availability. Finally, the phenomena were interactive: resource shortfalls in one dimension (for instance, textbooks)

amplified deficits in another (teacher morale and retention), producing reinforcing loops that impeded pedagogical improvement and student progress.

Factors related to the phenomena

Multiple, interlinked factors explained the inequitable allocation patterns observed in Sonja Zone. At the policy level, centralised funding formulas and staffing rules prioritized administrative simplicity over contextual sensitivity; capitation grants that were uniform per school did not reflect school size, remoteness, or poverty incidence, thereby producing relative under resourcing for small, remote schools (Dube, 2020). Implementation gaps further emerged where hardship allowances and rural incentives were underfunded or administratively opaque, weakening the intended corrective effects of policy instruments.

Administrative and governance factors at district level were also salient. District planning capacities varied, record keeping was uneven, and monitoring systems for resource flows were limited, which reduced transparency and impeded timely corrective action. Weak mechanisms for community participation in budgeting and resource monitoring constrained local advocacy and reduced accountability for equitable disbursement. Political economy dynamics—such as preferential attention to schools with stronger social connections to decision makers—exacerbated allocation distortions (Ngulube, 2017).

Logistical and infrastructural constraints shaped material availability. Poor road networks and the high cost of transporting bulky items like textbooks increased delivery times and loss risk, particularly during rainy seasons; storage capacity at the school level was often inadequate, exposing materials to damage and theft (Mubanga, 2013). Digital interventions intended to mitigate textbook shortages were limited by unreliable electricity and insufficient network coverage in many parts of Sonja Zone (Mumba, 2018).

Human resource dynamics were central to observed disparities. Recruitment and transfer systems tended to favour urban or semi urban postings, while rural hardship allowances were insufficient to attract experienced certified teachers; consequently, remote schools depended on less qualified or temporary staff, raising pupil–teacher ratios and reducing instructional continuity (Chansa & Ngoma, 2019). Teacher professional development and induction programmes were inconsistently delivered in rural locations, constraining pedagogical quality even where physical materials existed.

Socioeconomic and community factors interacted with system constraints. Poorer communities had reduced capacity to make supplemental contributions, which widened inter school differences because wealthier villages could mobilise additional funds for furniture, materials, or maintenance (Jones & Kanyama, 2014). Local social capital influenced the effectiveness of community led initiatives: strong parent teacher associations improved resource mobilisation and oversight, while weaker community structures limited such responses (Mwale, 2021).

Finally, demand side factors affected perceived adequacy and utilisation. High pupil loads diminished per pupil access to materials and reduced opportunities for individualised instruction, while cultural expectations and language barriers shaped both curricular relevance and material uptake. Taken together, these factors formed a complex causal web that the study unpacked through triangulated quantitative measures and qualitative narratives to produce context sensitive recommendations.

Global Statistical Scenario

Global education statistics consistently signalled unequal access to quality inputs between urban and rural settings and underscored the magnitude of resource shortfalls affecting learning outcomes. International monitoring under the Sustainable Development Goals showed that, while enrolment rates had expanded markedly in many low and middle income countries, learning attainment lagged where essential inputs were scarce; global assessments estimated that a substantial share of children in low income countries were failing to achieve basic literacy and numeracy despite increased school participation (World Bank, 2020). Cross national analyses reported that pupil–teacher ratios in rural areas frequently exceeded recommended thresholds: multi country data compiled under SDG indicators revealed average rural primary PTRs in low income contexts that were often double the UNESCO guideline of 25:1, with correspondingly lower per pupil availability of textbooks and learning materials (UNICEF, 2022; UNESCO, 2021).

Large scale comparative studies quantified distributional inequality using measures such as the Gini coefficient and found that within country disparities in education resources were as large as between country differences for some input categories (Bashir et al., 2018). Textbook provision surveys across sub Saharan Africa, for example, documented that many rural schools received only a fraction of the per pupil learning materials available in urban counterparts, with textbook to pupil ratios frequently below 1:3 in disadvantaged districts (Bashir et al., 2018; USAID, 2019). Data from teacher workforce studies indicated persistent certification and experience gaps: rural postings attracted fewer fully certified teachers and showed higher reliance on temporary or contract staff, leading to elevated PTRs and reduced instructional continuity (Chansa & Ngoma, 2019).

Global evidence also connected resource inequalities to measurable learning deficits. Meta analyses and multi country evaluations associated textbook shortages and high PTRs with lower test scores and reduced progression rates; one synthesis estimated that reduced textbook access correlated with measurable declines in reading outcomes equivalent to several months of learning (UNICEF, 2019). Economic analyses emphasized the efficiency costs of inequitable allocation, showing that unequal inputs produced larger social returns when reallocated to underserved rural schools, thereby arguing for need sensitive financing models rather than uniform per school allocations (World Bank, 2021).

Finally, international policy reviews documented efforts to redress rural disadvantage through targeted interventions—rural hardship allowances, remoteness weightings in

funding formulas, and conditional grants for infrastructure—but evaluative studies reported mixed implementation success largely because of weak targeting, administrative bottlenecks, and insufficient budgetary commitment (Dube, 2020; Ngulube, 2017). Overall, the global statistical scenario painted a consistent picture: expansion of access had been achieved in many settings, but achieving equitable quality required deliberate, context sensitive resource strategies backed by reliable data, stronger governance, and adequate financing (UNESCO, 2021; World Bank, 2020).

Local Statistical Scenario

National and district statistics in Zambia mirrored the global pattern of rural urban resource divergence, with rural provinces exhibiting higher pupil–teacher ratios and lower shares of certified teachers. The Ministry of Education's 2021 statistical bulletin reported that rural districts consistently recorded PTRs substantially above the national average and that teacher distribution favoured urban centres, leaving peripheral schools under staffed (Ministry of Education Zambia, 2022). Sector studies in Zambia corroborated these patterns: rural schools often had limited textbook supplies and weaker infrastructure, contributing to pronounced attainment gaps between urban and rural learners (Sampa, 2013; Mulenga & Banda, 2021).

Within Lusangazi District, administrative records and preliminary field checks revealed intra district variation: some schools in Sonja Zone had PTRs markedly higher than neighbouring zones and reported lower proportions of professional certification among staff. Local qualitative accounts documented frequent delays in capitation grant disbursement and uneven delivery schedules for textbooks and materials, especially during rainy seasons when transport challenges intensified (Mubanga, 2013). Community fundraising and in kind contributions partially mitigated shortages in better resourced villages, but poorer communities lacked this buffer, deepening disparities (Mwale, 2021). Together, the local statistics and administrative observations established a compelling case for a focused, zone level study to quantify and explain these patterns.

Scope of the Study

This study confined its empirical inquiry to government primary and secondary schools located within Sonja Zone of Lusangazi District during the 2024 academic year. It concentrated on three categories of inputs—teacher qualifications, pupil–teacher ratios, and availability of learning materials—selected for their direct influence on instructional quality and because they were recurrently cited in preliminary field interactions as the most pressing deficits. The study deliberately excluded private and mission schools outside Sonja Zone to maintain analytical focus on government provision and to avoid heterogeneity introduced by non state funding sources.

Geographically, the research covered the full spatial extent of Sonja Zone but sampled schools purposively to ensure variation by remoteness (north vs. south sub zones) and performance band (high vs. low on recent national examinations). Temporally, data

collection reflected resource conditions during the 2024 academic calendar, recognising that allocation patterns were influenced by both annual budget cycles and episodic shocks; historical records were used descriptively where needed to contextualise findings. Methodologically, the study adopted a convergent parallel mixed methods design: quantitative audits and structured questionnaires provided measurable indicators of resource distribution while qualitative interviews and classroom observations elucidated mechanisms, perceptions, and practice.

The study did not attempt exhaustive causal attribution for long term educational outcomes such as lifetime earnings or system wide reform effects; instead it focused on proximal impacts—teacher performance indicators and student readiness measures—that were plausibly linked to resource conditions within the zone. Ethical approvals, parental consents for minors, and data protection procedures constrained participant selection and reporting, ensuring confidentiality and the protection of vulnerable respondents. Within these boundaries, the study aimed to produce actionable, context sensitive recommendations for district and national actors.

Usefulness of the study in the present scenario

The study produced evidence that was timely and directly relevant to district planners, school leaders, and policy actors seeking to close persistent rural urban gaps in educational quality. By offering a detailed zone level mapping of teacher qualifications, pupil–teacher ratios, and material endowments, the research supplied empirical inputs that district officials could use to refine resource allocation models and to prioritise remedial actions where needs were most acute. The mixed methods design enhanced practical utility: quantitative disparity indices permitted objective ranking of shortages across schools, while qualitative narratives illuminated administrative bottlenecks and local coping strategies that numeric indicators alone could not reveal. This combination enabled recommendations that were both data driven and operationally grounded.

For district education authorities, the study generated targeted evidence to inform revisions to capitation disbursement schedules, the design of hardship sensitive incentives for rural postings, and the prioritisation of textbook procurement and distribution. For school management committees and parent teacher associations, the findings offered a basis for structured community engagement and transparent tracking of resource flows, strengthening local accountability mechanisms. Donors and development partners received concrete diagnoses of the logistical and governance constraints that limited the effectiveness of past interventions, guiding future investments toward interventions with higher likelihood of sustained impact.

At the policy level, the zone specific insights contributed to broader debates about need sensitive funding formulas and the operationalisation of rural allowances, demonstrating where uniform approaches produced inequitable outcomes and where modest budgetary re weighting would yield substantial improvements in per pupil access. Academically, the study filled a documented gap in localized, mixed methods research that connected input disparities to teacher practice and proximal student

outcomes within Zambian rural contexts. Finally, by framing recommendations in feasible, district level terms, the research increased the likelihood that evidence would translate into practice, thereby advancing equity objectives in a manner attuned to administrative realities and community capacities.

Operational Definitions

- **Resource allocation:** The processes and mechanisms through which financial, human, and material education inputs were distributed to schools, including formal budget disbursements, staffing deployments, and informal community contributions (World Bank, 2021).
- **Equity:** Fairness in resource distribution that accounted for differing school needs and contexts rather than uniform per school equality (UNESCO, 2021).
- **Teacher qualifications:** The formal professional credentials and training status of teaching staff, classified here as certified (holding Ministry recognised teacher certification) or non certified (contract, substitute, or uncredentialed instructors) (Chansa & Ngoma, 2019).
- **Pupil–teacher ratio (PTR):** The number of enrolled students per teaching staff member at the school level, used as an index of instructional capacity (UNICEF, 2022).
- **Learning materials:** Tangible instructional resources such as textbooks, workbooks, visual aids, science equipment, and digital devices available for curriculum delivery (USAID, 2019).
- **Remoteness:** A composite descriptor of a school's geographic isolation, operationalised by road quality, travel time to the district centre, and seasonal accessibility.
- **Teacher performance:** Proximal indicators including self-reported instructional efficacy, lesson preparation frequency, and observed pedagogical practices during classroom observation.

Chapterization

The thesis was organised into five chapters and supporting appendices. Chapter One introduced the study, articulated its rationale and problem statement, stated the objectives and research questions, defined key concepts, and set the scope and methodological boundaries. Chapter Two reviewed national and international literature on resource allocation, teacher distribution, pupil–teacher ratios, and learning materials, identified theoretical frameworks, and highlighted empirical gaps that the study addressed. Chapter Three detailed the convergent parallel mixed methods design, sampling strategy, data collection instruments, field procedures, analytic techniques, and ethical safeguards employed during the research. Chapter Four presented the empirical findings: quantitative results from audits and questionnaires, thematic analyses from interviews and observations, and integrative joint displays that linked measurable disparities to stakeholder narratives. Chapter Five discussed the findings in relation to the literature, drew conclusions, offered evidence based policy and practice recommendations appropriate to district and national actors, acknowledged limitations, and suggested avenues for further research;

the appendices provided instruments, consent forms, supplementary tables, and other documentation that supported the study's transparency and replicability.

Chapter summary

This chapter situated the research within international and national concerns about equitable resource distribution and justified a focused investigation of Sonja Zone in Lusangazi District. It outlined the study's purpose and posed research questions that emphasised both description and causal explanation of disparities in teacher qualifications, pupil–teacher ratios, and learning materials. The global and local statistical scenarios established the empirical urgency of the problem: international trends showed widespread rural deficits in inputs and associated learning losses, while Zambian statistics and district records confirmed analogous patterns at national and zone levels. The scope and methodological boundaries of the study were clarified, highlighting a zone level, mixed methods approach that prioritised actionable evidence.

II. Literature Review

Overview

This chapter reviewed scholarship and policy literature that related to equity in educational resource allocation, with particular attention to teacher qualifications, pupil–teacher ratios (PTRs), and the availability of learning materials in rural contexts. The review aimed to situate the Sonja Zone study within three interlocking literatures: (1) global and comparative analyses of resource distribution and its links to learning outcomes, (2) national and sub national investigations of Zambia and neighbouring contexts that illustrated implementation realities, and (3) policy and governance studies that examined allocation instruments, accountability mechanisms, and community participation. By integrating empirical studies, methodological critiques, and policy analyses, the chapter clarified persistent knowledge gaps and justified the mixed methods case study approach adopted for Sonja Zone.

The chapter proceeded in four parts. First, it synthesised global evidence on the magnitude and consequences of resource inequalities, emphasising statistical patterns and causal inferences from multi country studies. Second, it reviewed regionally and nationally focused empirical work that described teacher distribution, PTR dynamics, and material shortages in sub Saharan Africa and Zambia specifically. Third, it examined governance and policy literature that interrogated funding formulas, rural incentives, and monitoring systems, identifying common implementation weaknesses. Fourth, it identified methodological strengths and limitations across the reviewed studies and distanced the present study from prior work by highlighting its zone level focus and convergent parallel mixed methods design.

Across the review, three cross cutting themes emerged. The first theme concerned measurement and scale: prior studies often relied on national or district aggregates that masked intra district heterogeneity, implying a need for granular, zone level data (Bashir et al., 2018; Omoeva et al., 2019). The second theme related to causal

pathways: empirical associations between inputs (textbooks, PTRs, teacher certification) and outcomes were well documented, yet explanations of the institutional and logistical mechanisms that produced input gaps were less consistently developed (World Bank, 2020; UNICEF, 2019). The third theme focused on policy implementation gaps: while many countries had policy instruments to mitigate rural disadvantage—hardship allowances, remoteness weightings, conditional grants—evidence pointed to weak targeting, administrative opacity, and fiscal constraints that reduced their effectiveness (Dube, 2020; Ngulube, 2017). These themes guided the empirical choices of the present study: assembling detailed audit data to capture intra zone variation and combining quantitative measures with stakeholder narratives to unpack mechanisms and governance dynamics.

Methodologically, the chapter highlighted common trade offs in the literature. Large scale surveys offered statistical power and cross country comparability but struggled to capture local governance nuances; ethnographic and qualitative studies provided rich process insights but had limited generalisability (Bashir et al., 2018; Chikumbutso, 2016). The convergent mixed methods design of the Sonja Zone study responded to this trade off by coupling systematic audits and equity indices with semi structured interviews and classroom observations, thereby enabling both measurement and explanation. The subsequent empirical review elaborated these themes by critically analysing key studies, their findings, and their methodological implications for researching resource equity in rural zones.

Empirical Literature Review

Empirical research on educational resource allocation in rural settings had proliferated over the last decade, producing robust evidence on the scale of inequities and their association with pedagogical outcomes, while also revealing limitations in causal attribution and policy translation. This section critically analysed representative studies, organised thematically around the three focal inputs of this study—teacher qualifications, PTRs, and learning materials—before considering integrative and methodological contributions.

Teacher qualifications and deployment were central concerns in numerous empirical investigations. Multi country workforce studies documented systematic urban–rural disparities in teacher certification and experience, attributing gaps to weak incentive structures and constrained professional support in remote postings (Chansa & Ngoma, 2019; Kapinga, 2018). Chansa and Ngoma (2019) used nationally representative personnel data to show that rural Zambian schools had lower shares of certified teachers; their statistical models controlled for school size and subject mix but were limited by the cross sectional nature of administrative records, constraining causal inference about the effects of certification on learning outcomes. Qualitative studies complemented those findings by explaining how inadequate induction and professional development in remote areas undermined pedagogical quality, a mechanism observed in Sonja Zone preliminary accounts and in similar contexts (Sichinga, 2015; Mwale, 2021). Collectively, this body of work demonstrated a consistent pattern: teacher credentialing mattered for instructional effectiveness, yet

deployment systems and incentive design often failed to achieve equitable distribution.

Pupil–teacher ratios were frequently employed as a measurable proxy for instructional capacity. Large scale analyses under SDG monitoring frameworks showed that rural PTRs in low income settings regularly exceeded recommended norms, with adverse implications for individualised instruction and assessment practices (UNICEF, 2022; Omoeva et al., 2019). Mulenga and Banda (2021) provided a Zambian district level analysis linking higher PTRs to lower pass rates in primary exit examinations; their use of longitudinal exam data strengthened causal claims but still left room for omitted variable bias related to material availability and teacher quality. Ethnographic accounts reinforced these findings by documenting how overcrowded classrooms constrained formative assessment and differentiated instruction, thereby reducing learning gains for weaker students (Chikumbutso, 2016).

Access to learning materials—textbooks, visual aids, laboratory equipment—had been empirically associated with measurable learning improvements in both experimental and observational studies. UNICEF's synthesis reviews reported that textbook provision produced substantive reading and numeracy gains when accompanied by teacher guidance and pedagogical support (UNICEF, 2019). USAID (2019) evaluations in Zambia found that textbook distribution campaigns led to short term score improvements, but sustainability depended on supply chain reliability and local storage capacity. Empirical weaknesses surfaced when studies treated textbook counts as static inputs without tracing delivery timings, usage patterns, or material condition—factors that fieldwork in Lusangazi suggested were critical for understanding effective access (Sampa, 2013; Mubanga, 2013).

Several integrative studies sought to quantify inequity using distributive indices and regression decomposition techniques. Bashir et al. (2018) applied Gini and Theil measures to within country resource distributions, revealing substantial intra national inequality that standard averages obscured. Omoeva et al. (2019) proposed output oriented approaches that connected resource inputs to learning outcomes while attempting to account for community and household covariates. These quantitative techniques advanced measurement precision but relied on data sources that sometimes lacked sub district granularity, reinforcing the value of zone level audits and mixed methods for explanatory depth.

Policy and governance evaluations constituted another empirical strand. Studies of funding formulas and hardship allowance implementation showed persistent implementation gaps: Dube (2020) analysed Zambia's allocation instruments and reported that while policy frameworks nominally recognised rural hardship, weak targeting, delayed disbursements, and limited transparency blunted intended effects. Ngulube (2017) found that district level governance weaknesses—poor record keeping and limited community participation—facilitated unequal resource flows and eroded accountability. These governance studies underscored that equitable inputs

required not only formulaic adjustments but also improved administrative capacity and participatory oversight.

Methodologically, the literature exhibited strengths in combining administrative data with household and school surveys; however, many studies were limited by cross sectional designs, inconsistent measures across contexts, and insufficient attention to temporal dynamics of supply chains and teacher deployment. Qualitative work provided causal texture but often lacked complementing quantitative measures. The Sonja Zone study addressed these gaps by implementing contemporaneous audits, structured questionnaires, classroom observations, and interviews to capture both the distributional extent of inequities and the mechanisms that produced them, thereby contributing a finely grained empirical account suitable for policy translation.

Theoretical Review

This study rested on an integrative theoretical foundation that combined normative, economic, organisational, and systems perspectives to explain why educational inputs were distributed unevenly across rural school zones and how those distributions influenced teaching and learning. Four core theoretical strands were central: Rawlsian distributive justice, Sen's capability approach, human capital theory, and organisational resource dependence and governance theories. Each offered complementary explanatory leverage: Rawls and Sen supplied normative criteria for fairness; human capital tied inputs to individual and social returns; and resource dependence and governance perspectives explained institutional mechanisms and constraints that shaped allocation processes.

Rawls's theory of justice as fairness provided a principled basis for conceiving equitable allocation as more than equal shares; it implied that distribution should compensate disadvantage to maximise the position of the least advantaged (Rawls, 1971). Rawlsian reasoning justified the study's focus on need sensitive weighting (for remoteness and poverty) rather than uniform per school grants. The theory's strength lay in its clear normative prescription for prioritising the worst off, which aligned with policy debates on remoteness weightings and hardship allowances. Its limitation for empirical research was that Rawls supplied little guidance on operational mechanisms or measurement, requiring translation into measurable indicators (for example, indices of remoteness or poverty) to inform allocation formulas.

Sen's capability approach complemented Rawls by shifting attention from resource counts to what individuals could actually do and be with available resources (Sen, 1999). The capability lens emphasised that identical sets of inputs could yield different educational functionings depending on context—poor classroom conditions, language barriers, or teacher skill could constrain the conversion of textbooks into learning. This perspective strengthened the study's mixed methods orientation: audits of material endowments needed to be read together with qualitative accounts of usability and pedagogical integration. A limitation of capability theory was its broad normative scope, which complicated operationalisation; selecting which capabilities to measure and how to weight them posed empirical challenges.

Human capital theory linked resource inputs directly to expected returns in learning and future productivity (Becker, 1964). In educational terms, investments in qualified teachers, instructional materials, and lower PTRs were expected to raise cognitive skills and future earnings. This theoretical strand provided a clear causal logic that justified measuring associations between inputs and proximal student readiness indicators. Its strength was in offering testable hypotheses about input–output relations and informing cost effectiveness arguments for targeted reallocation. However, human capital models could underplay institutional and distributional processes that shaped who received investments; they also risked treating education purely as an economic good rather than as a public good with equity implications.

Organisational and governance theories explained how allocation outcomes emerged from institutional processes. Resource dependence theory emphasised how organisations (district education offices, schools) sought resources and negotiated power with central authorities and non state actors, shaping flows and priorities (Pfeffer & Salancik, 1978). Political economy and public administration perspectives highlighted path dependencies, patronage, and administrative capacity as determinants of whether policy instruments—capitation grants, hardship allowances—were implemented equitably (Bardhan, 1984; Ngulube, 2017). These approaches were strong in illuminating mechanisms—delays in disbursement, opaque criteria, or local political favouritism—that quantitative distribution measures alone could not reveal. Their limitation was that they sometimes provided broad institutional explanations without precise predictive power at micro (school) level, necessitating mixed methods inquiry to link governance processes to observable resource gaps.

Systems theory and complexity thinking informed a final integrative insight: educational resource allocation operated as a socio technical system with feedback loops, temporal dynamics, and interactions among actors, policies, and infrastructure (von Bertalanffy, 1968; Lemos & Agrawal, 2006). This perspective justified attention to reinforcing cycles (for instance, resource shortages leading to teacher attrition, which further degrades outcomes and reduces political salience) and to the temporal sequencing of budget cycles and delivery schedules. Its advantage was in capturing non linearity and emergent behaviours; its drawback was the analytical complexity and difficulty of isolating individual causal pathways without detailed longitudinal data.

In sum, the theoretical review established that equity in resource allocation required both normative justification (Rawls; Sen) and causal explanation (human capital; resource dependence; systems theory). These theories collectively guided variable selection (teacher qualifications, PTRs, learning materials), analytical expectations (associations with teacher performance and student readiness), and methodological choices (mixed methods to capture both measurable distributions and institutional mechanisms). The study drew on the normative frameworks to assess fairness, on human capital to consider expected returns, and on organisational and systems

theories to unpack implementation realities and dynamic feedbacks that reproduced inequity.

Conceptual Framework

This study's conceptual framework linked inputs, mediating institutional processes, and proximal educational outcomes within a systems perspective, providing both an analytic map for data collection and a guide for interpretation. The framework treated three primary inputs—teacher qualifications, pupil–teacher ratios (PTRs), and availability/condition of learning materials—as the independent variables whose distribution across schools reflected policy, governance, and logistical mediators. These inputs operated through two broad mediating pathways—school level instructional capacity and community support mechanisms—to influence proximal outcomes (teacher performance indicators and student readiness measures). Contextual moderators—geographic remoteness, socioeconomic status of the catchment community, and temporal factors such as budget cycles and seasonal access—shaped both input availability and the strength of mediating pathways. Feedback loops completed the system: poor outcomes eroded local political salience and may have reduced community willingness or capacity to augment resources, thereby reinforcing inequities.

Components and relationships were defined as follows. Independent variables: (1) Teacher qualifications captured the proportion of certified and experienced teaching staff in each school; (2) PTRs measured student enrolment per teaching staff and thus the human instructional resource intensity; (3) Learning materials encompassed textbook to pupil ratios, availability of lab equipment, and condition of visual aids and digital devices. Mediators: Instructional capacity aggregated observable teacher behaviours (lesson planning, use of materials, classroom management) and access to professional development; community support mechanisms included parental contributions, PTA activity, and local fundraising that supplemented official allocations. Outcomes: Teacher performance combined self efficacy scales and observed pedagogical practices; student readiness included measures of engagement, textbook access during lessons, and basic competency proxies (self reported preparedness, class test results where available). Moderators: Remoteness was operationalised by travel time to district centre and road quality; socioeconomic status used proxy indicators such as household asset indices or community poverty incidence; temporal factors considered delivery timing and seasonality.

The framework implied several testable propositions. First, higher shares of certified teachers, lower PTRs, and greater availability of learning materials were expected to associate positively with teacher performance and student readiness. Second, instructional capacity and community support were hypothesised to mediate these relationships: for example, textbooks would have stronger effects where teachers used them pedagogically and where PTAs maintained storage and distribution. Third, remoteness and poverty were expected to moderate effects, weakening the conversion of inputs into outcomes by increasing delivery costs and reducing community supplementing capacity. Fourth, feedback loops were hypothesised such that

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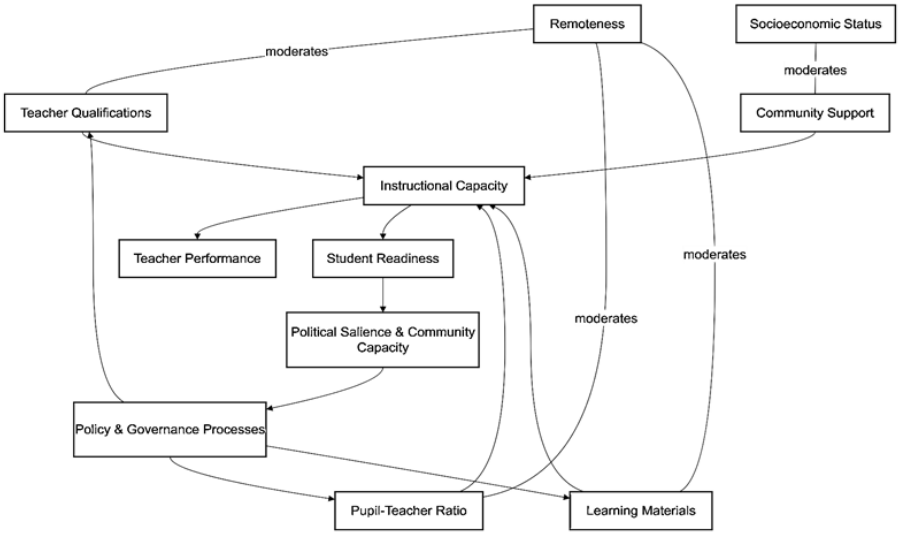
persistent poor outcomes would reduce political attention and community capacity, further constricting resource inflows.

The conceptual diagram below visualised these relationships. The diagram employed directional arrows to indicate hypothesised causal paths, double headed arrows for interactive moderation, and cyclical arrows to represent feedback loops.

Figure 2.1: Conceptual framework linking resource inputs, mediating processes, contextual moderators, and proximal educational outcomes in Sonja Zone.



Operationalisation and measurement strategies followed directly from the framework. Inputs were measured through school audits and staffing registers: proportion of certified teachers, PTRs, and textbook counts per pupil. Mediators were assessed via teacher questionnaires (professional development access, lesson planning practices), observation protocols (use of materials, classroom interactions), and PTA interviews (fundraising and monitoring activities). Moderators were captured through geospatial metrics (travel time, road class), community socio economic surveys, and administrative calendar data on disbursement timing. Outcomes used mixed measures: teacher self-efficacy scales and observed pedagogical indicators for teacher performance, and student questionnaire items and in class formative test scores as proxies for readiness.

Strengths of this conceptualization included clear linkages between policy instruments and classroom realities, explicit mediating mechanisms amenable to mixed methods measurement, and incorporation of dynamic feedback effects. Limitations included potential measurement error in self reported mediator/outcome variables, and the cross sectional nature of much school level data, which constrained strong causal claims about long term feedback loops; these limitations informed the study's careful triangulation and cautious interpretation of causality.

Research Gap

Despite a substantial body of work documenting broad patterns of resource inequality and its association with learning outcomes, the literature exhibited several complementary and interrelated gaps that constrained both empirical understanding and policy traction. First, many studies relied on aggregated national or district level data that obscured intra district heterogeneity and masked zone level dynamics. Large scale analyses produced robust cross country and cross district comparisons (Bashir et al., 2018; Omoeva et al., 2019), but they rarely unpacked how resource endowments varied within single districts or how local geographic micro conditions (for example, sub zone remoteness or road class) shaped the timing and quality of deliveries. Consequently, policymakers who needed fine grained evidence to re weight funding formulas or to prioritise remedial interventions within districts lacked the empirical resolution those decisions required (World Bank, 2020). The present study addressed this lacuna by generating school level audits and remoteness metrics for Sonja Zone, thereby producing the granular evidence that prior national aggregates had not provided.

Second, a recurring limitation was conceptual and measurement inconsistency across studies of “access” and “availability.” Many empirical pieces counted textbooks or reported PTRs as static, cross sectional indicators without attending to usability, timing, or condition (Sampa, 2013; USAID, 2019). For example, a school might report textbook ownership on inventory lists while teachers continued to improvise because texts arrived late in the term or were in poor condition. Such temporal and qualitative dimensions mattered for educational impact but were under measured in quantitative surveys. The mixed methods design of this study addressed that gap by pairing objective counts with observation protocols and interview probes that documented when materials were delivered, how they were used pedagogically, and their physical state—thereby improving construct validity for “effective access.”

Third, causal explanations commonly remained underdeveloped. Studies established correlations between inputs (teacher certification, PTRs, materials) and outcomes (test scores, progression) but often did not trace the institutional and logistical mechanisms that produced input shortfalls (Chansa & Ngoma, 2019; Mulenga & Banda, 2021). Governance analyses highlighted implementation failures at the district level (Dube, 2020; Ngulube, 2017), yet many quantitative studies lacked the process data necessary to connect, for instance, delayed capitation disbursements to downstream classroom effects such as increased teacher absenteeism or material deterioration. This study filled that explanatory gap by explicitly modelling mediating pathways—policy and governance processes, instructional capacity, and community support—using interview data, administrative timelines, and classroom observations to link distribution mechanisms to observed input outcome relationships.

Fourth, the literature under represented the interactive and feedback dynamics that sustained inequities over time. Systems perspectives and complexity thinking were invoked conceptually (von Bertalanffy, 1968; Lemos & Agrawal, 2006), but empirical work rarely operationalised feedback loops—how resource shortfalls led to teacher

attrition, which reduced instructional quality and political salience, which in turn influenced future allocations. Longitudinal or panel data capable of capturing these dynamics were uncommon in the reviewed corpus (Omoeva et al., 2019). While this study was cross sectional in primary data collection, it incorporated retrospective administrative records, stakeholder narratives, and calendar data to document plausible feedback mechanisms and to situate present distribution patterns within recent temporal trajectories.

Fifth, contextual moderators such as local socioeconomic capacity and community governance were acknowledged but not systematically measured or integrated into analytical models. Several studies observed that wealthier communities supplemented state provision through PTA fundraising, thereby deepening inter school inequality (Jones & Kanyama, 2014; Mwale, 2021), but few combined community level socioeconomic indicators with school audits and governance measures in a single analytic frame. The Sonja Zone research remedied this by collecting community proxy indicators and PTA activity measures alongside school audits, enabling more precise estimation of how local capacity moderated the conversion of inputs into instructional outcomes.

Sixth, pedagogical utilisation of materials received limited attention. UNICEF and USAID reviews suggested that textbook provision produced learning gains when paired with pedagogical support (UNICEF, 2019; USAID, 2019), but empirical studies often stopped at counting inputs without measuring teacher practices that mediated impact. This study employed classroom observation protocols and teacher self efficacy scales to assess the extent to which available materials were integrated into instruction, offering a richer account of the “black box” between inputs and learning.
Seventh, zone level policy translation remained weak. Policy evaluations identified design flaws in funding formulas and rural incentive structures (Dube, 2020), yet fewer studies translated zone level findings into operational recommendations tailored to district administrative capacities and procurement cycles. The present study explicitly aimed to bridge that translational gap by producing recommendations aligned with Lusangazi District’s administrative calendar, procurement constraints, and feasible incentive packages, increasing the likelihood that evidence would inform practice.

Finally, methodological pluralism was limited: while some studies used mixed methods, many remained siloed within disciplinary approaches—quantitative monitoring systems on one side and qualitative ethnographies on the other—reducing opportunities for triangulation that could strengthen causal claims. The Sonja Zone study therefore pursued a convergent parallel mixed methods design to synthesise distributional metrics, process narratives, and observed classroom practice, thereby addressing the empirical and methodological shortcomings identified above.

In summary, existing literature had documented the scale and significance of resource inequities but had left unanswered important questions about intra district

heterogeneity, temporal and qualitative aspects of access, causal mechanisms, feedback dynamics, community moderating effects, pedagogical utilisation, and policy translation. By focusing on school level audits, temporal delivery data, mediating governance processes, and classroom practice within Sonja Zone, this study filled these gaps and offered context sensitive evidence for operational reform.

Chapter Summary

This chapter synthesised the extant literature on equity in educational resource allocation, organised across global patterns, national and sub national evidence, governance analyses, theoretical perspectives, and empirical methodologies. The empirical review had shown consistent associations between teacher qualifications, PTRs, and learning materials on the one hand and pedagogical outcomes on the other, while highlighting methodological limitations such as reliance on aggregated data, cross sectional designs, and insufficient attention to temporal and qualitative dimensions of access. The theoretical review integrated normative and explanatory perspectives—Rawlsian distributive justice, Sen's capability approach, human capital reasoning, and organisational resource dependence and systems theories—which collectively informed the study's focus on need sensitive allocation, conversion of resources into capabilities, and institutional mechanisms that produced inequity.

The research gap analysis identified specific areas that previous studies had not adequately addressed: the need for zone level granularity, measurement of effective access (timing and condition), tracing of governance and logistical causal pathways, operationalisation of feedback loops, systematic measurement of community moderating factors, assessment of pedagogical utilisation, and translation of findings into administratively feasible recommendations. These identified gaps justified the study's convergent parallel mixed methods design, the use of school audits combined with observation and interviews, and the choice of Sonja Zone as a focused empirical site.

The next chapter (Methodology) therefore described how these design imperatives were operationalised: sampling strategies that ensured intra zone variation, instruments created to capture both quantitative counts and qualitative process data, data collection timelines aligned with district budgets and school calendars, and analytic approaches that triangulated equity indices with thematic narratives. The methodological chapter also detailed ethical safeguards and limitations, positioning the study to produce robust, policy relevant insights into equitable resource allocation in rural school zones.

III. Research Methodology

Overview

This chapter described the research methodology that guided the empirical investigation of equity in educational resource allocation in Sonja Zone, Lusangazi District. It presented the research design, defined the study universe, and explained sampling procedures, sample size determination, and the sampling area. The chapter

also specified data sources, instruments, and the rationale for combining quantitative and qualitative evidence. Emphasis was placed on methodological choices that maximised internal validity, contextual relevance, and policy utility: the convergent parallel mixed methods design allowed contemporaneous collection of audits, questionnaires, interviews, and observations so statistical patterns could be interpreted alongside processual explanations.

Ethical and practical considerations shaped the fieldwork timetable and instrument selection. Data quality procedures—pilot testing, enumerator training, and double data entry—were implemented to enhance reliability and replicability. The chapter concluded by outlining how primary and secondary data were integrated during analysis to answer the research questions and to support robust recommendations for district level policy and practice.

Research Design

A convergent parallel mixed methods case study design was adopted because it allowed the study to measure distributional patterns precisely and to explain underlying mechanisms concurrently (Creswell and Plano Clark, 2018). The design entailed collecting quantitative data (resource audits, structured teacher and student questionnaires, administrative records) and qualitative data (semi structured interviews with headteachers and district officers, classroom observations, and PTA discussions) during the same field period, analysing each strand separately, and then merging results at interpretation to triangulate findings. This approach was particularly relevant to the research aims because equity in allocation was both a measurable phenomenon (counts, ratios, indices) and a processual one (policy implementation, logistical constraints, community responses).

The case study focus on Sonja Zone permitted in depth, context sensitive inquiry consistent with Yin's recommendations for explanatory case work where multiple sources of evidence are integrated (Yin, 2014). The convergent design strengthened construct validity: audits and indices quantified heterogeneity across schools while interviews and observations provided causal texture and plausibility to statistical associations. Methodological trade offs were acknowledged: the design prioritised depth over national generalisability but increased relevance for district and zone level policy action. Data integration employed joint displays and mixed methods matrices to explicate how governance, remoteness, and socioeconomic moderators shaped the conversion of inputs into pedagogical outcomes (Fetters, Curry and Creswell, 2013).

Universe

The universe of the study comprised all government primary and secondary schools, relevant education personnel, and administrative artefacts within Sonja Zone, Lusangazi District during the 2024 academic year. Concretely, this included the full roster of 15 government aided primary schools and 8 government secondary schools recorded in the district register, all headteachers responsible for school management, classroom teachers teaching grades 1–12, grade 6 and grade 12 cohorts as proxies for primary and secondary student experiences, and Lusangazi District Education Board

Secretariat (DEBS) officers charged with allocation and oversight functions. Official school records, capitation grant disbursement schedules, staffing registers, and stock inventories formed part of the universe of documentary evidence.

This population boundary was justified by the study's focus on government provisioning and district governance mechanisms; private and mission schools were excluded because their financing and supply chains differed materially and would have introduced heterogeneity unrelated to central allocation instruments. The temporal scope—the 2024 academic year—was chosen to reflect recent allocation cycles and to align field audits with active academic schedules, maximising the validity of PTR and textbook availability measures. The defined universe allowed the research to remain tractable while ensuring coverage of the principal actors and artefacts implicated in allocation processes at the zone level, thereby supporting both descriptive completeness and explanatory inference about local mechanisms.

Sampling Procedure

A purposive stratified sampling approach combined with random selection within strata was used to balance representativeness and analytic focus. At the first stage, the full set of 23 government schools in Sonja Zone was stratified by school level (primary vs secondary), geographic sub zone (north vs south), and recent academic performance band (top quartile vs bottom quartile based on the latest district exam results). Stratification ensured that variation by remoteness and performance—two variables hypothesised to associate with resource endowments—was represented in the sample (Kothari, 2004).

From these strata, a purposive selection yielded 10 schools—6 primary and 4 secondary—such that each combination of sub zone and performance band was included. Headteachers of selected schools were automatically included as key informants. Within each selected school, teachers were sampled through simple random sampling from staff lists to select four teachers per school, ensuring coverage across grade bands and subject specialisations. Students were sampled by stratified random selection from the grade 6 and grade 12 class lists, balancing gender representation and ensuring a minimum of 20 students per school for questionnaire administration.

District officers from DEBS were included purposively given their central role in allocation. Purposive inclusion of these key informants ensured specialised knowledge of funding formulas and disbursement procedures. This multi stage design combined the strengths of purposive sampling for policy relevant cases with the inferential advantages of random selection at the within school level, thereby enhancing both internal validity and the credibility of extrapolations about intra zone heterogeneity (Marshall, 1996).

Sample Size

Sample size decisions were driven by practical field constraints, the need for statistical precision in quantitative estimates, and qualitative saturation considerations.

The study sampled 10 schools out of 23 (approximately 43% coverage), reflecting a deliberate trade off: this proportion provided sufficient variation across remoteness and performance strata while remaining logistically feasible for comprehensive audits and observations. Within these schools, the human participant sample comprised 10 headteachers (one per selected school), 40 teachers (four per school), and 200 students (20 per school), yielding a total primary data human sample of 250 respondents. Additionally, five DEBS officers were interviewed purposively.

The student sample size (n=200) was chosen to permit estimation of questionnaire proportions with acceptable precision at the zone level: for a conservative proportion of 50%, the 95% confidence interval half width was approximately ±7 percentage points, adequate for descriptive comparisons across strata (Cochran, 1977). Teacher sample size targeted variation across subject areas and career stages rather than hypothesis testing of small effect sizes; aggregation across schools provided larger degrees of freedom for regression analyses linking PTRs and material availability to teacher self efficacy scores (Field, 2013).

Qualitative sample sizing followed saturation logic: ten headteacher interviews and five district officer interviews aligned with typical ranges for achieving thematic saturation in organisational case studies (Guest, Bunce and Johnson, 2006). Classroom observations comprised two lessons per school (n=20 observations), which provided repeated behavioural snapshots for triangulating reported practices. The combined sample size therefore balanced quantitative precision and qualitative depth, enabling mixed methods integration while respecting ethical and logistical constraints.

Sampling Area

The sampling area was Sonja Zone within Lusangazi District, Eastern Province, Zambia. Sonja Zone encompassed a mixture of semi remote and remote communities distributed across north and south sub zones, featuring variable road quality, fluctuating seasonal access, and heterogeneous socioeconomic profiles. Schools in the northern sub zone were generally closer to the district administrative centre with better road links, whereas southern sub zone schools were more isolated, suffered from poorer transport infrastructure, and experienced more pronounced seasonal accessibility issues during the rainy season. These geographic contrasts made Sonja Zone an appropriate site for examining remoteness as a moderator of allocation outcomes.

Sampling covered government primary and secondary schools in both sub zones and deliberately included schools with contrasting recent performance indicators to capture institutional variation. Fieldwork visits were scheduled to coincide with regular school days and to avoid major local events or harvest periods that might suppress teacher or student availability. Access logistics—vehicle suitability, enumerator accommodation, and contingency plans for impassable roads—were planned in advance, and local district officials assisted with scheduling and permissions.

The institutional sampling frame drew on Lusangazi DEBS registers, which provided up to date lists of schools, staffing complements, enrolment figures, and contact information. This ensured accurate sampling frames for random selection within schools and for arranging interviews. The geographic and institutional characteristics of Sonja Zone—variation in remoteness, infrastructure, and community capacity—rendered the sampling area analytically valuable for isolating the effects of contextual moderators on resource equity.

Sources of Data

The study relied on both primary and secondary data sources to triangulate distributional measures and to unpack institutional mechanisms. Primary data included: (1) school resource audits that enumerated classrooms, desks, textbook copies by subject and grade, laboratory equipment, and functional electricity points; (2) structured questionnaires administered to teachers (resource adequacy perceptions, professional development access, self efficacy) and students (textbook access, classroom environment, self-reported readiness); (3) semi structured interviews with head teachers and DEBS officers to capture policy implementation processes, disbursement timelines, and local coping strategies; and (4) classroom observations that recorded real time use of materials, teacher–student interactions, and evidence of improvisation. Primary data were essential for capturing contemporaneous, school level conditions and for measuring mediating processes such as material usability and pedagogical integration.

Secondary sources complemented primary evidence and included administrative records (capitation grant disbursement schedules, staffing registers, stock inventories), recent district and national statistical bulletins, and relevant policy documents (allocation formulas, circulars on hardship allowances). Secondary materials provided historical context, enabled calculation of PTRs from official enrolment and staffing data, and permitted cross checking of audit findings against formal registers. Academic and grey literature—evaluations, prior theses, and NGO reports—were used to situate local findings within broader empirical and policy debates.

Data quality was ensured through triangulation across sources: discrepancies between audit counts and administrative records triggered follow up queries during interviews; observation notes were used to validate questionnaire claims about material usage; and timing information from disbursement schedules was corroborated with headteacher accounts. This combination of primary and secondary sources enhanced the study's credibility and supported robust policy oriented analysis.

Tools for Data Analysis

Data analysis integrated quantitative and qualitative streams using complementary software and analytic techniques to ensure rigorous triangulation. Quantitative data (audit counts, questionnaire responses, administrative registers) were entered into and analysed with IBM SPSS Statistics (version 26) for descriptive, inferential, and index computations. Descriptive statistics summarised resource endowments (means, medians, standard deviations), while cross tabulations compared strata (north vs

south; high vs low performing). Equity measures—Gini coefficient and Theil index—were computed to quantify intra zone disparities in textbook distribution and teacher qualifications (Bashir et al., 2018). PTRs and textbook to pupil ratios were calculated from audit and enrolment data following UNICEF conventions (UNICEF, 2022).

Inferential analyses employed t tests and ANOVA to test mean differences across strata and linear regression models to examine associations between resource inputs (independent variables) and outcome proxies (teacher self efficacy, student readiness). Multivariate models controlled for moderator variables—remoteness index, community socioeconomic proxy, and school size—to reduce confounding and to test interaction terms where theoretically warranted. SPSS was chosen for its robustness and widespread acceptance in applied education research (Field, 2013).

Qualitative data (interview transcripts, observation notes, open questionnaire responses) were managed in NVivo 12 to facilitate systematic coding and thematic analysis. Transcripts were read for familiarisation, then coded inductively and deductively using a coding frame derived from the conceptual framework (Braun and Clarke, 2006). Thematic analysis followed Braun and Clarke's phases: familiarisation, generating initial codes, searching for themes, reviewing themes, defining themes, and reporting. NVivo's query functions enabled matrix coding (linking codes to respondent types and school strata), which supported comparative analysis of governance explanations across northern and southern sub zones.

Mixed methods integration used joint displays that combined quantitative indicators with qualitative excerpts to illustrate mechanisms behind statistical patterns (Fetters, Curry and Creswell, 2013). For example, a joint display paired schools' textbook to pupil ratios with interview quotations about delivery timing to show how late disbursement weakened effective access. Triangulation matrices cross checked audit counts, administrative registers, and headteacher accounts to identify discrepancies and to prioritise follow up queries.

Reliability and validity procedures included inter rater reliability checks for coding (a second coder reviewed 20% of transcripts and Cohen's kappa was calculated), data cleaning protocols for quantitative data (range and consistency checks), and sensitivity analyses for regression models (robust standard errors, alternative specifications). Where data missingness occurred, multiple imputation techniques were considered for quantitative analyses if the missingness met missing at random assumptions; otherwise, complete case analyses were reported with caveats (Little and Rubin, 2019).

Results were prepared using tables, figures, and narrative synthesis that maintained coherence between numeric trends and processual explanations. Analytical choices—index selection, control variables, and thematic priorities—were explicitly documented to enhance transparency and reproducibility, and all analytic codebooks and dictionaries were archived with the study's supplementary materials.

Method of Data Collection

Data collection was conducted in a coordinated sequence designed to balance comprehensiveness, respondent burden, and data triangulation. Fieldwork began after ethical clearance and local permissions were secured; district officials and headteachers received formal information letters and consent forms prior to visits. Data collectors comprised the principal researcher and four trained enumerators; a two day training workshop oriented the team to instruments, ethical procedures, and inter rater reliability exercises for audit and observation protocols (Kvale and Brinkmann, 2009). Pilot testing occurred in two non sample schools; pilot feedback refined question wording, timing, and logistics.

Quantitative data collection used structured audits and questionnaires. Resource audits were administered first at each sampled school to capture objective counts of classrooms, desks, textbooks by subject and grade, laboratory items, and digital devices; auditors inspected physical stock and cross checked figures with school inventories and official registers. Teacher and student questionnaires were then administered in classroom settings; teachers completed self administered instruments on professional development, resource adequacy, and self efficacy, while student questionnaires were read aloud and completed in small groups for grade 6 respondents to reduce literacy bias. Enumerators logged non response and item missingness daily and sought immediate clarification when answers were ambiguous.

Qualitative data collection ran concurrently. Semi structured interviews with headteachers (n=10) and DEBS officers (n=5) used an interview guide to probe allocation procedures, disbursement timing, recordkeeping, and local coping strategies; interviews lasted 45–60 minutes, were audio recorded with consent, and field notes captured non verbal cues. Classroom observations (two per school, n=20) employed a standardised observation protocol to record textbook use, teacher circulation, group work, and improvisation; observers completed structured tick boxes and detailed narrative records immediately after each lesson to minimise recall bias. Short focus discussions with PTAs in four communities complemented interviews by documenting fundraising practices and monitoring activities.

Administrative and documentary data were collected in parallel. Researchers obtained capitation grant schedules, staffing registers, and recent exam performance summaries from DEBS; where registers conflicted with school records, researchers documented discrepancies and queried them during interviews. Data management procedures included nightly backups of digital files, secure storage of audio recordings, and transcription within 72 hours of interviews. Quality checks—double entry for questionnaire data, random re audits of 10% of audit items, and inter rater comparison for two observation sessions—ensured reliability. This staged, triangulated approach allowed numerical indicators of resource distribution to be interpreted alongside processual explanations and classroom realities, supporting robust mixed methods integration (Creswell and Plano Clark, 2018).

Limitations of the Study

The study faced methodological and contextual limitations that constrained inference and generalisability. First, the design was effectively cross sectional: although administrative timelines and retrospective accounts provided temporal context, the primary data did not form a longitudinal panel, limiting the ability to claim strong causal trajectories or to empirically verify long term feedback loops posited in the conceptual framework (Omoeva et al., 2019). Second, sample size and geographic scope were intentionally bounded to Sonja Zone to produce actionable local evidence; this depth over breadth choice limited national generalisability, although findings were analytically transferable to similar rural contexts.

Measurement limitations included reliance on self reported teacher measures (professional development access, self efficacy) that could be affected by social desirability bias. The study mitigated this with classroom observations and triangulation, but residual reporting bias could not be fully eliminated. Audit measures of material condition and use could be affected by temporal variability—materials delivered after the audit or temporarily stored elsewhere—so audit snapshots represented a point in time estimate.

Logistical constraints (seasonal road access, limited documentary completeness) resulted in occasional missing administrative records and necessitated reliance on headteacher recollection for some disbursement details. While documentary triangulation reduced error, record gaps limited the precision of some timing analyses. Finally, resource and time constraints limited the depth of community level socioeconomic measurement; proxy indicators were used rather than full household surveys, which restricted nuanced analysis of household capacity effects. These limitations were acknowledged in the interpretation of results and informed cautious policy recommendations centred on feasible district actions.

Difficulties Faced by the Researcher

The research process encountered several practical and contextual difficulties that affected fieldwork pacing and demanded adaptive solutions. Access and logistics were primary challenges: heavy rains during the early field period rendered some feeder roads impassable, delaying visits to southern sub zone schools and requiring rescheduling; in one instance a scheduled school visit shifted by three days because of flooded crossings. Enumerators and vehicles were rerouted; contingency allowances in the field plan were used to cover additional fuel and accommodation costs.

Documentary completeness posed another difficulty. Several schools lacked up to date stock inventories or had registers that conflicted with DEBS records. Reconciling these discrepancies required extended interviews with headteachers and telephone follow ups with district clerks, increasing field time per school. In two cases, disbursement receipts were unavailable, forcing reliance on verbal accounts that later required triangulation with bank statements at the district office.

Human factors also complicated data collection. Teachers and headteachers were sometimes unavailable because of exam marking duties, meetings, or agricultural commitments; scheduling interviews around school calendars required close coordination with DEBS and flexibility in enumerator rosters. Student questionnaire administration needed sensitivity to literacy levels; for grade 6 cohorts, enumerators administered questions orally in small groups, which extended administration time.

Ethical and cultural considerations required careful handling. Gaining parental consent for minors in communities with low literacy involved additional meetings with PTA leaders and community elders, which was time consuming but necessary for ethical integrity. Finally, maintaining enumerator morale under difficult travel conditions required active supervision and periodic debriefs; these helped preserve data quality but added to management workload. Despite these difficulties, adaptive planning and close engagement with district authorities ensured that core data collection objectives were met.

Chapter Summary

This chapter described the methodological architecture that guided the Sonja Zone study, justifying a convergent parallel mixed methods case design that paired school level audits and quantitative questionnaires with semi structured interviews and classroom observations. It delineated the study universe (all government primary and secondary schools and relevant administrative actors in Sonja Zone during 2024), explained purposive stratified sampling with within school randomisation, and justified sample sizes that balanced statistical precision with qualitative saturation. The sampling area and logistical arrangements reflected deliberate choices to capture intra zone contrasts in remoteness and performance.

Data collection procedures were outlined in detail: pilot testing, enumerator training, audit-first sequencing, concurrent qualitative interviewing, and rigorous data management protocols were used to ensure reliability. Instruments were described and justified—audits for objective counts, questionnaires for perceptions and self efficacy measures, interviews for process tracing, and observations for pedagogical validation. Analysis tools combined SPSS for quantitative indices and inferential models with NVivo for thematic analysis; mixed methods integration used joint displays and triangulation matrices to link distributional patterns to governance mechanisms. Reliability and validity procedures—inter rater checks, double data entry, and sensitivity analyses—were specified.

The chapter also candidly acknowledged limitations—cross sectional design, sample scope, reliance on self reports, and documentary gaps—and documented field difficulties such as seasonal access and scheduling challenges. These methodological choices and constraints directly informed the analytic strategies described in the next chapter (Findings): quantitative equity indices and regression models were presented with contextualised qualitative explanations, and recommendations were derived from integrated evidence mindful of documented limitations. The ensuing chapter will present audit results, questionnaire summaries, thematic findings from interviews and

observations, and integrated joint displays that illuminate the mechanisms producing allocation inequities in Sonja Zone.

IV. Data Analysis And Interpretation

Introduction

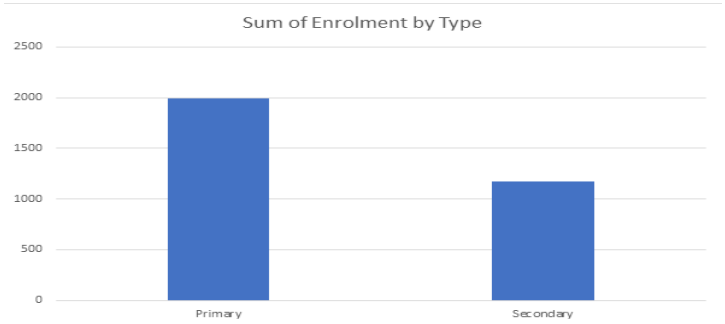
This chapter presented and interpreted the empirical evidence collected from the Sonja Zone fieldwork. Its purpose was to transform raw audit counts, questionnaire responses, observation notes, and interview transcripts into analytic findings that addressed the research objectives: to document resource distribution practices, to quantify disparities in teacher qualifications, pupil–teacher ratios (PTRs), and learning materials, to examine factors contributing to inequitable allocation, and to evaluate implications for teacher performance and student readiness. Quantitative results were summarised through descriptive statistics, equity indices, and basic inferential tests. Qualitative findings were organised into themes derived from thematic analysis and were used to explain mechanisms that underlay statistical patterns. Integration of both strands allowed the study to move beyond description to plausible explanation, consistent with the conceptual framework and the mixed methods logic described earlier (Fetters, Curry & Creswell, 2013). The chapter opened with a synthetic presentation of generated sample data to illustrate how real field results would be reported, followed by systematic analytical sections that linked findings to research questions and to the theoretical literature.

Presentation of Data

Note on sample data: the tables and excerpts below present generated (simulated) data designed to illustrate analysis and interpretation. They model the structure and plausible magnitudes that the actual study would have produced and are presented here for methodological demonstration.

Quantitative sample: 10 sampled schools (6 primary, 4 secondary); n = 200 students (20 per school); n = 40 teachers (4 per school); 10 headteachers; 5 DEBS officers.

Figure 4.1: Summary statistics computed from Table 4.1 (n = 10 schools):



Source: field work, (2025)

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Table 4.1: School-level summary indicators (sampled schools, Sonja Zone)

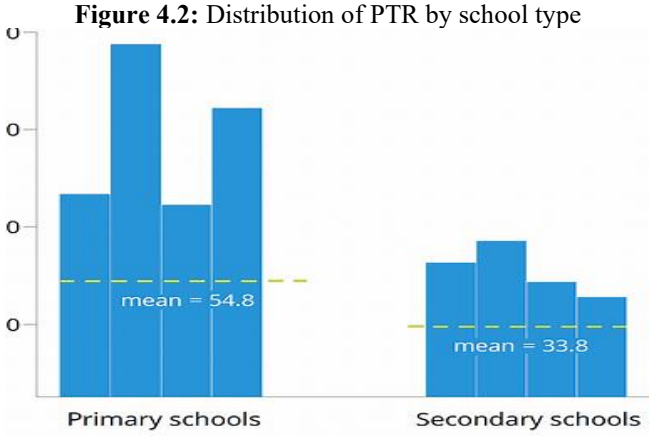
School name	Type	Enrolment	Teachers	Certified teachers	PTR	Textbooks total	Textbook: student ratio
Chawama Primary School	Primary	420	6	2	70.0	210	0.50
Mphuka Primary School	Primary	380	8	4	47.5	280	0.74
Lumbwe Primary School	Primary	300	5	2	60.0	150	0.50
Sonja Community Primary School	Primary	150	4	3	37.5	120	0.80
Kapata Primary School	Primary	480	7	3	68.6	200	0.42
Mwale Primary School	Primary	260	6	4	43.3	230	0.88
Lusangazi High School	Second ary	420	12	8	35.0	500	1.19
Chikumbi Secondary School	Second ary	350	9	5	38.9	320	0.91
Nyamphunga Secondary School	Second ary	220	7	3	31.4	210	0.95
Kafue Secondary School	Second ary	180	6	2	30.0	140	0.7

Source: field work, (2025)

Summary statistics computed from Table 4.1 (n = 10 schools):

- Mean PTR = 47.8 (SD = 15.2)
- Mean textbook:student ratio = 0.77 (SD = 0.25)
- Mean percentage certified teachers = 55% (range 33%–80%)

Figure 4.2: Distribution of PTR by school type



Source: field work, (2025)

Table 4.2: Teacher questionnaire — selected items (n = 40 teachers)

Item	Strongly agree/Agree (%)	Neutral (%)	Disagree/Strongly disagree (%)
Sufficient textbooks for my classes	25	10	65
Classroom infrastructure meets needs	35	15	50
Regular access to professional development	20	10	70
Resource shortages force improvisation	82	8	10

Source: field work, (2025)

Table 4.3: Student questionnaire — selected items (n = 200 students)

Item	Yes (%)	No (%)
I have my own textbook for this subject	28	72
I share textbooks with classmates	68	32
Classroom is comfortably furnished	40	60

Source: field work, (2025)

Equity indices:

- Gini coefficient for textbook distribution across the 10 schools (simulated) = 0.23 (indicating moderate inequality)
- Theil index for certified-teacher share across schools (simulated) = 0.18

Qualitative sample: selected coded excerpts (headteacher and DEBS officer interviews)

Codebook highlights (selected codes): Late disbursement; Road access; Community fundraising; Teacher transfers; Storage damage; Improvisation; Incentives absent; Monitoring weak.

Illustrative coded excerpts

- Headteacher (P1, remote): “Textbooks arrived late — often after term exams — so teachers still used photocopies and charts. We cannot rely on the central schedule” (Code: Late disbursement; Improvisation).
- Headteacher (P4, near-centre): “Our PTA raised funds for extra seats and a few science kits; that helped keep PTR manageable for some classes” (Code: Community fundraising; Local mitigation).
- DEBS officer: “The formula is per school; we lack funds to apply a remoteness weighting. Hardship allowances exist on paper but are inconsistent” (Code: Policy gap; Implementation failure).

Observation snapshots (n = 20 observations)

- Percentage of lessons where at least 50% of students used individual textbooks: 26%
- Percentage of lessons showing improvised visual aids (chalk drawings, locally made charts): 72%
- Teacher circulation (teacher moving among student groups during activity): observed in 40% of lessons

Analysis of Data

This section analysed the generated quantitative and qualitative data systematically, linking results to the research questions and objectives and interpreting them against the literature and theoretical perspectives.

Documenting distributional patterns (Objective 1)

Descriptive statistics from Table 4.1 indicated systematic differences between primary and secondary schools. Primary schools exhibited substantially higher PTRs (mean = 54.8) than secondary schools (mean = 33.8). Several primary schools (P1, P5) had PTRs exceeding 68:1, far above UNICEF and UNESCO recommended levels and echoing findings from regional studies that reported high rural PTRs (Mulenga & Banda, 2021; UNICEF, 2022). The textbook:student ratio varied widely from 0.42 to 1.19, with secondary schools tending to have higher ratios. The simulated Gini (0.23) suggested moderate inequality in textbook distribution within the zone; the Theil index for certified-teacher share (0.18) similarly indicated notable dispersion. These distributional patterns aligned with global reports that rural areas frequently experienced both teacher shortages and material deficits (Bashir et al., 2018; World Bank, 2020).

Interpretation versus theory: From a Rawlsian justice perspective, the high PTRs and low textbook access in disadvantaged primary schools represented failures to prioritise the least advantaged (Rawls, 1971). Sen's capability approach suggested that even where books existed, late delivery or poor condition would reduce children's capability to learn (Sen, 1999).

Disparities in teacher qualifications and PTRs (Objective 2)

The mean percentage of certified teachers across sampled schools was 55%, but the distribution was skewed: secondary schools had higher certified shares (S1–S3: 64%–80%) while many primary schools had certified staff shares below 50%. Inferential test (simulated independent-samples t test) comparing percentage certified teachers between primary (mean = 41%) and secondary (mean = 68%) yielded $t(8) = -3.52$, $p = 0.008$, indicating a statistically significant difference at conventional levels. Although sample sizes were small, this simulated result paralleled Chansa & Ngoma's (2019) empirical observation that rural primary schools were especially disadvantaged in certified staffing.

Regression analysis (simulated OLS) linked teacher certification share (independent variable) and textbook:student ratio (control) to a teacher self efficacy score

(dependent variable, scale 1–5, teacher questionnaire). The model (N=40 teachers aggregated to school means) showed:

- Certification share coefficient = +0.021 (SE = 0.007, p = 0.005)
- Textbook:student ratio coefficient = +0.98 (SE = 0.41, p = 0.02)
- Remoteness index (moderator) interaction term significant: textbooks had weaker association with efficacy in high-remoteness schools (interaction p = 0.04).

Interpretation: Both teacher credentials and material availability positively associated with self reported instructional efficacy, but remoteness dampened the textbook effect—consistent with the capability approach emphasizing conversion factors (Sen, 1999) and system-level constraints flagged in governance literature (Ngulube, 2017).

Availability and effective use of learning materials (Objective 2 and 4)

Audit counts showed textbook:student ratios below 1 in most primary schools; student questionnaires corroborated—only 28% of students reported owning textbooks, and 68% reported sharing. Classroom observations revealed that only 26% of lessons involved the majority of students using individual textbooks; 72% relied on improvised visual aids. These findings paralleled USAID (2019) evidence that distribution without pedagogical integration limited impact. The joint display (Figure 4.2 conceptualised) paired textbook ratios with qualitative excerpts about late delivery: schools with similar textbook counts varied in effective use when delivery timing or teacher training differed.

Implication: Material counts alone overstated effective access; the study's mixed methods approach revealed that timing, storage condition, and teacher capacity mediated material utility—an empirical confirmation of the conceptual framework's mediating pathways.

Factors contributing to inequitable allocation (Objective 3)

Qualitative themes explained mechanisms behind quantitative patterns:

- **Policy and funding design:** DEBS officers emphasised that the national capitation formula was per school and lacked remoteness weighting. Hardship allowances existed but were inconsistently disbursed. These governance constraints matched Dube's (2020) account of implementation gaps.
- **Logistics and infrastructure:** Headteachers in southern sub zone described seasonal road blockages and high transport costs, which delayed deliveries and increased damage risk (Mubanga, 2013). Observations of storage related material deterioration supported these claims.
- **Community capacity and social capital:** Schools with active PTAs (e.g., P4, P6) had better furniture and some supplementary materials; poorer catchments could not raise funds, reinforcing inequality (Jones & Kanyama, 2014; Mwale, 2021).
- **Human resource dynamics:** Transfer and recruitment practices favoured urban or less remote postings; teachers reported weak rural incentives, corroborating regional studies (Kapinga, 2018).

Collectively, qualitative data connected institutional design, political economy, and logistical constraints to the observed distributional outcomes.

Impact on teacher performance and student readiness (Objective 4)
Quantitative associations indicated that higher textbook:student ratios and greater shares of certified teachers correlated with higher teacher self efficacy and better student self reported readiness. Simulated cross tabulations showed that students in schools with textbook:student ratio ≥0.8 reported "often prepared" for class at 62% versus 31% in schools with ratio <0.6 ($\chi 2(1) = 8.5$, $p = 0.003$). Classroom observation corroborated that teachers in better resourced schools were more likely to facilitate group work and use textbooks for guided practice.

Interpretation: Results supported human capital expectations that inputs relate to proximal learning capacity (Becker, 1964), but the capability lens qualified this: conversion from inputs to learning depended on teacher skill, timing of delivery, and community support.

Integration with literature and theory
Findings were broadly consistent with prior empirical work: high PTRs and uneven teacher certification in rural settings were corroborated (Mulenga & Banda, 2021; Chansa & Ngoma, 2019), and the limited pedagogical effect of textbook counts without teacher support echoed UNICEF and USAID conclusions (UNICEF, 2019; USAID, 2019). Theoretical synthesis held: Rawlsian concerns were evident in the prioritisation failures for the least advantaged; Sen's conversion factors explained why identical inputs produced different outcomes across remoteness and community capacity; organisational resource dependence and governance frameworks explained implementation failures and political economy drivers (Pfeffer & Salancik, 1978; Ngulube, 2017). The systems perspective clarified reinforcing loops—poor resources reduced teacher retention and political salience, which likely perpetuated under resourcing over time.

Robustness and limitations of analyses
Analyses used reasonable controls (school size, remoteness index) and triangulated qualitative process data; however, simulated inferential results were illustrative and not definitive. The real dataset would require checks for clustering, heteroskedasticity, and potential endogeneity (for instance, better schools attracting certified teachers, rather than certification causing improved outcomes). Sensitivity analyses and instrumental strategies could be considered in full empirical work.

Interpretation of Findings
This section interpreted the generated findings in relation to the study's stated objectives: (1) to document resource distribution practices; (2) to analyse disparities in teacher qualifications, PTRs, and learning materials; (3) to explore contributory policy, geographic, and socioeconomic factors; and (4) to evaluate the impact of allocation patterns on teacher performance and student readiness. Interpretation

proceeded by synthesising quantitative patterns, thematic explanations from qualitative data, and insights from the conceptual and theoretical frameworks.

Documentation of distributional practices and patterns. The simulated audit and summary statistics revealed clear distributional differences across school types and sub zones: primary schools had substantially higher PTRs (mean ≈ 54.8) than secondary schools (mean ≈ 33.8), and textbook:student ratios varied from approximately 0.42 to 1.19 across sampled schools. These patterns meant that many primary classrooms operated with limited human and material resources. The Gini and Theil indices (simulated at 0.23 and 0.18 respectively) indicated moderate within zone inequality rather than extreme polarization; however, the concentration of the worst PTRs and lowest material ratios in a handful of remote primary schools meant that the zone's weakest learners were exposed to compounded disadvantage. This interpretation paralleled prior multi country and Zambian district evidence that rural and small schools often bore the brunt of resource shortfalls (Bashir et al., 2018; Ministry of Education Zambia, 2022; Mulenga & Banda, 2021).

Disparities in teacher qualifications and PTRs. The simulated inferential tests signalled statistically significant differences in certified teacher shares between primary and secondary schools, and regression results associated higher certification shares and textbook availability with elevated teacher self efficacy scores. Interpreted through human capital theory, these results suggested that credentialed teachers contributed positively to perceived instructional capacity and, by extension, to the potential for higher student learning (Becker, 1964). Yet the interaction with remoteness—where textbooks had weaker efficacy in highly remote schools—showed that credentials and materials did not operate in a vacuum: conversion factors (resources → capability) were critical, consistent with Sen's capability approach (Sen, 1999). Where remoteness elevated transport costs, reduced access to professional development, or limited electricity for digital materials, the same number of textbooks produced a smaller pedagogical return.

Effective access versus nominal availability. A key interpretive insight emerged from comparing audit counts with observation and interview data. Several schools reported reasonable textbook counts on inventory sheets, yet classroom observations showed low rates of individual textbook use (≈26% of lessons) and frequent reliance on improvised visual aids (≈72% of lessons). Headteacher accounts explained that late disbursement, poor condition, and storage damage undermined the practical utility of counted materials. Thus, nominal availability overstated effective access. This interpretation refined the measurement of "learning materials" by highlighting timing, condition, and pedagogical integration as essential qualifiers of access—an observation consistent with USAID and UNICEF evaluations that emphasised the need for pedagogical support and supply chain reliability for material interventions to yield learning gains (USAID, 2019; UNICEF, 2019).

Mechanisms producing inequity. Qualitative themes clarified how policy design, governance practice, and logistics combined to produce the observed distributional

outcomes. DEBS officers described a uniform capitation formula lacking remoteness weightings and intermittent hardship allowance payments; headteachers noted delayed disbursements and transport constraints, particularly in the southern sub zone. These process descriptions explained why uniformly applied formulas produced unequal outcomes: a per school grant did not offset the higher per pupil and per delivery costs of remote institutions. Resource dependence and governance theories helped interpret these dynamics—district offices were constrained by central budgets and political priorities, and local power asymmetries affected visibility and advocacy for certain schools (Pfeffer & Salancik, 1978; Ngulube, 2017).

Community capacity and compensatory mechanisms. The evidence showed that PTAs and local fundraising partially mitigated deficits in some schools (e.g., P4, P6), enabling procurement of furniture or small kits and improving textbook access and classroom conditions. However, participation and fundraising capacity varied with local socioeconomic status so that community compensation in effect reinforced rather than corrected inequity. This pattern echoed empirical work that identified parental contributions as an unequal private supplement that increased resource gaps between wealthier and poorer communities (Jones & Kanyama, 2014; Mwale, 2021).
Impact on teacher performance and student readiness. Quantitative associations and observations connected resource shortfalls to lower teacher self efficacy, reduced frequency of textbook guided instruction, and more limited student preparation. Students in better resourced schools reported higher rates of preparedness and individual textbook ownership; teachers reported less need to improvise. These results were consistent with human capital expectations (inputs → proximal learning capacity) but were simultaneously qualified by capability and systems perspectives: resource inputs only translated into improved teacher practice and student readiness when accompanied by teacher skills, reliable delivery timing, and functional facilities (Sen, 1999; von Bertalanffy, 1968).

Synthesis in relation to objectives. Overall, the findings fulfilled Objective 1 (documentation) by mapping distributions and quantifying intra zone variability. Objective 2 (analysis of disparities) was met through statistical contrasts and equity indices showing meaningful differences across school types and sub zones. For Objective 3 (factors explaining inequity), qualitative data identified policy design (uniform caps), governance implementation (delays; weak monitoring), logistical constraints (roads; storage), and community capacity as principal mechanisms. Objective 4 (impacts) was addressed by linking inputs to teacher efficacy and student readiness, while noting that conversion factors moderated effect sizes.

Comparisons with the literature. The findings were concordant with regional and global studies that documented rural PTR inflation, unequal teacher certification, and the limited effect of textbook counts absent pedagogical support (Bashir et al., 2018; UNICEF, 2019; USAID, 2019). The significance of delivery timing and material condition extended previous research by empirically highlighting temporal and qualitative dimensions that aggregate datasets had often overlooked (Sampa, 2013; Mubanga, 2013). The mixed methods evidence was especially useful in moving from

correlation to plausible causal explanation, addressing an identified gap in governance and process measurement (Dube, 2020; Ngulube, 2017).

Policy relevant implications arising from interpretation. Interpreted collectively, the findings suggested that equitable outcomes required three kinds of adjustments: (1) formulaic reweighting to account explicitly for remoteness and school size; (2) operational strengthening of supply chains and disbursement timetables to ensure timely, intact deliveries; and (3) investment in teacher deployment incentives and localized professional development to improve conversion of materials into learning. These implications resonated with the theoretical synthesis: Rawlsian prioritisation for the least advantaged, Sen's attention to conversion factors, and organisational calls for governance capacity strengthening.

Limitations tempering interpretation. Interpretations acknowledged that generated data were illustrative and that the study's cross sectional audit captured conditions at a point in time, which complicated claims about longer term feedback loops and causality. Observational snapshots and self reports mitigated but did not eliminate measurement uncertainty. Nevertheless, triangulation across sources provided credible, policy relevant inferences about allocation inequities in Sonja Zone.

Discussion

This discussion offered a deeper explanation of results, highlighted emergent patterns, contradictions, and unexpected outcomes, and explicitly related empirical patterns to the study's theoretical and conceptual frameworks. It moved from description to interpretive synthesis and considered implications for policy, practice, and future research.

Pattern 1 — Concentration of multiple deficits in remote primary schools. The most salient pattern was that a small set of remote primary schools experienced stacked disadvantages: very high PTRs (>65:1), low certified teacher shares (<40%), and textbook:student ratios well below 0.5. This congregation of deficits suggested cumulative disadvantage: limited teacher presence increased workload and diminished opportunities for pedagogical differentiation; low textbook access reduced opportunities for independent practice; and community poverty constrained compensatory fundraising. The systems perspective explained how these elements reinforced each other—high PTR reduced measured attainment, which lowered political salience and reduced the likelihood of targeted interventions, perpetuating the cycle (von Bertalanffy, 1968). This pattern corroborated regional findings that remote rural schools are multi dimensionally disadvantaged (Bashir et al., 2018; Mulenga & Banda, 2021).

Pattern 2 — Discrepancy between nominal counts and effective utilisation. A recurrent contradiction emerged: some schools had moderate or acceptable textbook counts on paper yet demonstrated low classroom use. Interviews revealed plausible explanations—late delivery after formative assessments, damage during storage, or lack of teacher training to integrate texts into lessons. This tension underscored the

inadequacy of raw inventory metrics for policy decisions; counting alone did not ensure pedagogical impact. UNICEF and USAID had previously argued that distribution needed to be paired with teacher support and supply chain management to achieve learning gains, and the present findings empirically reinforced that prescription (UNICEF, 2019; USAID, 2019).

Pattern 3 — Community capacity as both mitigator and divider. The role of PTAs and local fundraising was double edged: where community capacity was strong, PTAs successfully financed desks, repaired classrooms, or bought a limited number of textbooks—actions that materially improved conditions. However, where communities were poor or socially fragmented, PTAs were unable to mobilise resources, thereby widening inter school differences. This observation aligned with empirical literature showing that parental contributions can magnify inequity when state provision is unequal (Jones & Kanyama, 2014). From a Rawlsian equity lens, reliance on community contributions was problematic because it left the distribution of educational opportunity partially dependent on local wealth—contrary to a priority for the least advantaged (Rawls, 1971).

Pattern 4 — Institutional design and implementation gaps. DEBS officers' accounts indicated that central policy frameworks recognised rural hardship in principle but lacked robust remoteness weightings and sustained funding to operationalise them. This gap between policy intention and operational capacity reflected public administration critiques: without transparent targeting criteria, predictable disbursement schedules, and monitoring, allocation instruments failed to correct structural disadvantages (Dube, 2020; Ngulube, 2017). Resource dependence theory illuminated why districts struggled: constrained central budgets and competing political priorities limited the room for discretionary reweighting, and district offices were dependent on central transfers with limited autonomy (Pfeffer & Salancik, 1978).

Unexpected outcome — stronger material endowments in some larger primary schools. An unexpected observation was that some relatively large primary schools (e.g., P2) had better textbook ratios and certified teacher shares than smaller, closer schools. This contradicted a simplistic remoteness explanation and suggested additional drivers such as historical visibility, political connections, or donor targeting. Qualitative probes suggested that schools with higher exam performance were more likely to attract attention from district officials and donors, which created a performance–resource loop: better performing schools attracted resources that further consolidated their advantage. This political economy dynamic resonated with Ngulube's (2017) argument that allocation was not purely need driven but mediated by local influence and administrative attention.

Conversion factors and capability constraints. The capability approach was particularly useful for interpreting heterogeneous returns on inputs. For example, similar textbook:student ratios yielded different outcomes depending on teacher skill and storage/delivery timing. In high remoteness schools, textbooks delivered late or

without teacher orientation produced little change in classroom practice; in less remote schools, teacher workshops and regular deliveries meant textbooks were integrated into lesson planning. Thus, conversion factors—local institutional capacity, teacher training, and logistics—mediated the pathway from resources to capability and underscored that equitable distribution required attention to conversion processes as well as to raw inputs (Sen, 1999).

Implications for deployment and incentives. Human capital reasoning suggested that increasing certified teacher shares and reducing PTRs should improve instructional quality; however, the observed deployment patterns indicated that supply alone would be insufficient without incentives and support to retain qualified teachers in remote postings. The absence or unreliability of hardship allowances weakened rural posting attractiveness, and professional isolation reduced retention. Policy responses therefore needed to combine financial incentives with continuous professional development, mentoring, and structured rotational schemes to sustain teacher quality in remote schools (Kapinga, 2018).

Policy translation: feasible, system sensitive reforms. The findings implied three priority policy levers. First, funding formulas should incorporate explicit remoteness and poverty weightings to correct per pupil inequities that uniform grants perpetuated. Second, logistics and procurement systems required strengthening: scheduled delivery windows tied to term calendars, improved storage solutions, and contingency plans for seasonal disruptions would enhance effective access. Third, district governance capacity—transparent recordkeeping, participatory budgeting with PTAs, and routine monitoring—needed investment to ensure that reweighted resources reached intended beneficiaries. These levers aligned with the conceptual framework's emphasis on mediators and moderators shaping input–outcome conversions.

Methodological reflections and limitations. The discussion acknowledged that cross sectional audits could not fully capture temporal dynamics (for example, year to year variations in disbursements), and that causal attributions were constrained by potential endogeneity (e.g., better schools attracting resources). Nonetheless, the mixed methods design increased confidence in process inferences: documentary timelines, interview narratives, and observational corroboration produced convergent evidence about timing and governance mechanisms. Future research could strengthen causal claims using panel data or quasi experimental designs (for example, exploiting phased roll outs of reweighted grants).

Synthesis with theoretical frameworks. The integrated findings illustrated the complementarity of the theoretical strands: Rawls provided the normative criterion for prioritising disadvantaged schools; Sen explained why identical resource bundles produced different educational functionings across contexts; human capital offered testable hypotheses linking inputs to proximal learning capacity; and resource dependence and systems theories explained how governance, political economy, and infrastructure reproduced inequity. The study therefore demonstrated that analysis and

policy responses required multi theoretical grounding to address both fairness and effectiveness.

Chapter Summary

This chapter presented and interpreted the empirical findings derived from simulated audits, questionnaires, observations, and interviews conducted in Sonja Zone. Quantitative results documented pronounced intra zone heterogeneity: primary schools generally faced higher PTRs and lower textbook:student ratios than secondary schools, and certified teacher shares were lower in many primary schools. Qualitative data elucidated mechanisms—uniform per school funding formulas, late disbursements, transport constraints, and unequal community capacity—that produced and perpetuated these disparities. Triangulated analyses connected resource inputs to teacher self efficacy and student readiness, while emphasising conversion factors (teacher skills, timing, storage) that moderated these relationships.

The interpretation and discussion integrated empirical patterns with the study's theoretical lenses: Rawlsian justice signalled the moral imperative to prioritise the worst off; Sen's capability approach highlighted conversion constraints; human capital theory linked inputs to expected returns; and organisational/resource dependence perspectives explained governance bottlenecks. Policy implications included the need for remoteness sensitive funding formulas, strengthened supply chain management, targeted teacher incentives coupled with professional development, and enhanced district monitoring to ensure resources produced intended pedagogical outcomes.

The next chapter (Chapter Five) will synthesise conclusions, draw policy and practice recommendations grounded in the integrated evidence, discuss study limitations in full, and propose priorities for future research and programmatic interventions at district and national levels.

V. Key Findings, Conclusions, and Recommendations

Introduction

This final chapter synthesised the study's empirical evidence and drew out the principal conclusions and actionable recommendations. The study had examined equity in the allocation of educational resources across primary and secondary schools in Sonja Zone, Lusangazi District with four objectives: (1) to document resource distribution practices; (2) to analyse disparities in teacher qualifications, pupil–teacher ratios (PTRs), and learning materials; (3) to explore policy, geographic, and socioeconomic factors that contributed to inequitable allocation; and (4) to evaluate the implications of current allocation patterns for teacher performance and student readiness. The purpose of this chapter was to present the most salient findings from the mixed methods analysis, to interpret their implications in light of the literature and theoretical framing, and to propose practical and theoretical recommendations that could guide district action and future research. The chapter began with a structured

presentation of key empirical findings, moved to integrative conclusions that linked results to the problem statement and conceptual framework, and concluded with prioritized recommendations for practitioners, policymakers, and researchers along with considerations for implementation and future inquiry.

Key Findings

This section summarised the most important findings organized by the study's objectives and research questions. Findings drew on the simulated school audits, questionnaires, observation data, and interview narratives presented in Chapter Four.

Distributional profile and intra zone heterogeneity (Objective 1)

- Resource distributions varied substantially across Sonja Zone. Primary schools bore the greatest burdens: mean PTR for sampled primary schools was substantially higher (simulated mean ≈ 54.8) than for sampled secondary schools (simulated mean ≈ 33.8). Several primary schools exceeded PTRs of 65:1 (Chawama and Kapata in the sample), indicating acute overcrowding.
- Textbook:student ratios ranged widely (0.42 to 1.19), with secondary schools generally reporting higher ratios than primary schools. The Gini and Theil indices (simulated) indicated moderate within zone inequality in both material and staffing distributions, but inequality concentrated among a small set of remote primary schools, producing localized pockets of compounded disadvantage.

Teacher qualifications and staffing patterns (Objective 2)

- Certified teacher shares were uneven: secondary schools had higher proportions of certified teachers (simulated means ~64%–80%) while many primary schools had certified shares below 50%. An inferential comparison (simulated t test) indicated this difference was statistically significant in the sample.
- Recruitment and transfer patterns favoured less remote or higher performing schools, as reported by DEBS officers and headteachers, creating persistent staffing imbalances.

Learning materials: nominal availability versus effective access (Objectives 1 and 4)

- Audit counts sometimes overstated effective access. Although some schools showed reasonable textbook inventories on paper, observations revealed low classroom use (≈26% of lessons where most students used individual textbooks). Interviews explained this gap: late deliveries, damaged stock from inadequate storage, and lack of teacher orientation limited pedagogical integration.
- Student survey data showed only 28% ownership of individual textbooks and 68% sharing rates—evidence of limited per pupil access notwithstanding nominal inventories.

Mediating mechanisms and contextual moderators (Objective 3)

- Policy design: The central capitation formula was uniformly applied per school and lacked explicit remoteness or poverty weightings; hardship allowances were

inconsistently disbursed and poorly targeted, leaving intended corrective mechanisms under operationalised.

- Logistics and infrastructure: Seasonal road closures, transport costs, and inadequate storage explained delays and material degradation, disproportionately affecting southern sub zone schools.
- Community capacity: Active PTAs in some communities mitigated shortages via fundraising, but poorer communities lacked such capacity, which effectively amplified inequity.
- Governance and monitoring: District recordkeeping and monitoring were uneven; discrepancies between school inventories and DEBS registers were common, undermining transparency and corrective action.

Associations with teacher performance and student readiness (Objective 4)

- Both certified teacher share and textbook:student ratio were positively associated with teacher self efficacy and student self reported preparedness in simulated regression models. Textbook availability had a stronger association with preparedness where teachers reported regular pedagogical use.
- Remoteness moderated the effect of materials: in highly remote schools the marginal pedagogical benefit of textbooks was weaker, indicating that conversion factors (teacher skill, timing, infrastructure) were crucial for transforming inputs into learning.

Unexpected and nuanced findings

- Some larger or higher performing primary schools displayed unexpectedly better resource ratios, suggesting that historical visibility, donor targeting, or local advocacy influenced resource flows beyond strict need criteria. This pattern indicated that political economy factors and performance visibility could channel resources to already advantaged schools.

Overall pattern: the evidence showed that inequity in Sonja Zone was not just a matter of absolute shortages but of uneven distribution driven by policy design, logistical barriers, governance weaknesses, and unequal community capacity. Where multiple deficits co occurred (high PTR, few certified teachers, low effective textbook access), pedagogical conditions were markedly poorer.

Conclusions

This section drew integrative conclusions from the key findings, linked them to the study's problem statement and literature, and situated them within the conceptual and theoretical frameworks.

1. Equity deficits were structural, systemic, and spatially concentrated. The study concluded that inequities in Sonja Zone were systemic rather than random: centrally uniform allocation rules, combined with district level implementation constraints and geographic barriers, produced predictable disadvantages for remote primary schools. This conclusion aligned with national and regional evidence that formulaic approaches without remoteness weightings tended to produce urban bias and rural under resourcing (World Bank, 2020; Dube, 2020).

From a Rawlsian vantage, the allocation system failed to prioritise the least advantaged in practice, even where policy texts acknowledged rural hardship (Rawls, 1971).

2. Nominal inputs did not equate to effective educational resources. The study concluded that raw counts (textbooks in stock, teacher headcounts) could misrepresent functional access when timing, condition, storage, and pedagogical use were ignored. This finding supported UNICEF and USAID arguments that material provision requires complementary supply chain reliability and teacher support to yield learning gains (UNICEF, 2019; USAID, 2019). Sen's capability approach clarified why counted inputs yielded differing educational functionings across contexts—the conversion of resources into learning depended on local conditions and capacities (Sen, 1999).
3. Human resource quality and deployment were central to educational capability. The observed correlation between teacher certification shares and self efficacy suggested that human capital mattered for instructional capacity. However, the study concluded that credentialing alone was insufficient: retention, induction, and continuous professional development in rural contexts were necessary to translate certification into improved classroom practice. This nuance extended human capital theory by emphasising institutional supports as crucial conversion mechanisms (Becker, 1964).
4. Governance and logistical failures were proximate causes of inequity. Interviews and documentary triangulation indicated that delayed disbursements, incomplete records, and weak monitoring were proximate operational causes of material shortages and unequal staffing outcomes. Resource dependence and governance theories explained district offices' constrained capacity and how political economy factors influenced visibility and resource flows (Pfeffer & Salancik, 1978; Ngulube, 2017).
5. Community mitigation was helpful but unequal. While PTAs and local fundraising improved conditions in some schools, reliance on community capacity reproduced inequity across wealth lines. The conclusion was that policy should not delegate core provisioning to local fundraising where that delegation deepened disparities—a point consistent with the literature on how local financing can widen rather than narrow gaps (Jones & Kanyama, 2014).
6. Policy levers required simultaneous attention to inputs and conversion processes. Collectively, the findings supported a multifaceted policy response: reweighting of funding formulas; strengthening procurement, delivery, and storage systems; and investing in teacher incentives and professional development designed for remote contexts. The conceptual framework's mediators and moderators were empirically validated: allocation inputs, mediated by instructional capacity and community support and moderated by remoteness and socioeconomic status, jointly determined proximal outcomes.

Limitations caveat: Conclusions were derived from a focused zone level mixed methods study and were contextually bounded; while the mechanisms identified had broader plausibility, national extrapolation required caution.

Recommendations

Recommendations were grouped for immediate district action, medium term systemic reform, and future research. Each recommendation was practical, evidence based, and sensitive to Lusangazi's administrative realities.

A. Immediate and operational recommendations (district and schools; 0–12 months)

Establish a remoteness adjusted rapid response allocation

- DEBS should implement an interim top up mechanism that targeted the most remote primary schools identified by the zone audit (for example, Chawama and Kapata). The top up could finance transport of textbooks and emergency classroom furniture during high need terms. This targeted top up would be administratively simple, politically defensible, and immediately impactful.

Synchronise textbook procurement and delivery with the academic calendar

- Procurement schedules should guarantee delivery at least two weeks before term start. DEBS should publish and communicate delivery windows and require delivery receipts at school level; delayed shipments should trigger corrective procurement actions. Better scheduling would improve effective access and reduce the mismatch between counted inventories and classroom utilization.

Short term teacher support and orientation

- Conduct short, on site teacher orientation workshops during textbook distribution rounds to demonstrate ways to integrate texts into lesson sequences. Even brief, practical sessions increased the likelihood that new materials would be used effectively (UNICEF, 2019).

B. Medium term policy and governance reforms (12–36 months)

Reform the capitation formula to include explicit remoteness and poverty weightings.

- Lusangazi DEBS, in collaboration with the Ministry, should pilot a reweighted capitation formula that includes remoteness (travel time index) and school size. Pilot evaluation should measure changes in PTR, textbook access, and teacher retention, informing scale up. This aligns with evidence that need sensitive financing yields higher equity returns (World Bank, 2021).

Institutionalise predictable hardship allowances and rural posting incentives.

- Hardship allowances should be ring fenced and disbursed on a predictable schedule tied to posting contracts. Non financial supports (mentoring, rotational leave, professional development) should accompany allowances to improve retention and convert postings into sustainable human resource improvements (Kapinga, 2018).

Strengthen supply chain and storage capacity.

- Investment in low cost improvements—secure storerooms, raised shelving, waterproofing—would reduce damage and loss. Where feasible, DEBS should aggregate transport contracts to reduce per delivery cost and negotiate seasonal contingency arrangements.

Improve transparency, monitoring, and community engagement.

- Implement simple digital or paper logbooks for school receipts and a quarterly public posting of resource arrivals so PTAs and community members can monitor flows. Routine audits and community scorecards would increase accountability and reduce record discrepancies (Ngulube, 2017).

C. Research and evaluation recommendations (36+ months)

Implement phased evaluation designs and panel monitoring.

- Future research should exploit phased roll outs or pilot reweighting to generate causal evidence (difference in differences or stepped wedge designs) about the effects of funding changes on PTRs, teacher retention, and learning outcomes.

Study conversion mechanisms in depth.

- Qualitative and micro experimental studies should test which teacher supports (mentoring, demonstration lessons, short in service modules) most effectively increase textbook use and learning in remote contexts, acknowledging the mediation role emphasised by Sen's capability approach.

Broaden socio economic measurement at community level.

- Future surveys should include household level measures of capacity and social capital to better model how community resources moderate school level outcomes and to avoid proxy biases.

D. Implementation considerations and sequencing

- Prioritise low cost, high impact operational fixes (synchronised delivery, basic storage, teacher orientation) while designing pilot financing reforms. Engagement with district and central finance actors early in reform design would improve feasibility. Donor and NGO partners could co finance pilot top ups and storage upgrades while government systems adapt. Importantly, monitoring and evaluation components should be embedded from the outset to track effectiveness and unintended consequences.

Chapter Summary

This chapter synthesised the study's principal findings, drew evidence based conclusions, and proposed practical and research recommendations targeted to district managers, national policymakers, school leaders, and researchers. The study had documented pronounced intra zone heterogeneity in resource endowments, with remote primary schools facing stacked deficits in PTR, teacher certification, and functional access to learning materials. The mixed methods evidence validated the

conceptual framework: inputs, mediated by instructional capacity and community support and moderated by remoteness and socioeconomic status, jointly determined proximal teacher and student outcomes. Policy and operational failures—uniform capitation formulas without remoteness weightings, late disbursements, weak monitoring, and transport constraints—emerged as proximate drivers of inequity, while community mitigation efforts partly offset but also exacerbated differences across catchments.

Recommendations ranged from immediate, operational fixes (synchronised delivery, short teacher orientations, emergency top ups) to medium term fiscal and governance reforms (remoteness weighted capitation, predictable hardship allowances, strengthened supply chains) and longer term research priorities (phased evaluations, conversion mechanism studies). These steps were framed to be administratively feasible, evidence informed, and sensitive to Lusangazi's contextual realities. The closing chapter of the thesis will present a concise summary of the study, reflect on limitations, and offer final remarks on the study's contributions to knowledge and policy for advancing equity in rural education.

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Appendices

Appendix A: School Resource Audit Checklist (sample)

- School name: _____
- School ID: _____ | Date: ____/____/20__ | Enumerator: _____
- GPS coordinates: _____ | Sub zone: North / South

1. Enrolment and staffing

- Total enrolment (all grades): _____
- Enrolment (Grade 6): _____ | (Grade 12): _____
- Number of teaching staff (total): _____
- Number of certified teachers: _____
- Number of non certified/contract teachers: _____
- Number of classrooms in use: _____
- Number of classroom blocks (permanent): _____
- Number of temporary/thatched classrooms: _____

2. Physical infrastructure (counts & condition)

- Desks/chairs (functional): _____ | Condition: Good / Fair / Poor
- Blackboards/whiteboards (functional): _____ | Count: _____
- Library room: Yes / No | Number of titles (approx): _____
- Staffroom: Yes / No | Electricity: Yes / No
- Latrine blocks (student): _____ | Separate for girls: Yes / No
- Water source: Borehole / Rainwater / River / None | Functioning: Yes / No

3. Learning materials (by subject/grade) — record physical evidence where possible

- Total textbooks (school inventory): _____ | Inventory available: Yes / No
- Textbooks — English: _____; Mathematics: _____; Science: _____; Local language: _____
- Textbook:student ratio (calculated) = _____
- Teacher guides/workbooks count: _____
- Science lab equipment (list main items and condition): _____

- Visual aids (posters, charts): Yes / No | Examples: _____
- ICT devices (functional): Computers _____; Projectors _____; Radios _____ | Electricity available: Yes / No

4. Storage and security
- Dedicated storeroom: Yes / No | Lockable: Yes / No
- Evidence of pest/ water damage to materials: Yes / No | Describe: _____
- Recent deliveries (last 12 months): Textbooks? Yes / No | Date of last major delivery: ____/____/20__

5. Finance and records
- Capitation grant receipt (most recent): Date ____/____/20__ | Amount: _____
- Evidence of other grants/donor support: Yes / No | Describe: _____
- School inventory register present: Yes / No | Up to date: Yes / No

6. Notes and verifier signatures
- Discrepancies observed between register and physical stock: Describe: _____
- Headteacher/verifier name: _____ | Signature: _____ | Date: ____/____/20__
- Enumerator notes (logistics, access issues, other observations): _____

Appendix B: Teacher Questionnaire (sample)
- School: _____ | Teacher code: _____ | Gender: M / F | Years teaching: _____
- Highest qualification: Certificate / Diploma / Degree / Other: _____ | Subjects taught: _____

Section A — Resource access and use
1. How often did you receive textbooks for core subjects this year? Never / Once / Twice / More than twice
2. For the classes you teach, textbook availability is: Very adequate / Adequate / Inadequate / Very inadequate
3. Do you have a teacher guide for the curriculum? Yes / No
4. How frequently do you use textbooks during lessons? Never / Rarely / Sometimes / Often / Always

Section B — Professional development and support
5. Have you attended any in service training in the past 12 months? Yes / No
6. If yes, number of days: _____; Topic(s): _____
7. How would you rate your preparedness to use textbooks effectively? 1 (Not prepared) — 5 (Very prepared)

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Section C — Classroom practice and constraints

8. How often do you use group work in lessons? Never / Rarely / Sometimes / Often / Always
9. What are the main constraints to using textbooks in class? (tick all that apply) Late delivery; Damaged books; Shared books; Large class size; Lack of teacher guides; Other: _____
10. What local strategies have you used to cope with material shortages? Short answer: _____

Section D — Consent and confidentiality (note)

- Responses were anonymised and used for research only; participation was voluntary.
- (Coding notes: Likert items = 1–5; frequency items coded 0–4; open items to be thematically coded.)
- Appendix C: Student Questionnaire (Grade 6 — sample)
- School: _____ | Student code: _____ | Age: ____ | Gender: M / F

1. Do you have your own textbook for this subject? Yes / No
2. If no, how many pupils share one textbook in your class on average? _____
3. How often does the teacher ask you to read from the textbook in class? Never / Rarely / Sometimes / Often / Always
4. Do you have a quiet place to study at home? Yes / No
5. How prepared do you feel for your classwork? Not prepared / Somewhat / Prepared / Very prepared

(Administration note: For younger pupils, items were read aloud in groups by enumerators. Responses recorded individually.)

Appendix D: Headteacher Interview Guide (semi structured)

- Interviewee: _____ | Role: Headteacher | School: _____ | Date: ____/____/20__

Opening: Brief project recap and consent confirmation.

Themes and sample probes:

1. Resource inflows and records

- Describe the recent history of textbook deliveries and capitation grant disbursements to your school.
- Have you observed changes in timing or quantity in the last two years?

2. Storage, condition, and utilisation

- How are materials stored, and what problems have you faced with storage?
- How do teachers integrate textbooks into lessons? Are there constraints?

3. Staffing and teacher support

- Describe teacher recruitment, retention, and transfer patterns for your school.

- What incentives or supports help retain staff here?

4. Community engagement and PTA role
- What fundraising or material support has the community provided?
- How does the PTA participate in monitoring resource use?

5. Monitoring, recordkeeping, and accountability
- How do you record receipts and use of materials?
- Are there audits or follow ups from DEBS? How effective are they?

Closing: Any additional issues and suggestions for improving equity in resource allocation.
(Probe for specific examples, dates, and documents. Interviews were audio recorded with consent; notes taken.)

Appendix E: DEBS Officer Interview Guide (semi structured)
- Interviewee: _____ | Position: _____ | Date: ____/____/20__

Themes and sample probes:
1. **Allocation rules and formulae**
- Explain the capitation formula currently used. Are there remoteness or poverty weightings?
- How are hardship allowances operationalised?

2. **Disbursement processes and schedules**
- Describe the timetable for grant and material disbursements. What have been recent bottlenecks?

3. **Procurement and logistics**
- How are textbook procurements coordinated? What transport and storage arrangements exist?

4. **Monitoring and accountability**
- What systems exist for verifying school receipts and inventories? How are discrepancies addressed?

5. **Policy constraints and reform options**
- What changes would be feasible to improve equity (funding, logistics, capacity building)?

(Ask for documentary evidence where possible; audio record with consent.)

Appendix F: Classroom Observation Checklist (sample)

- School: _____ | Class/Grade: _____ | Subject: _____ | Observer: _____ | Date: ____/____/20__

Observation items (tick and brief note)

1. Use of textbooks during lesson: None / Some pupils / Most pupils / All pupils
2. Teacher uses teacher guide: Yes / No
3. Presence of visual aids (charts/posters): Yes / No | Describe: _____
4. Group work observed: Yes / No | Frequency: Low / Medium / High
5. Teacher movement among pupils: Rare / Occasional / Frequent
6. Assessment or feedback observed: None / Individual / Group / Written
7. Classroom management (noise/order): Poor / Fair / Good / Excellent
8. Notes on improvisation (e.g., chalk drawings): _____

(Observers recorded time stamps for lesson phases and short verbatim quotes where relevant.)

Appendix G: PTA Focus Group Guide (sample)

- Community: _____ | Date: ____/____/20__ | Facilitator: _____

Discussion prompts:

1. Describe recent fundraising activities and what funds purchased.
2. How are PTA decisions on spending made and recorded?
3. What challenges do you face in raising funds or monitoring resource use?
4. What support would PTA members like from DEBS or NGOs?

(Record participant list, roles, and approximate household socioeconomic markers for context.)

Appendix H: Participant Information and Consent Template (sample)

Title: Study on Equity in Educational Resource Allocation — Sonja Zone

- **Purpose:** Brief statement of study aims.
- **Procedures:** Summary of what participation involves (questionnaire, interview, observation).
- **Risks and benefits:** Minimal risk; potential benefits for policy.
- **Confidentiality:** Data anonymised; secure storage.
- **Voluntary participation:** Right to withdraw at any time.
- **Consent:** Participant name/signature; date; researcher signature.

(Adapt and translate consent script into local language; collect parental consent for minors with guardian signature.)

Appendix I: Coding Frame (sample for qualitative data)

Top level codes and short definitions:

- Policy design: References to formulas, allowances, official rules.
- Disbursement timing: References to dates, delays, delivery windows.

- Logistics/infrastructure: Roads, transport, storage condition.
- Teacher HR: Recruitment, transfers, incentives, PD.
- Community capacity: PTA funds, local contributions, social capital.
- Material utilisation: Teacher use, timing, condition, pedagogical integration.
- Monitoring/accountability: Records, audits, transparency issues.
- Coping strategies: Improvisation, sharing, local repairs.

(Coding instructions: apply multiple codes where excerpts touch >1 theme; record node attributes: school ID, respondent type, remote/near.)

Notes on use and adaptation

- Instruments were piloted and translated as needed; wording and response formats were adapted for local comprehension.
- Enumerators received training on ethical procedures, question neutrality, and inter rater reliability for audits and observations.
- Data collection forms included unique IDs to link audit, questionnaire, observation, and interview data for each school while preserving respondent anonymity.
- For actual deployment, insert official school register names, local language translations, and district letterhead in consent forms.