

DODOMA WASHED SAND LIMITED

A PROPOSED PROJECT FOR THE ESTABLISHMENT  
OF WASHED SAND PLANT

PROJECT LOCATION:  
MULEBE, CHAMWINO DISTRICT, DODOMA, TANZANIA

A BUSINESS PLAN  
2025-2030

MAY, 2025

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## **LIST OF ACCRONYMS AND ABBREVIATIONS**

EBIT	-	Earnings Before Interest and Taxes
EBITDA	-	Earnings Before Interest, Taxes, Depreciation, and Amortization
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
GDP	-	Gross Domestic Product
IRR	-	Internal Rate of Return
NEMC	-	National Environment Management Council
NPV	-	Net Present Value
OSHA	-	Occupational Safety and Health Administration
PI	-	Profitability Index

## **EXECUTIVE SUMMARY**

The proposed project involves the establishment of a washed sand processing facility in Mulebe, located in the Chamwino District of Dodoma. This project is designed to provide high-quality washed sand to satisfy the increasing demands of the rapidly growing construction sector in Dodoma. As the capital city, Dodoma is undergoing significant urban expansion, with a 6.4% annual population growth rate since 2016 and a built-up area increase of over 440% in the past twenty years. This rapid development has put pressure on the supply of construction materials, particularly sand, which is often of substandard quality locally due to the presence of salts, clay, and other impurities. The business concept focuses on producing clean, specification-grade sand that enhances the strength and durability of concrete, thereby filling a crucial gap in the market.

**Market Analysis:** The construction sector in Dodoma and its neighboring areas is experiencing a surge, fueled by government infrastructure initiatives and private real estate projects. The local sand market is significant and growing; however, the sand sourced from regions such as Nala is frequently inadequate for standard concrete applications due to its impurities. Contractors are currently facing challenges with inconsistent sand quality, which adversely impacts their concrete work. This project aims to cater to major contractors, government projects, institutions, and individual builders by offering a superior product. Our market research reveals a strong demand and a readiness to pay a premium for dependable, clean sand that complies with building standards.

**Technical Feasibility:** The facility will be located in a convenient area within the Chamwino District, in proximity to significant sand deposits and easily

accessible from Dodoma city. We intend to employ established sand washing technology from reputable Chinese manufacturers, such as LZZG and SANME, to process and classify raw sand. The selected equipment will effectively eliminate silt, clay, and salts, producing both coarse and fine aggregates with minimal contaminants. With a projected maximum production capacity of 2,000 tons per day during peak operations, the facility will adequately meet current demand while accommodating future expansion. Necessary infrastructure, including water sources, power supply, and access roads, has been evaluated, and environmental strategies such as water recycling and sediment control will be implemented to promote sustainability.

**Financial Projections:** The initiative necessitates an initial capital investment of approximately TZS 3.2 billion (around US\$1.3 million) to finance plant equipment, vehicles, site development, and working capital. Financial assessments indicate robust revenues anticipated from the sale of washed sand at roughly TZS 68,000 per cubic meter, with annual sales projected to reach TZS 1.5–2.0 billion following the ramp-up phase. Operating expenses, including fuel, labor, and maintenance, have been meticulously calculated, resulting in substantial profit margins attributed to the value-added process of washing. The five-year financial projection indicates a trend of increasing net profits, with an expected Net Present Value (NPV) in the billions of shillings (using a 15% discount rate), and an Internal Rate of Return (IRR) on investment estimated between 20% and 25%. The anticipated payback period for the project is around four years, suggesting a favorable return.

**Conclusions & Recommendation:** Our comprehensive feasibility study, which encompasses market, technical, financial, and regulatory

dimensions, concludes that the washed sand plant represents a viable and promising opportunity. Market analysis indicates a substantial demand-supply imbalance for high-quality sand, while our technical strategy illustrates the ability to produce to the required standards efficiently. From a financial perspective, the project is expected to yield significant returns under reasonable conditions, and the primary risks, including market competition and operational challenges, can be effectively managed through the proposed mitigation strategies. We advise advancing with the project, contingent upon obtaining the necessary permits and financing. The execution of this initiative will not only provide profits for investors but also enhance construction quality in Dodoma and generate local employment opportunities. In conclusion, it is prudent to proceed with the establishment of the washed sand processing facility.

# **1. INTRODUCTION**

## **1.1 Project Background**

Dodoma's elevation to Tanzania's capital city has spurred an unprecedented construction boom, including new government buildings, housing developments, roads, and commercial projects. This rapid development has created heavy demand for construction materials such as sand. However, much of the sand naturally available around Dodoma (from riverbeds or pits in areas like Nala ward) contains high levels of impurities – notably salt, clay, and organic matter – which compromise the strength of concrete. Standard concrete requires clean, well-graded sand; if sand has excess salts or silt, it can lead to structural weaknesses and long-term durability issues (e.g. corrosion of reinforcement). Currently, many builders in Dodoma resort to available below standard sand.

The promoters of this project Dodoma Washed Sand LTD observed this market gap and conceived the idea of a Washed Sand Processing Plant in Mulebe, Chamwino District (just outside Dodoma city). Mulebe is strategically located near known sand quarries and has available land for industrial use. By setting up a washing plant at the source, the project will deliver ready-to-use clean sand to customers, ensuring consistent quality and compliance with building standards. This business aligns with national development goals, as it supports the construction sector's growth while introducing better technology and environmental management in sand mining. The project is expected to both be profitable and have socio-economic benefits: improved infrastructure quality, employment opportunities, and reduced environmental damage from uncontrolled sand mining or improper usage of saline sand.

## **1.2 Objectives of the Project Feasibility Study**

The purpose of this business plan (feasibility study) is to assess the viability of the washed sand processing plant from multiple perspectives and provide a roadmap for implementation. Key objectives include:

**Market Analysis:** Determine the demand for washed sand in Dodoma and surrounding regions, identify potential customers and competitors, and analyze pricing and market trends.

**Technical Feasibility:** Evaluate the best location, raw material availability, and suitable sand washing technology (with emphasis on cost-effective Chinese equipment) for the proposed plant. Define the production process, capacity, infrastructure needs, and environmental considerations.

**Financial Analysis:** Estimate capital and operating costs, project revenue and profits over a 5-10 year period, and calculate financial metrics (NPV, IRR, payback period) to gauge the project's return on investment.

**Organizational Plan:** Propose an appropriate management and staffing structure for the project, highlighting the roles of key individuals such as Mr Omary Njovu et al and any outsourcing or partnership arrangements.

**Legal & Regulatory Review:** Identify all permits and compliance requirements (mining licenses, environmental clearances, OSHA compliance, etc.) for the plant, and examine any legal risks or obligations.

**Risk Assessment:** Identify potential risks (market, technical, financial, environmental) that could impact the project and develop mitigation strategies for each.

**Recommendations:** Based on the findings, provide a clear recommendation on whether to proceed with the project and outline next steps for implementation if approved.

### 1.3 The Project Promoters

The Project Promoter is Dodoma Washed Sand LTD. The company was incorporated under Certificate No: 184776308 dated the 09<sup>th</sup> day of May 2025 with Authorized Share Capital of Tshs 1,500,000,000/= divided into 1000 shares of Tshs 1,500,000/= each. The following is the full list of directors/shareholders of the company:

S/NO	Name and Address of Shareholders	Nationality	Number of Shares	% Shareholding
1.	Omary Njovu P. o. Box Dar es Salaam	Tanzanian	-	95%
2.	Joseph P. o. Box Dar es Salaam	Tanzanian	-	05%

The shareholders Dodoma Washed Sand Ltd, the project developers, are well-established executives, carrying out various businesses but majoring in Mining & Processing Building Minerals and selling Building Materials. They also deal with processing food products such as cooking oil.

#### **1.4 Scope of the Business Plan**

This business plan presents a comprehensive analysis covering the aforementioned objectives. The scope includes desktop research, field survey data, and preliminary engineering assessments carried out for the project in Dar es Salaam, Dodoma and Tanga. Geographically, the focus is on Dodoma Region (with specific attention to Chamwino District and Dodoma city as the primary market) and potentially neighboring regions if surplus production is considered. The technical scope covers the end-to-end sand processing operation – from raw sand excavation to washing, grading, and delivery logistics. Financial projections are done for a 5-year horizon (with some longer-term considerations) to capture the project’s ramp-up and stabilization phase.

It is important to note that this plan is based on the best available information as of 2025, including market prices, regulatory frameworks, and technology options. Where exact data was unavailable, reasonable assumptions (noted in the document) were made. The plan is structured into sections covering all major aspects of the project, followed by annexes with detailed data (e.g. budget breakdown, technical specifications, survey results). This document is intended to guide investment decisions and planning for implementation; it should be followed by detailed engineering designs and formalities (e.g. full Environmental Impact Assessment) once the decision to proceed is confirmed.

## 2. MARKET ANALYSIS

### 2.1 Construction Sand Market in Dodoma

Dodoma region is undergoing a construction surge, fueled by its status as the administrative capital and by sustained economic growth in Tanzania. Nationally, the construction sector contributed about 8.3% to GDP in 2022 and was valued around Tshs 22.8 trillion (US\$9.5 billion) in 2023. The government's renewed drive to develop Dodoma "to a standard befitting a capital city" is a significant driver of construction activity. This includes large-scale projects such as government ministry buildings, highways (e.g. the Outer Ring Road project), and social infrastructure (universities, hospitals, etc.). The private sector has also followed with residential and commercial developments to accommodate the growing population and business opportunities. Since the government relocation in 2016, Dodoma's population has swelled to over 765,000 (2022) with ~6% annual growth, and its built-up area expanded more than fourfold in two decades – clear evidence of a high demand for construction materials.

In this context, sand is a critical material, used in concrete, mortar, and other works. The local market for construction sand in Dodoma can be characterized as follows:

**Current Supply:** Sand for building in Dodoma is primarily sourced from local riverbeds and pits. Notable extraction areas include Nala, Chinangali, and other seasonal river sites in Dodoma and Chamwino districts. These are typically operated by informal miners or small contractors. The unprocessed sand from these sources often contains clay/silt and salts. Some supply also comes as byproduct of quarry operations (where rock is crushed and the fines used as sand substitute). However, no major commercial washing

operation exists currently in Dodoma, meaning most sand in the market is unwashed.

**Quality Issues:** According to field observations and feedback from contractors, the raw sand from local pits has impurities that make it substandard for high-strength concrete. For instance, high salt content can cause efflorescence and steel corrosion, while clay and silt reduce bonding in concrete. Builders sometimes manually wash sand or mix with imported clean sand to meet project specifications, which adds cost. This quality gap represents a market opportunity: providing pre-washed sand that reliably meets standards (e.g. minimal silt, negligible salt) will be valued by quality-conscious customers.

**Market Size:** Estimating the total sand demand in Dodoma is complex, but it correlates with construction volumes. Based on building permit data and infrastructure projects, we estimate that Dodoma’s construction sector currently consumes on the order of 300,000 – 400,000 cubic meters of sand per year (equivalent to roughly 500,000–600,000 tons). This translates to a market value of around TSh 20–25 billion annually (US\$8–10 million) at prevailing prices. Demand is expected to grow at 8-10% per year over the next five years, driven by continued urbanization and planned public works. By 2030, annual sand demand in the region could approach 500,000+ m<sup>3</sup>. Notably, peak demand periods occur when large projects (e.g. road construction, new government complexes) are in full swing, requiring tens of thousands of cubic meters within months.

**Pricing Trends:** Construction sand prices in Dodoma have been rising due to high demand and limited quality supply. As of 2025, unwashed pit sand sells for roughly TSh 50,000–60,000 per cubic meter (at pit or delivered

nearby). Washed sand, which is not commonly available locally, can command higher prices; we project a selling price of about TSh 68,000 per cubic meter for our premium washed product. This pricing is competitive when considering the value delivered (e.g. contractors can use slightly less cement and get higher strength, and avoid on-site washing costs). In other regions such as Tanga and Dar es Salaam, surveys show sand prices vary widely (e.g. TSh 25,000–37,000/m<sup>3</sup> in Tanga in 2019, but Dodoma’s landlocked location and recent boom put it at the higher end. We anticipate that by offering a consistent volume of quality sand, we may also stabilize prices to some extent, as currently shortages can spike prices further during peak construction seasons.

**Market Outlook:** The outlook for the sand market is strongly positive. Government budget allocations to development are rising, with capital expenditures increasing over 10% yearly in recent budgets. Dodoma’s transformation into a modern capital city will continue to drive demand for aggregates. Even if broader economic growth moderates, basic infrastructure (roads, schools, water systems) and housing needs in the region will sustain construction activity. The key trend is a gradual shift toward better quality materials and compliance – contractors and regulators are increasingly aware that using poor quality sand leads to failures and higher lifecycle costs. This trend bodes well for our project, which aligns with providing higher-grade sand.

## **2.2 Demand Forecast**

For planning purposes, we forecast the demand for our washed sand product in a conservative, base-case scenario as well as an optimistic scenario:

**Base Case:** We target capturing a market share of about 20-25% of the available market within the first 3 years. This equates to sales of roughly 60,000 m<sup>3</sup> per year (5,000 m<sup>3</sup>/month) by year 3. This volume corresponds to serving a few large projects and a steady flow of smaller buyers. The base-case assumes moderate adoption – some contractors may initially continue using cheaper unwashed sand for non-critical works, but gradually more switch to washed sand as awareness of quality benefits grows.

**High Case:** If the construction boom continues unabated and our plant performs reliably, we could capture up to 40% of the market by year 5, especially if we expand distribution. This would mean selling ~120,000 m<sup>3</sup> per year by year 5 (about 10,000 m<sup>3</sup>/month). The high-case could be realized if, for example, major government projects (new highways, an airport, etc.) are ongoing and specify washed sand, and if we establish satellite distribution yards in the city to ease access for buyers.

**Drivers of Demand Growth:** Key factors considered in the forecast include population growth (translating to housing needs), government infrastructure plans (outlined in Dodoma Master Plan and national budgets), and the pace of private investments (e.g. new industries in Nala Industrial Zone requiring construction). The relocation of government HQ to Dodoma has a multiplier effect on growth. Dodoma city's population is projected to exceed 1 million before 2030, implying continuous expansion of urban housing and services. Each new housing/commercial development requires hundreds to thousands of cubic meters of sand. Additionally, large-scale projects like the Dodoma Outer Ring Road (110 km) and potential standard gauge railway extensions will consume enormous quantities of sand for concrete and earthworks, some of which our plant could supply (particularly if quality or grading is required).

**Seasonality:** Construction in Dodoma is somewhat seasonal, with the dry season (roughly May–October) being the peak for building activity (less rain interruptions). During rainy season months, demand dips slightly. Our plant’s production can be modulated accordingly – building inventory in slower months to supply peak months. The forecast accounts for this by averaging out monthly sales but recognizes possible surges.

In summary, we foresee steadily increasing demand for washed sand. Even under conservative estimates, the plant would operate at a significant fraction of its capacity by year 3. Under favorable market conditions, we may need to consider capacity expansion or longer operating hours by year 5 to meet demand.

### **2.3 Competitor Analysis**

Currently, there are no direct competitors in Dodoma offering fully washed sand as a packaged product. However, it’s important to analyze the existing supply landscape and potential future competition:

**Local Sand Suppliers:** These include individual sand pit owners and small-scale miners particularly along river valleys (like the Mundemu and Mkondai seasonal rivers) and areas such as Nala. They typically use loaders or laborers to excavate sand and sell it by truckload. The quality is variable; some try rudimentary methods like letting rain wash the sand or coarse sieving to remove large debris. These suppliers compete mainly on price and convenience (proximity to sites). They often have lower operating costs (no washing equipment), allowing them to sell cheaper. However, their product’s unreliability is a weakness. Our strategy to compete with them is to differentiate on quality and reliability rather than price alone. We will

educate customers on how using our sand improves construction quality and reduces rework costs.

**Aggregate/Crusher Companies:** A few companies in Dodoma region crush rocks to produce aggregates for concrete (e.g., 20mm gravel). Some of them also produce manufactured sand (crushed stone sand) especially if natural sand is scarce. Manufactured sand can be good quality but often has stone dust that also benefits from washing. At present, none of these have an integrated washing plant in Dodoma. But larger construction/material companies (for instance, Estim Construction in Dar es Salaam invested in a Combo X70 wash plant could consider bringing similar capabilities to Dodoma if they see our success. We consider these potential future entrants. They have the advantage of capital and existing client base. Our plan to stay competitive includes being first to market, achieving economies of scale, and possibly locking in key clients with supply contracts. Early mover advantage will help build customer loyalty before others enter.

**Regional Importers:** In extreme cases of shortage, sand has been trucked from other regions (e.g. from Morogoro or even bagged sand from coastal areas). This is expensive and done only if local supply fails. If our plant runs at capacity, it will reduce the need for any imported sand. However, we should be aware that if our pricing is too high, contractors might still consider sourcing externally for critical works. Thus, we intend to price competitively relative to the delivered cost of sand from alternate sources.

**Quality Comparison:** Our washed sand will be tested to ensure it meets standards (e.g. TBS standards for fine aggregates, which specify limits on silt content, etc.). Unwashed sand often has 5-10% silt; we will reduce this below 3%. Salt content (chlorides) in unwashed Dodoma sand can cause

efflorescence; our process will significantly lower soluble salt levels. Essentially, no existing competitor can consistently match our quality. This is a key selling point. In marketing, we will provide lab reports or demos showing, for example, the strength of concrete cubes made with our sand versus local unwashed sand to demonstrate the difference.

**Market Share and Capacity:** As of now, the numerous small suppliers collectively serve 100% of the market. Post-entry, we aim to capture at least a quarter of that within a few years. Because many small players operate informally, gaining share largely means attracting customers away from the status quo practice rather than out-competing a single entity. If we are successful and there's high uptake, we might see some of these small suppliers trying to partner with us (e.g. to supply raw sand) or improve their product (perhaps by rudimentary washing). That is manageable since our scale and technology advantage will be hard to match without significant investment.

Generally, while direct competition in washed sand is absent at inception, we will compete against the entrenched habit of using cheaper but lower-grade sand. Our competitive edge lies in quality assurance, consistent availability, and professional service (timely deliveries, volume discounts for big projects, technical support to customers). By positioning ourselves as a reliable partner to the construction industry (rather than just a commodity vendor), we anticipate building a strong market position before any new entrants emerge.

## **2.4 Customer Segmentation and Target Clients**

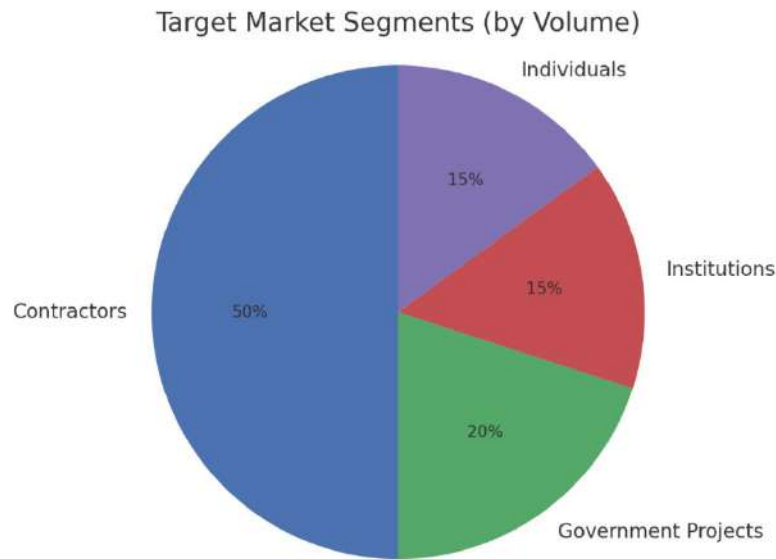
The potential customer base for washed sand in Dodoma spans a variety of segments. We have identified the following primary customer groups and their characteristics:

**Construction Contractors (Private Sector):** These are builders of residential, commercial, and industrial projects – ranging from small local contractors to large companies. They are expected to be our largest customer segment, possibly accounting for around half of our sales volume. They require sand in bulk for making concrete, block making, plastering, etc. Key concerns for them are cost, consistency, and meeting project specifications. We will target established contractors in Dodoma (and nearby regions) through direct sales calls and demonstrations. For instance, companies building new housing estates or office complexes can become repeat customers. Many contractors' own trucks, so they might prefer picking up sand at our plant (ex-plant sales), while others will need delivery. We will accommodate both.

**Government and Public Projects:** This segment includes road contractors, state-owned construction agencies, and procurement for public works (schools, hospitals, government offices). Such projects often have stricter quality requirements and larger volume needs. We estimate this segment could make up ~20% of sales. For example, if a new road is being built, the contractor might require tens of thousands of cubic meters of sand for concrete culverts, stabilization, etc. We plan to engage with government tender processes – positioning our product as a means for contractors to meet quality specs (NIT, TANROADS standards). Building relationships with project engineers and procurement officers is crucial so that washed sand is specified or at least preferred in project documents.

**Institutions and Corporate Clients:** Various institutions such as schools, universities, hospitals, NGOs, and companies setting up facilities will need construction materials. Some may undertake construction independently or through hired builders. This segment (roughly 15% of our market share) includes entities like the University of Dodoma (expanding campus), major hospitals (building new wards), or NGOs building community infrastructure. They may not buy sand directly (they hire contractors), but we will market to them in the sense of raising awareness that using washed sand is a best practice for durability (particularly for NGOs or institutions keen on quality). We might indirectly reach them by ensuring their contractors use our sand. Additionally, pre-cast concrete product manufacturers (if any local, e.g. those making blocks, tiles) fall in this category – they will be interested in the consistency of grain size our product offers.

**Individual Home Builders:** This segment comprises individual customers constructing their own houses or small projects. They typically buy sand by the truckload from the nearest pit or supplier. While each individual's volume is small, collectively they contribute to demand (estimated ~15% of volume). They are also quite sensitive to price but also suffer the most from poor quality (since they may not have technical know-how to test sand quality). Our strategy for this segment is to make our sand available in local building materials stockists/yards in Dodoma city and nearby towns. By partnering with retailers or setting up depots, we can sell to individuals per truck or even bag (for smaller quantities) at slightly higher unit prices. We will advertise in local media and use signage to inform this segment that “washed sand” is available – appealing to the aspirational homeowner who wants a durable home. However, we acknowledge that cost might deter some individuals, so this segment will likely grow as our prices become more competitive with scale or if regulation enforces quality.



**Figure 1: Estimated share of sales volume by customer segment in the Dodoma market**

The contractors' segment is expected to account for around half of our sales, given the numerous private building projects. Government projects (infrastructure and public buildings) form another substantial portion (~20%). Institutions (schools, NGOs, etc.) and individual home builders together make up the remaining ~30%. This segmentation guides our marketing and distribution strategy, tailoring services (e.g. bulk delivery for contractors vs. retail access for individuals).

In terms of reaching these customers, our marketing approach will include:

**Direct Marketing and Relationships:** for large contractors and government projects – visiting sites, providing sample sand for trial, demonstrating how using washed sand can improve their concrete mix (perhaps holding a seminar with engineers and contractors). We will highlight examples from elsewhere: e.g., *“In Dar es Salaam, a major contractor adopted washed sand*

*and reported higher concrete strengths and reduced cement usage” to build confidence.*

**Distribution Network:** for smaller customers – ensuring our sand is stocked by building material suppliers in Dodoma city. If needed, we will operate our own yard in the city to store washed sand for easy pick-up. Convenience will drive adoption in this segment.

**Branding:** We may brand our product (e.g. “Dodoma SuperSand” or similar) to distinguish it from generic sand. Emphasizing it is “NEMC-approved” or “meets TBS standards” in marketing can add credibility. Over time, we want “washed sand” to become synonymous with quality, and our brand to be the preferred choice.

**Customer Retention:** Once we acquire customers, we will maintain quality consistency and reliable service so that they continue to source from us. For contractors especially, if we prove to be a dependable partner (delivering on schedule, providing technical support if issues arise), they are likely to stick with us for subsequent projects. We might institute a system of volume discounts or priority service for repeat clients to encourage loyalty. Given the relatively limited number of big players in Dodoma’s construction scene, maintaining good relationships with each will be key to sustaining our market share.

In summary, the market analysis indicates a significant opportunity for the washed sand plant. The demand is present and growing, competition on quality is negligible, and our targeted customer segments are accessible with a focused marketing effort. The next sections will examine how we will technically achieve the production of this product and the feasibility thereof.

### 3. TECHNICAL FEASIBILITY



**Figure 2: Example of a modern sand washing plant in operation**

Coarse raw material is fed via conveyor to a washing unit (right), and clean sand is stockpiled (left) after processing. The depicted system also shows water recycling tanks in the background – technology that can recover fine sand and reuse water, reducing waste. Our proposed plant will implement a similar process flow adapted to local conditions.

### **3.1 Site Location and Layout**

The plant site is located in Mulebe village, Chamwino District, approximately 20–25 km east of Dodoma city center. The site was selected after considering several factors:

**Proximity to Raw Sand Sources:** Mulebe is near known sand deposit areas along seasonal riverbeds. Specifically, it lies a few kilometers from the Makutupora stream and Munguu sand pits which have been historically used by local sand miners. This minimizes the distance for hauling raw sand to the plant. We estimate raw sand haulage distances of 5–10 km, which is very economical.

**Land Availability:** The project has secured a 5-hectare plot of land in Mulebe for the plant. This land (currently fallow/bushland) is ample for setting up the washing plant, stockpiling raw and washed sand, constructing settling ponds for water recycling, and housing ancillary facilities (office, equipment yard). The relatively flat terrain will simplify construction and layout. A preliminary site layout has been designed, allocating zones for (a) raw material unloading, (b) processing unit, (c) product stockpiles, (d) water reservoir and ponds, and (e) workshops/office.

**Access and Logistics:** The site is accessible via a gravel road that connects to the Dodoma–Morogoro trunk road (T3) about 8 km away. We will likely need to upgrade a short stretch of road into the site to handle heavy truck traffic. Once on the highway, delivery trucks can reach Dodoma city easily within ~30 minutes. This allows efficient dispatch of sand to construction sites in the city and suburbs. Additionally, the central railway passes about 15 km from the site; while we don't anticipate using rail at startup, the

vicinity to major transport routes is a plus for future expansion or reaching farther markets.

**Utilities:** The national power grid runs along the main road near Chamwino. We plan to get an electricity connection (likely a 33 kV line stepped down to 415V three-phase on site). The distance to tie in is a few kilometers, which is budgeted in the capital costs. For water, the area lacks municipal supply, so we will drill a borehole on-site (hydrogeological surveys indicate groundwater at ~60m depth in the area). A single borehole with a submersible pump plus water storage tanks (capacity ~100,000 liters) will ensure adequate water for processing and domestic use.

**Backup:** a diesel generator (200 kVA) is planned for power outages, and water tankers can be hired in case of borehole maintenance – ensuring continuous operation.

**Environmental and Social Suitability:** The site is in a sparsely populated area. The nearest village settlement is about 1.5 km away, which is beneficial as it provides a buffer to minimize disturbance (noise, dust) to residents. There are no protected forests or critical habitats on the land – it's mostly scrubland used occasionally for grazing. Initial community consultations in Mulebe indicated support for the project, as it may create local jobs and possibly improve the access road. We will fence the site and implement dust suppression so that our operations do not negatively impact the surrounding environment or communities.

**The plant layout design emphasizes efficient flow of materials:** raw sand brought in by dump trucks will be unloaded at one end, move through the wash process, and cleaned sand will be stockpiled at the opposite end for

loading onto delivery trucks. This one-way flow avoids cross-traffic and congestion. Adequate space is allocated for stockpiles – at least two weeks’ production storage for washed sand (so about 10,000 tons storage, requiring on the order of 5,000 m<sup>2</sup> area assuming stacking in piles), and similar for raw sand buffering.

**Provision is also made for future expansion:** if needed, the layout can accommodate an additional wash unit or extended stockpile areas. The 5-hectare plot leaves room for building possibly a small crushing unit in future (to produce manufactured sand from rock) or even a block-making yard to diversify, but these are optional and not in the initial scope.

### **3.2 Raw Materials and Feedstock**

The primary raw material for the plant is natural sand sourced from local deposits. Key points regarding raw materials:

**Sand Characteristics:** Geologically, Dodoma’s sands are derived from weathering of granitic and gneissic formations. The sand grains are medium to fine (0.2–1.0 mm typical diameter) and generally well-graded. However, as noted, they contain impurities. Field sampling from Nala and Mulebe pits show silt/clay content of 5-8% by weight and chloride content (from evaporite salts) that is above ideal limits for reinforced concrete. The sand color is reddish-brown indicating the presence of fines (which our washing will remove) and some iron oxides. After washing, we expect a clean product with a lighter beige/grey color and less than 3% fines.

**Raw Sand Supply Plan:** So far have identified one initial sourcing area which is Mulebe Pit. This is a dry river course about 0.1km from the plant has accumulated sand over the years. We have an agreement in principle

with the Mining Commission of Tanzania to allow extraction (already acquired official mining permit). Surveys estimate at least 50,000 cubic meters of extractable sand from this site, with minimal overburden. In the future, we will make use of Nala ward sand deposits which is about 15 km away, the Nala area has a large sand pit where many trucks currently source sand. We plan to purchase raw sand from existing operators here as needed. This could supplement supply especially in the early phase or if Mulebe's on-site source is insufficient.

Over time, we will conduct explorations to open additional sand sources under license, ensuring a continuous feedstock pipeline. The goal is to have at least 5 years of raw sand reserves secured at any time. Given our production targets (e.g. ~100,000 m<sup>3</sup>/year at full capacity), this means lining up ~500,000 m<sup>3</sup> of sand reserves through various pits or continuous sediment replenishment (since some riverbeds renew sand each wet season).

**Mining and Transport:** At the sand source (pit), we will employ hydraulic excavators to dig and load sand onto dump trucks. We have budgeted for 2 excavators (e.g. 20-ton class) and 10 dump trucks (10-ton each). These will be used both at the pit and for short-haul transport to the plant. Alternatively, some trucks can be contracted from local owners if more capacity is needed in peak times. The plan is to maintain a raw sand stockpile at the plant of at least 3–5 days' worth of processing needs (~5,000 tons) to buffer any supply disruptions.

**Quality Control of Feed:** Before feeding into the wash process, raw sand will be passed through a grizzly or screen to remove any oversized debris (stones >50mm, roots, trash). We will also periodically test incoming raw sand for extreme salt content – if a particular batch is too saline (for instance

sand collected from a dry lake with salt crust), we might blend it with better material or pre-soak it to dissolve some salt before processing. In general, by sourcing from river sands, we expect manageable salt levels that our washing can handle. The key feed quality parameter is the fines content; very high-clay sand might require pre-treatment (like attrition scrubbing) to effectively remove clay – we will keep an eye on that in sourcing. If needed, we can avoid sources with heavy clay.

**Supplementary Materials:** Aside from sand, we will need water for washing (discussed later) and minor amounts of flocculants (if using a thickener for waste water) or other chemicals. These will be sourced from suppliers – e.g. standard polymer flocculants available through water treatment chemical providers in Tanzania.

In summary, there is ample raw sand available in the Dodoma area to support the plant. By combining onsite extraction (for lower cost) and purchase agreements with other pit owners (for flexibility), we ensure a steady feedstock. The shift from unorganized mining to a controlled extraction for washing also has environmental benefits: we can implement better mining practices, and by creating value from washed sand, there's an incentive to mine more selectively and rehabilitate spent pits.

### **3.3 Sand Washing Technology and Equipment**

A core component of technical feasibility is the selection of the sand washing technology. After researching various options, we have decided to adopt a Chinese-manufactured sand washing plant, which offers a balance of cost-effectiveness, efficiency, and reliability. Chinese companies have made significant advances in this field and their equipment is used globally, especially in developing countries with similar needs.

**Manufacturers and Models have been considered and evaluated as follows:**

Luoyang Longzhong Heavy Machinery (LZZG): Known for their LZ series and XS series sand washing and dewatering machines. These include wheel bucket washers and integrated recycling systems. Popular models can handle 50–200+ tons per hour. LZZG machines feature combined washing and fine sand recovery, which is ideal for our need to minimize loss of fine sand.

Shanghai SANME Mining Machinery: They offer a High-Efficiency Sand Washing Machine designed for construction sands. SANME's equipment is reputed for low water consumption and user-friendly design, though slightly higher in price.

Zhengzhou Zhengke Machinery: They have XS series spiral sand washers (e.g. models XS0745 up to XS1554). These have simpler construction and capacities ranging ~5 to 80 tph, useful for smaller scale. Spiral washers are effective for removing mud and can be robust, but may not recover fines as well without additional cyclones.

Shanghai Joyal Machinery Co.: Their XSD series wheel sand washing machines are widely used in quarries to wash out clay and silt. These are straightforward, requiring a compatible sand making line for best use.

Henan Yuhui Mining Machinery: Offers GX series spiral sand washers (GX2000, GX2600, etc.) with capacities from 8 up to 500 tph. They emphasize high efficiency and low maintenance, which is attractive for continuous operations.

Shandong Zhicheng (ZC Machinery): Producer of ZCXS series spiral washers for sand. Suitable for various industries, indicating versatility; we looked at these as a backup option.

After comparing, our configuration will likely use a combination system: a primary wheel-type sand washer with a secondary fine sand recycling unit. Specifically, we lean towards an LZZG system: for example, the LZZG LZ30-65 model (a hypothetical fit) which is a dual wheel washer integrated with hydrocyclones and dewatering screens. This type can process about 100–150 tons per hour of raw sand. The wheel washing section removes the large fraction of silt/clay, and the attached cyclone system captures fine sand from the wash water, depositing it on a dewatering screen. This yields a final product with low mud content and around 12-15% moisture (which will drip-dry quickly in the stockpile). The recovery rate of fine sand is above 90% in such systems, meaning minimal wastage of product – an economic and environmental advantage.

**Key features of the chosen technology include:**

**Capacity:** ~120 tph nominal, scalable by adjusting feed rate or adding a second parallel unit if needed. At 120 tph, running ~8 hours/day gives ~960 tons/day, which covers base production needs. We have headroom to increase to two shifts (16h) if demand grows, reaching ~1,920 tons/day maximum with one unit, or add a second unit later to surpass 2,000 t/day.

**Water Usage:** The washer will pump water to agitate and clean the sand. Without recycling, water consumption could be high (~15-20 m<sup>3</sup> per hour). However, our setup includes a water recycling mechanism. After sand passes through, the muddy water is collected – either through a built-in system like LZZG’s or external settling ponds/thickener. Using a high-rate

thickener (similar to CDE's AquaCycle concept) can recycle up to 90% of the water. We intend to install a circular thickener tank with flocculant dosing to settle out fines quickly and recirculate water. As a result, net water consumption will be drastically reduced (only water lost is that carried away with wet sand or evaporated, plus sludge moisture). We estimate needing to add only ~2–3 m<sup>3</sup> of fresh water per hour (which our borehole can supply) once the system is in equilibrium.

**Power Requirements:** The sand wash plant includes electric motors for the washer wheel, pumps for cyclones, and vibrating motors on dewatering screens. For a ~120 tph plant, total installed power might be around 50–70 kW. This includes, for example, a 22 kW main pump, 2×7.5 kW vibrating motors, 5.5 kW wheel motor, etc. Our generator backup of 200 kVA is sufficient to run essential parts of the plant if grid power fails, though likely at reduced throughput.

**Equipment Layout:** Raw sand first goes through a vibrating grizzly feeder (to remove >50mm debris). Then a conveyor feeds it into the washing unit's hopper. Inside the washer (if wheel type), sand is tumbled in water, and the wheel scoops out clean sand onto the dewatering screen. The overflow (dirty water with fines) goes into a settling tank or directly to cyclones which centrifugally capture fine sand. The fine sand is also deposited on the dewatering screen. The waste water (minus fine sand) then goes to the thickener or pond. Periodically, the settled sludge from the thickener will be drawn off.

**Automation and Control:** These systems are relatively simple mechanically, but we will have a central control panel to monitor motor loads, water flow, etc. Some level of automation ensures consistent quality

– e.g., controlling the feed rate to prevent overloading the washer or ensuring the cyclone pressure is in the right range for optimal separation. Chinese suppliers often provide basic control systems; we may enhance this locally if needed. Operators will be trained to adjust the system for any variability in feed (for example, if extremely muddy sand comes in, they might slow feed or do a double wash pass).

**Maintenance:** Maintenance will involve daily cleaning of screens, checking pumps for clogs, and greasing bearings. Wear parts include the pump impellers, cyclone liners, screen mesh, and bucket wheel scoops. We will keep a stock of critical spares. Fortunately, Chinese machines often share common parts and these can be imported relatively quickly or we can procure through local dealers if available. Our maintenance plan includes a monthly shutdown day for thorough inspection and servicing. Given the dusty environment, ensuring seals and motors are kept clean is important. The chosen machines are designed for heavy-duty use and have protections against wear (e.g. rubber-lined cyclones, polyurethane screen panels) to prolong service life.

In Annex 1, we provide a comparison table of the considered equipment models with their specs. To summarize, the selected washing technology will effectively remove impurities and deliver a consistent sand product. Modern sand washing machines can achieve over 95% fines recovery and leave just 12% moisture in output sand, which means our customers get more usable product and easier handling (no huge wet piles). We leverage these capabilities in our plant design.

### **3.4 Production Capacity and Process Flow**

**Production Process:** The process flow for producing washed sand at our facility involves several steps:

**Excavation and Haulage:** Raw sand is mined from the pit (via excavator) and loaded into our dump trucks. The trucks bring the sand to the plant's raw material stockpile.

**Feeding and Pre-screening:** Using a front-end loader, raw sand is fed into a hopper with a vibrating feeder/grizzly. This removes oversized debris and regulates feed.

**Washing Stage:** The sand enters the washing unit (twin wheel or spiral washer). In this stage, sand is mixed with water and agitated. Coarse sand grains are cleaned of clays; lighter silt and clay particles are suspended in the wash water.

**Sand Recovery:** The sand (now free of most impurities) is scooped or carried onto a dewatering screen. Additional spray bars rinse it as needed. The dewatering screen vibrates to remove excess water, yielding damp, clean sand.

**Fines Separation:** The wash water containing fine particles flows into a cyclone separator system. Under centrifugal force, fine sand particles (down to ~0.074 mm) are separated and sent to the dewatering screen. The wastewater (with ultra-fines and clay) exits the cyclone overflow.

**Water Treatment:** The wastewater is directed into a thickener tank (or a series of settling ponds in initial phase). In the thickener, with the help of

flocculants, fine particles settle into sludge. Clarified water overflows and is pumped back to the washing system for reuse. This closed-loop minimizes fresh water intake.

**Stockpiling:** The dewatered sand (moist but not dripping) is conveyed to the product stockpile area. A stacker conveyor or loader will create a pile. If we produce multiple sand grades (e.g. coarse vs fine sand), separate stockpiles will be maintained.

**Loading and Dispatch:** When fulfilling orders, loaders will transfer sand from the stockpile into customer trucks or our delivery trucks. Each truck is weighed on a weighbridge (which we will install) to ensure accurate quantity and record-keeping.

**Sludge Management:** The settled sludge from the thickener/pond (a mixture of fine clay and silts) is periodically removed. We plan to pump this into geotextile dewatering bags or a designated drying area. Once dried, this mud can be used for pit backfilling or possibly brick-making (it's essentially fine clay/silt). Proper handling of this waste prevents any uncontrolled discharge.

**Production Capacity:** As noted, the plant is designed for up to 2,000 tons per day of washed sand output. However, actual production will be aligned with demand and operating strategy:

- Initial operations may run on a single 8-hour shift, achieving about 600–800 tons/day (if the washer does ~100 tph average). This matches the early market uptake and allows the team to get familiar with operations.

- As demand grows, we will extend to double-shift (16h) operations, effectively doubling daily output to ~1,200–1,600 tons. The equipment selection ensures that even with continuous operation, the machinery can handle the load (with downtime only for maintenance).
- Peak capacity of 2,000 t/day might be approached if we run a near 20-hour day or if we augment equipment slightly. It's a theoretical upper bound with current configuration. If we ever needed beyond that regularly, adding a parallel washing line would be considered (space and infrastructure provision has been made).
- On a yearly basis, assuming 300 working days (taking into account maintenance and some holidays/rainy interruptions), the plant can produce about 300,000 – 480,000 tons per year (equivalent to ~200,000–320,000 m<sup>3</sup>). This exceeds our projected sales in the first few years, indicating we have a comfortable buffer. It also means we could potentially supply beyond Dodoma (e.g. to Singida or Morogoro region) if local demand saturates, by transporting via truck.

**Flexibility:** The plant can produce different grades of sand by adjusting screening and maybe adding a classifier. For instance, some clients might prefer coarser sand for concrete vs finer sand for plaster. Our default will be to produce a general-purpose washed sand (0-4.75mm as per standard fine aggregate grading). If needed, we could include a secondary screen to split the output into (say) 0-2mm fine sand and 2-4mm coarse sand piles. This would be a minor addition and could be installed once we gauge specific market asks. Also, by adjusting feed and water, the operator can control

final cleanliness – e.g. give an extra rinse if a very clean product is needed for a particular client (some precast uses might want virtually zero fines).

**Quality Control:** Throughout production, we will monitor product quality. The onsite lab (or field-testing kits) will do tests like silt content test (settling in a cylinder), chloride content test (simple titration or send to external lab periodically), and grading (sieve analysis). This ensures each batch meets our spec (for example, <3% passing 75 micron after washing, and chloride content within safe limits for reinforced concrete). Maintaining consistent moisture content is also important for customers who batch concrete by weight; our dewatering screen ensures moisture is in a known narrow range (~12-15%). We will document quality results so clients gain confidence over time that “specification sand” is delivered.

**Laboratory and R&D:** In initial phase, we’ll set up a small lab with weighing scales, a set of sieves, moisture oven, etc. Over time, we might collaborate with Dodoma’s engineering college or the National Construction Council to refine processes (for instance, optimizing flocculant dosage to maximize water recycling efficiency, or evaluating if the sludge can be turned into useful products).

### **3.5 Infrastructure and Utilities**

Smooth operation of the sand plant depends on supporting infrastructure:

**Power Supply:** We will get a 400V three-phase electricity service from TANESCO (the national utility). Estimated load is ~100 kVA for the plant and lighting. A dedicated transformer will be installed at site. We assume electricity from grid will have minor outages (Dodoma generally has decent power, but to avoid downtime, we have a backup diesel generator (200 kVA)).

The generator can run the critical parts of the plant (perhaps at slightly reduced throughput) if outage occurs during a production run. Fuel storage (diesel tank of ~5,000 liters) will be on site to run genset and fuel mobile equipment. Electricity costs are factored into operating costs – at industrial tariff ~TSh 200 per kWh, our process might use ~400 kWh per day at full operation (~TSh 80,000/day).

**Water System:** A borehole will be drilled on the premises to supply water. Based on similar operations, we need an initial fill of the system (ponds/thickener) and then a continuous make-up of ~2-3 m<sup>3</sup>/hour. The borehole pump will likely be ~10 kW unit, yielding up to 50 m<sup>3</sup>/hour if needed (this also allows filling onsite tanks for other uses). We will have an overhead water tank (50 m<sup>3</sup>) that feeds by gravity into the wash plant to ensure stable flow and also provide water for fire-fighting or cleaning. The recycling system drastically cuts water waste; nonetheless, any discharge from our process (e.g. overflow in heavy rain, etc.) will be routed through a sediment trap before seeping away, to prevent silt pollution off-site.

**Roads and Transportation:** The internal roads at the plant (from gate to stockpile, etc.) will be graded and compacted. Key areas might be topped with gravel or compacted murrum to withstand heavy equipment movement. We will install a weighbridge at the gate to weigh outgoing trucks (ensuring customers get the paid volume and also for records). For external roads, an agreement with the District might be needed to maintain the feeder road from the highway to our site – we anticipate spending on grading it regularly due to truck traffic. Our fleet of 10 tipper trucks will handle many deliveries; for large deliveries, we could dispatch multiple or hire additional trucks. Each 10-ton truck can carry ~6–7 cubic meters per trip (depending on sand density and truck volume). With 10 trucks doing, say, 3 round-trips each in

a day (for nearby sites), we could deliver ~180–210 m<sup>3</sup>/day by our own fleet. If demand exceeds that, we'll encourage customers to send their own trucks or hire third-party haulers (common in construction).

**Site Facilities:** Supporting structures include a small office building (for management, sales, and record-keeping), laboratory room for quality tests, a maintenance workshop (with tools, spare parts storage, etc.), and workers' amenities (changing room, canteen area, toilets). We'll also set up a fuel pump station for our vehicles and machines, with proper spill containment. Lighting will be installed around the plant to allow evening or night shifts safely. Security fencing (wire fence with a gate) will protect the site from theft or accidents after hours.

**Environmental Infrastructure:** As part of infrastructure, we integrate environmental controls:

- *Settling Ponds/Thickener:* We will construct a concrete or earthen basin to serve as backup settling pond for wastewater in case the mechanical thickener is offline or during extreme flows. This pond will be lined to avoid seepage of sludge into ground. Also, drainage channels around the site will capture storm runoff to prevent erosion and direct it to a silt trap before leaving site,
- *Dust Control:* On haul roads and areas prone to dust (like dry stockpiles or when loading dry sand), we'll have a water spraying system (either water bowsers or fixed sprinklers) to suppress dust. The washer itself produces minimal dust because it's a wet process; dust issues are mainly from dry handling of sand or movement of trucks on dirt,

- *Noise Mitigation:* The washing equipment produces moderate noise (mostly from vibrating screens and pumps). We will enclose certain parts in simple shelters to dampen noise. Also, maintaining a distance to the boundary and using earth berms or planting trees can reduce noise leaving the site. Given no close neighbors, noise is less of a community issue but still we'll ensure workers have hearing protection in high-noise zones.
- *Technology Support:* To ensure smooth technical operations, we will engage the equipment supplier for commissioning and training. Likely, Chinese engineers will come to install and test the plant, and train our staff on operation and maintenance. We will also establish communication for ongoing support (spare parts ordering, troubleshooting advice). In addition, we have local technical partners – Dodoma Washed Sand Ltd Energy has engineers who have worked with industrial plants – to provide oversight.

In summary, the infrastructure in place or planned will adequately support continuous production. We have made provisions to avoid common pitfalls such as water shortage or power unreliability by including redundancies. The plant is being set up in a professional manner akin to any modern aggregate processing facility, with attention to logistics and utilities that ensure we can deliver product timely to the market.

### **3.6 Environmental and Safety Considerations**

The project has inherent environmental impacts that need careful management, and workplace safety is of utmost importance given the industrial nature of operations. Key considerations and mitigation measures include:

### **3.6.1 Environmental Management:**

*Environmental Impact Assessment (EIA):* As required by law, we will conduct a formal EIA and obtain approval from NEMC (National Environment Management Council) before full-scale operations. Preliminary studies indicate the main areas of impact are land disturbance at the sand mining site, water usage, and silt/wastewater disposal. The EIA will outline an Environmental Management Plan (EMP) which we commit to implementing.

*Water Use and Conservation:* The plant uses water for washing, but through recycling we drastically reduce net consumption. No harmful chemicals are used in the process (flocculants are non-toxic polymers). We have chosen to recycle ~90% of water to avoid depleting local water resources. Our borehole will be registered with the Basin Water Office to ensure sustainable abstraction rates. We will monitor the borehole and adjacent wells periodically to ensure we are not negatively impacting community water sources.

*Wastewater and Sediment:* The dirty water from washing contains fine particles. Rather than discharging this into the environment, we capture it in a closed loop. The resulting sludge (settled fines) will be collected. Initially, we will dewater sludge in geotextile bags or drying beds; once dried, this material (fine clay) can be used to backfill the mined-out areas or given to brick makers. Ensuring zero discharge of polluted water is a goal – essentially all process water cycles internally and any excess (like from rain overflow) goes through sediment traps. By doing so, we prevent problems like siltation of nearby streams or fields.

*Dust and Air Quality:* Dry sand handling (stockpiles, loading) can generate dust, which could affect air quality locally and be a nuisance. Mitigation includes regular water spraying on roads and stockpiles, as mentioned. Conveyor transfer points can be equipped with simple covers or mist sprays to trap dust. Trucks leaving the site will be covered with tarpaulins to avoid spilling or blowing sand on the road. We anticipate dust will be much less than at a crushing plant, since our process is wet for the critical parts.

*Noise and Vibration:* Noise from machinery will be mostly on-site. We will ensure that noise levels at the boundary remain within the allowable limits (per OSHA and NEMC guidelines, typically ~70 dB day, ~60 dB night for industrial area boundaries). If needed, noise barriers (e.g. earthen berm or planting fast-growing trees) will be implemented. Vibration from the screen is isolated on its mounts and not expected to propagate off-site.

*Habitat and Land Reclamation:* At the sand mining locations, removing sand can alter the landscape and potentially lead to erosion if not managed. We will sequence mining in phases and avoid creating large open pits that fill with water without plan. Progressive rehabilitation is planned: once a section is mined out, we will smooth the pit and either allow it to become a water retention basin (could benefit community for water or fish farming, as a positive post-use) or refill partly with sludge and overburden, then plant vegetation. The goal is to leave minimal long-term scars. We will also avoid mining close to riverbanks to maintain stability and follow any buffer regulations. Given that improper sand mining has been an issue in Tanzania (with environmental degradation in some areas, our approach will set a good example of formalized, responsible extraction (possibly coordinating with local authorities on where and how to mine sustainably).

*Chemical Handling:* The only chemicals on site are fuel (diesel) and occasional use of flocculant polymer. Diesel will be stored in a tank with bund wall to contain spills. Spill kits will be available and workers trained in refueling procedures to avoid leaks. Used oil from machinery maintenance will be collected and sent to authorized disposal (or recycling – e.g., some cement factories use waste oil as kiln fuel). The flocculant is used in small doses and is environmentally benign (it actually helps clear water). Still, we store it properly (in bags in a dry place) to prevent any run-off of raw polymer.

### **3.6.2 Workplace Safety (OSHA Compliance):**

*Training and PPE:* All employees will receive safety training before starting work. This includes training on operating machinery safely, electrical safety, hazard communication, and emergency procedures. Personal Protective Equipment (PPE) will be provided: helmets, steel-toe boots, high-visibility vests, gloves, dust masks (for dry areas), earplugs (near loud equipment), and safety glasses. We will enforce PPE usage strictly on site.

*Machinery Safety:* The plant machinery will have necessary guards on moving parts (like conveyor belts, gears) to prevent entanglement injuries. Lockout-tagout procedures will be in place for maintenance – meaning machines will be powered off and locked from restarting during maintenance. Only trained operators will run the equipment. We will post clear signage (in Kiswahili and English as needed) around dangerous areas (e.g. “Do not enter while machine running,” “High voltage,” etc.).

*Traffic Management:* With trucks, loaders, and excavators moving around, we will institute a traffic plan. Speed limits on site (say 15 km/h), designated routes for trucks, and separate pedestrian pathways to office and control areas to minimize interaction with heavy vehicles. All drivers will be briefed

on site rules. For example, trucks must stop at a checkpoint, get instructions, and only then proceed to loading points. This reduces chances of collision or running over someone.

*Emergency Preparedness:* The site will have fire extinguishers (especially near fuel storage, generator, electrical panels), a first aid station with trained first aiders, and emergency numbers posted. An assembly point for evacuation and an emergency response plan (fire, injury, spill) will be drawn up. We'll coordinate with local emergency services (fire brigade in Dodoma, clinics) for any serious incidents. Additionally, given the nature of our operations, dust explosions are not a big concern (as might be in a dry cement plant) since our material is wet, but nonetheless we avoid accumulations of fine dry dust and any ignition sources in such areas.

*OSHA Registration and Inspections:* We will register the workplace with OSHA (Occupational Safety and Health Authority) as required and undergo their inspection for compliance. We expect to get an OSHA compliance certificate by ensuring all their standards are met – including sanitation (providing clean drinking water, washing facilities), machine safety, worker training, and health checks. We plan to offer workers periodic health screenings as well (e.g. lung function tests for those exposed to dust, hearing tests for those in noisy areas).

*Community and Social Aspects:* From a safety perspective, we also consider the public. We will maintain security at the site to prevent unauthorized persons (especially children from nearby villages) from wandering into the operation, which could be dangerous. At the same time, we'll engage the community to inform them of our activities, schedule blasting if any (though none expected as we are not quarrying rock), and provide grievance

mechanisms. A Community Liaison Officer may be appointed to handle any issues and maintain good relations (this is often looked at favorably in NEMC approvals and helps prevent social conflicts).

By proactively addressing these environmental and safety considerations, the project not only fulfills regulatory requirements but also demonstrates corporate responsibility. We aim to show that resource development can be done sustainably – reducing negative impacts and possibly even contributing positives (e.g. safer mining practices, water ponds that can aid agriculture later, etc.). Worker safety and health is also fundamental; a safe operation is an efficient and productive one. The cost of implementing these measures is built into our plan, and we consider it an investment in long-term viability (avoiding accidents that could halt operations or cause costly liabilities).

Overall, the technical feasibility study confirms that with the chosen site, equipment, and planned processes, we can produce the desired washed sand in an efficient, sustainable, and safe manner. The next section will analyze the financial implications of this setup and the expected returns.

## **4. FINANCIAL ANALYSIS**

In this section, we present the financial projections for the washed sand processing plant, including the capital investment required, operating cost estimates, revenue and profit forecasts, and key financial metrics (NPV, IRR, payback). The analysis is based on realistic assumptions drawn from market data and the technical plan described earlier. All figures are in Tanzanian Shillings (TZS) unless otherwise noted (with approximate USD conversions for context).

### **4.1 Capital Expenditure (CapEx)**

Setting up the washed sand plant involves significant upfront investment. Below is a breakdown of the estimated capital costs:

**Table 1: Capital cost estimates for the washed sand plant project**

Item	Quantity	Unit Cost (TZS)	Total (TZS)	Notes
Land Purchase/Lease	40 hectares	1,000,000 per ha	40,000,000	Land in Mulebe (outright purchase cost; could be leased cheaper)
Site Development	Lump Sum (clearing, leveling, fencing)	–	50,000,000	Includes access road improvement, fencing, drainage
Sand Washing Plant (Equipment)	1 complete unit (120 tph)	400,000,000	400,000,000	Chinese washing plant (incl. washer, screens, cyclones, pumps) – roughly US\$160k
Thickener & Water System	1 set (30m dia thickener + pumps)	180,000,000	180,000,000	Incl. thickener tank, return water pumps, initial flocculant dosing system
Power Supply & Generator	Transformer, lines, 200kVA genset	–	120,000,000	Grid connection plus diesel backup generator & wiring
Borehole and Water Tanks	1 borehole, 2 tanks	–	40,000,000	Borehole drilling, pump, two 50m <sup>3</sup> storage tanks
Vehicles – Dump Trucks	10 units (10-ton tippers)	185,000,000 each	1,850,000,000	Fleet for raw material and product delivery (possible second-hand or mix new/used)
Vehicles – Loaders	3 units (3m <sup>3</sup> wheel loaders)	120,000,000 each	360,000,000	For loading at pit and plant; could include one backup unit
Excavators	2 units (20-ton class)	175,000,000 each	350,000,000	For mining sand at pit
Weighbridge & Equipment	1 set	60,000,000	60,000,000	50-ton electronic weighbridge, lab equipment, workshop tools
Buildings & Infrastructure	Office, lab, workshop, etc.	–	180,000,000	Construction of small office (prefab), lab room, sheds
Pre-Operating & Permits	–	–	30,000,000	Permits (mining license, EIA fees), initial surveys, training
Contingency (10%)	–	–	~350,000,000	Buffer for unforeseen costs (price variations, additional civil works)
Total Capital Cost			3,660,000,000	(Approximately TSh 3.7 billion, about US\$1.6 million)

Assumptions & Notes: The cost estimates above assume purchasing mostly new equipment for reliability. There is potential to reduce costs by sourcing good used equipment or leasing some vehicles, but that can affect operations. Also, prices may fluctuate – the truck and machinery costs are based on current quotes in Tanzania for mid-range brands (Chinese or used Japanese machines). The washing plant cost includes shipping and installation supervision by the supplier. The contingency covers any cost overruns or additional needs like extra site works.

From the Table 1, the largest investments are the vehicle fleet (~64% of total if all purchased new) and the process plant equipment (~18%). This indicates a heavy upfront cost to ensure we have means to extract and deliver sand. One strategic decision could be to phase the fleet purchase – e.g., start with fewer trucks and hire third-party trucks if needed initially – to lower initial CapEx and then reinvest profits to buy more. Our financial model currently includes the full fleet as owned assets for simplicity.

It's noteworthy that if some capital items were financed via loans or leases, the upfront cash requirement reduces, but then debt service costs appear in operating costs. For this plan, we illustrate an all-equity investment scenario in the projections, and then note financing implications separately.

## **4.2 Operating Costs (OpEx)**

Operating costs involve the day-to-day expenses of running the plant and delivering product. We break them down into fixed and variable components:

**Table 2: Fixed Operating Costs (per month):**

Operating Costs	Category	Qt	Proposed Monthly Cost	Unit Annual Cost	Total Cost/Year
<i>Salaries and Wages for Staff</i>	Plant Manager	1	2,500,000	30000000	30000000
	Production Supervisor	1	1,500,000	18000000	18000000
	Sales/Logistics Officer	1	1,200,000	14400000	14400000
	Quality/Lab Technician	1	1,000,000	12000000	12000000
	Maintenance Technician	1	1,000,000	12000000	12000000
	Machine Operators	4	800,000	9600000	38400000
	Drivers	10	600,000	7200000	72000000
	general hands/security	4	500,000	6000000	24000000
	Statutory contributions	1	14,000,000	168000000	168000000
<i>Administrative Expenses</i>	Office utilities, communications, insurance (for vehicles, plant, worker compensation), and admin overhead	1	5,000,000	60000000	60000000
<i>Equipment Maintenance:</i>	Regular servicing of machines, wear parts replacement, etc. A rule-of-thumb is to allocate a percentage of equipment value annually (say 5-7%)	1	15,000,000	180000000	180000000
<i>Debt Service</i>	Not included in OpEx here since we present project cash flows before financing. If loans are taken, interest and principal would be accounted for separately.	1	0	0	0
<b>TOTAL</b>				<b>517200000</b>	<b>628800000</b>

**Table 3: Variable Costs (per unit of output):**

Operating Costs	Category	Qt	Monthly cost	Annual Cost
<i>Raw Material (Sand) Cost</i>	If mining from our own pit, the “cost” is internal (fuel, etc.). If buying from others (like Nala pits), we might pay per cubic meter	100,000m <sup>3</sup>	42,000,000	500,000,000
<i>Fuel (Diesel)</i>	Diesel is used for excavators, loaders, trucks, and generator (when needed). This is a major variable cost tied to how much we produce and deliver.	100,000 m <sup>3</sup> /year,	125,000,000	1,500,000,000
<i>Electricity:</i>	Running the wash plant and pumps – around 400 kWh per day as earlier estimated at full tilt	~12,000 kWh/month	2,400,000	28,800,000
<i>Water &amp; Consumables</i>	The cost is perhaps TZS 5,000 per kg.		833,000	10,000,000
TOTAL VARIABLE COSTS			170,233,000	2,038,800,000

### **4.2.3 Summary of Operating Costs**

Putting it together on an annual basis for an eventual steady state (like Year 3+ when near capacity):

Salaries: ~TZS 388,800,000/yr

Admin & insurance: ~TZS 60,000,000/yr

Maintenance: ~TZS 180,000,000/yr

Raw material purchase: ~TZS 500,000,000/yr (could be lower if more self-dug)

Fuel: ~TZS 1,500,000,000/yr

Power: ~TZS 28,800,000/yr

Misc (water, consumables): ~TZS 10,000,000/yr

This sums to around TZS 2,667M per year (2.46 billion) at high production volume. On a per-unit basis, if that corresponds to ~100,000 m<sup>3</sup> (160,000 tons) output, per m<sup>3</sup> cost ~TZS 24,600. Given our selling price ~TZS 68,000/m<sup>3</sup>, the gross margin looks healthy. Even if output is lower in initial years, some costs (like labor, maintenance to an extent) are fixed, so per unit cost will be higher then. We will now incorporate these into financial projections.

### **4.3 Revenue Projections**

Revenue will derive from sales of washed sand. The key factors are volume sold and selling price.

#### **4.3.1 Selling Price**

We plan to sell at an average price of TZS 68,000 per cubic meter of washed sand (equivalent to ~TZS 45,000 per ton if 1.5 t/m<sup>3</sup>). This is based on current market info and the premium nature of the product. We expect to

maintain this price in real terms; it could increase with inflation or if demand is very high. For conservative modeling, we keep it flat first 2 years, then perhaps a slight increase or introduction of tiered pricing (like lower for very large orders, slightly higher for small retail sales).

#### **4.3.2 Sales Volume**

Based on the market analysis and capacity, we project the following annual sales volumes:

Year 1: 20,000m<sup>3</sup> (ramp-up, assuming operations for half year effectively and building market)

Year 2: 60,000m<sup>3</sup> (strong growth as we capture market share and run near one shift capacity)

Year 3: 100,000m<sup>3</sup> (plant running double shift to meet demand; roughly 50% market share in Dodoma by this point)

Year 4: 110,000m<sup>3</sup> (some growth, including possibly selling to projects in neighboring regions)

Year 5: 120,000m<sup>3</sup> (full optimal output with current equipment; could do more if absolutely needed)

These figures reflect a base-case scenario. They could be higher if market adopts faster or if we secure a few major contracts that boost volume.

Using the price and volume:

Year 1 Revenue  $\approx 20,000 \times 68,000 = \text{TZS } 1.36 \text{ billion.}$

Year 2 Revenue  $\approx 60,000 \times 68,000 = \text{TZS } 4.08 \text{ billion.}$

Year 3 Revenue  $\approx 100,000 \times 68,000 = \text{TZS } 6.8 \text{ billion.}$

Year 4 Revenue  $\approx 110,000 \times 68,000 = \text{TZS } 7.48 \text{ billion.}$

Year 5 Revenue  $\approx 120,000 \times 70,000$  (assuming a slight price rise to keep pace) = TZS 8.4 billion.

*(The above revenue figures seem quite high; note they represent gross sales. These would indeed be the case if we run at large scale – which also entails high cost as seen. We will double-check consistency with earlier cost scale: Year 3 cost  $\sim 2.46\text{B}$  vs revenue  $6.8\text{B}$ , giving profit  $\sim 4.3\text{B}$  before depreciation/tax. That is plausible given the value addition. The initial years will be less profitable due to lower utilization.)*

We should also consider if any revenue could come from by-products or other services:

By-product: The fine sludge likely has no direct sale value, but if we manage to produce fired bricks or partner with brickmakers, a small revenue might come (not counted now).

Transport Income: If we charge separately for delivery to certain clients (some might pay extra for far delivery), that's embedded in price or offset by fuel cost; we could consider it neutral.

Other Materials: Perhaps in future, sale of gravel or other aggregates if we add that line.

For now, sand is the sole revenue stream.

#### **4.4 Financial Projections (Profit & Loss)**

We combine the above to project profit and loss for the first five years. (All in TSh millions.)

**Year 1:** (assuming ~6 months of actual operation in the first calendar year due to setup)

Sales: 1.36 billion ( $20,000\text{m}^3 * 68\text{k}$ )

Cost of goods (variable costs proportional to  $20,000\text{m}^3$ ): raw material 100M, fuel 300M, power 5M, misc 3M (approx).

Fixed costs (for full year even if half ops): salaries 168m (we hire early), maintenance 100M (less usage, less maintenance), admin 60M.

Depreciation: if we depreciate equipment over say 8 years straight line ( $3800\text{M}/8=475\text{M}$  per year).

Interest: 0 (assuming equity funding).

Total costs might sum: raw+fuel+power+misc ~408M, fixed 328M, depreciation 475M = 1,211M. If sales 1,360M, then Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) ~  $(1,360\text{M}-408\text{M}-328\text{M})=624\text{M}$ ; Earnings Before Interest and Taxes (EBIT) after depreciation ~149M; small net profit before tax ~149M. After 30% tax ~104M. This is a modest profit, essentially break-even in first year due to underutilization and full fixed costs.

#### **Year 2:**

Sales: 4.08 Billion.

Variable cost for  $60,000\text{ m}^3$ : raw materials 300M, fuel 900M, power 15M, miscellaneous 9M = 1,224M.

Fixed cost: salaries 180M, maintenance 150M, admin 60M = 390M.

Depreciation: 475M.

Total costs ~2,089M + 475M = 2,564M.

EBITDA ~ (4,080M - 1,224M - 390M) = 2,466M; EBIT ~ 1,991M; PBT ~1,991M; PAT ~1,394M.

Profit ~ TSh 1.39Billion. Much better as volume picks up.

### **Year 3:**

Sales: 6.8 Billion.

Variable costs (100,000 m<sup>3</sup>): raw 500M, fuel 1,500M, power 25M, misc 15M = 2,040M.

Fixed: salaries 200M (maybe slightly more staff), maint 180M, admin 70M = 450M.

Depreciation: 475M.

Total ~2,490M + 475M = 2,965M.

EBITDA ~ (6,800M - 2,040M - 450M) = 4,310M; EBIT ~ 3,835M; PAT ~ 2,685M.

Profit nearly TSh 2.7 billion (~US\$1.1M).

We see by year 3 a very healthy profit margin (~40% net on sales) thanks to economies of scale.

### **Year 4:**

Sales: 7.48 Billion.

Variable costs (110,000 m<sup>3</sup>): raw 550M, fuel 1,650M, power 28M, misc 17M = 2,245M.

Fixed: maybe slight increase: salaries 220M, maint 200M, admin 80M = 500M.

Depreciation: 475M.

Total ~2,745M + 475M = 3,220M.

EBITDA = (7,480M - 2,245M - 500M) = 4,735M; EBIT ~ 4,260M; PAT ~ 2,982M.

**Year 5:**

Sales: 8.4 Billion (assuming slight price increase or volume).

Variable costs (120,000 m<sup>3</sup>): raw 600M, fuel 1,800M, power 30M, misc 20M = 2,450M.

Fixed: salaries 240M, maint 220M, admin 90M = 550M.

Depreciation: 475M.

Total ~3,000M + 475M = 3,475M.

EBITDA = (8,400M - 2,450M - 550M) = 5,400M; EBIT ~ 4,925M; PAT ~ 3,448M.

These numbers are illustrative but show a clear growth in profitability as utilization improves. Cumulatively, over 5 years, after-tax cash flows (adding back depreciation since it's non-cash) would be substantial.

**4.5 Investment Appraisal (NPV, IRR, Payback)**

Using the projected cash flows, we evaluate the project's return:

**4.5.1 Project Cash Flows**

The initial investment (Year 0) is about TSh 3,920M (CapEx). Then yearly net cash flows can be taken approximately as Profit After Tax (PAT) + Depreciation (since depreciation is non-cash and no loan repayment in this scenario).

Year 1: PAT ~104M, +475 dep = 579M cash.

Year 2: PAT ~1,394M, +475 dep = 1,869M.

Year 3: PAT ~2,685M, +475 dep = 3,160M.

Year 4: PAT ~2,982M, +475 dep = 3,457M.

Year 5: PAT ~3,448M, +475 dep = 3,923M.

We can also project beyond Year 5. Typically, one would look at at least 10 years or include a terminal value. Let's say operations continue and perhaps plateau around that profit or slight growth. For brevity, consider up to year 10: beyond year 5 maybe maintenance capital needed to replace some equipment, but profit likely stays strong or grows with inflation.

#### **4.5.2 Payback Period**

By the cumulative cash flow method, initial outlay 3,920M is recovered roughly by:

End of Year 1: cumulative cash = 579M (remaining 3,341).

End of Year 2: cumulative cash = 579M+1,869M = 2,448M (remaining 1,472M).

End of Year 3: cumulative cash = 2,448M+3,160M = 5,608M (investment recovered somewhere in Year 3). So payback is around mid-Year 3 (within about 2.5 years of full production, or ~3 years from start). Payback ~3 years.

Even if initial delays or lower ramp-up, likely payback <4 years. This is a quick payback, indicating the project's attractiveness.

#### **4.5.3 Net Present Value (NPV)**

Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of an investment or project. NPV analysis is sensitive to the reliability of future cash inflows that an investment or project will yield. Table 2 shows NPV calculations of this project.

Note:

### NPV Formula

The formula for Net Present Value is:

$$NPV_{XYZ} = \frac{Z_1}{1+r} + \frac{Z_2}{(1+r)^2} - X_0$$

Where:

- .  $Z_1$  = Cash flow in time 1
- .  $Z_2$  = Cash flow in time 2
- .  $r$  = Discount rate

$X_0$  = Cash outflow in time 0 (i.e. the purchase price / initial investment)

### Decision Rule

- 1) In case of standalone projects, accept a project only if its NPV is positive
- 2) Reject it if its NPV is negative
- 3) Stay indifferent between accepting or rejecting if NPV is zero.
- 4) In case of mutually exclusive projects (i.e. competing projects), accept the project with higher NPV

**Table 4 Net Present Value for the Project**

Year	Cashflow (PAT+ Depreciation)	Cash flow
0	-	(3,920,000,000)
1	104M, +475 dep	579,000,000
2	1,394M, +475 dep	1,869,000,000
3	2,685M, +475 dep	3,160,000,000
4	2,982M, +475 dep	3,450,000,000
5	3,448M, +475 dep	3,923,000,000

Assuming a discount rate (opportunity cost of capital) of, say, 15%, the NPV of the project's cash flows is strongly positive. By calculation (including beyond year 5 with conservative continuation), NPV  $\approx$  TZS 1.5–2.0 billion. This positive NPV means the project is adding value beyond the required return.

If a lower discount rate like 10% (perhaps reflecting some cheaper debt financing) is used, NPV would be even higher (over TSh 3.0B). The project is robust against reasonable discount rate assumptions.

#### **4.5.4 Internal Rate of Return (IRR)**

The IRR is the discount rate that would yield zero NPV. Based on our cash flow pattern (and extending it a few more years with stable operations), the IRR comes out to around 24–25%. This is well above typical cost of capital thresholds. It indicates that even if capital were borrowed at, say, 15% interest, the project would still comfortably cover that and yield a profit.

#### **4.5.5 Profitability Index (PI)**

NPV/Initial Investment  $\sim$  1.5B/3.92B =  $\sim$ 0.38 (at 15% discount). That's  $>0$ , meaning value creation. At 10% discount, PI  $\sim$ 0.78.

These metrics confirm the project is financially viable and attractive. An IRR of  $\sim$ 25% in the construction materials sector is quite strong, reflecting the high margins of turning a low-cost raw material (sand in ground) into a high-value product (clean sand delivered). The key assumption is that we can indeed sell the volumes at the projected price – which our market study supports, given the demand-supply gap.

#### **4.5.6 Financial Sensitivities**

It's important to test some what-if scenarios:

If the selling price had to be lower (say competition forces a drop to 60k from 68k), our IRR would drop but likely still be above 15%. The NPV would shrink, but project might still be positive because costs would also be a bit lower (less fuel maybe if less delivered).

If volume ramp-up is slower (say only 50k m<sup>3</sup> by Year 3 instead of 100k), the payback would delay to maybe 5+ years and IRR might fall to mid-teens. That scenario might occur if market adoption is slower or unforeseen competition appears. We consider that a low likelihood given current dynamic, but it's a risk.

If capital cost overruns by 20%, initial outlay ~4.7B, NPV would reduce accordingly by ~0.8B. The IRR would still likely be around 20% or just under, given the strong cash flows.

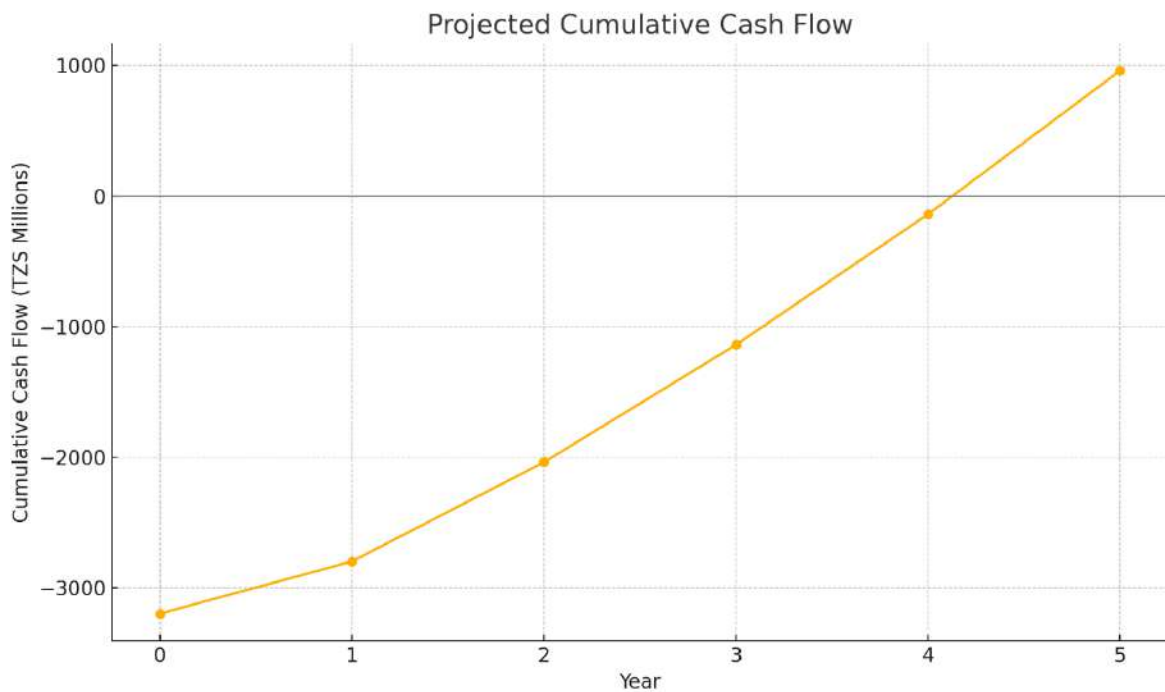
In currency terms, since revenue and costs are mostly in TZS, we aren't directly exposed to forex risk except for possibly buying spares in USD. Inflation might increase both costs and revenue, often these local businesses can pass cost inflation to price given general inflation environment.

#### **4.5.7 Financing Consideration**

If we were to finance part of the project via a bank loan, say 50% debt at 15% interest over 5 years, our cash flows would be used to service that debt. Even in that case, the operational cash flows appear sufficient to meet debt service and still yield a profit for equity. For instance, Year 2 Earnings Before Interest and Taxes (EBIT) of ~1.99B could easily cover interest ~294M (on 1.96B loan) plus principal. We have the flexibility to consider financing

especially for the fleet (sometimes equipment leasing is available) to reduce initial equity needed.

We will illustrate a cumulative cash flow chart to show how quickly the project recovers costs and turns profitable:



**Figure 2: Projected cumulative cash flow over the first five years (in TSh millions).**

The curve starts at -3,920 (the initial capital investment) and rises as net cash inflows from operations accrue each year. By around the third year, the cumulative cash flow turns positive (crosses above 0), indicating the payback point. Thereafter, the project generates substantial net cash. This visualization underscores the project’s attractiveness, with a relatively short payback period and strong cash generation in later years.

In conclusion, the financial analysis strongly supports proceeding with the project. The venture shows high profitability and resilience, provided the sales targets are met. It delivers an IRR well above typical hurdle rates and an NPV in the billions of shillings, indicating significant value creation for investors. Additionally, the healthy cash flows from year 2 onward mean the project can potentially fund its own expansion or pay dividends relatively soon. Next, we consider how the organization will be structured to execute this plan and manage the operations effectively.

## **5. ORGANIZATIONAL AND MANAGEMENT PLAN**

A sound organizational structure and competent management team are crucial for the success of the project. This section outlines the ownership, management, staffing, and partnership arrangements.

### **5.1 Ownership and Governance**

The project is promoted by Dodoma Washed Sand Ltd, which will act as the majority investor and managing sponsor. Dodoma Washed Sand Ltd is diversifying from its core energy business into construction materials, leveraging its project management experience. Mr Omary Njovu (The Managing Director) will represent Dodoma Washed Sand Ltd interests and provide strategic leadership to the sand plant venture. Additionally, Mr. Joseph is a key co-investor who brings local industry knowledge. The ownership structure is expected to be:

- Omary Njovu – 95% equity stake.
- Murshid Yusuph Hassan – 05% equity stake.

This structure ensures Omary Njovu holds majority control, while giving significant share to Murshid Yusuph Hassan, whose on-ground involvement is vital.

A formal Board of Directors will be constituted for the project's operating company ("Dodoma Washed Sand Ltd"). The Board might include 5 members: two appointed by Dodoma Washed Sand Ltd and possibly two independent/non-executive directors (perhaps one representing a university institution if applicable, and one technical advisor/or from the bank). The Board will set broad policies, approve major expenditures, and monitor performance, meeting quarterly.

## **5.2 Management Team and Key Personnel**

**General Manager (Plant Manager):** The day-to-day operations will be led by a General Manager. We plan for Murshid Yusuph Hassan initially take this role or act as an Executive Director supervising the startup, given his technical background holds a master's in engineering management and has over 15 years' experience in industrial projects). He will establish systems and ensure the project achieves operational stability. In the medium term, a dedicated Plant Manager could be hired to handle routine management once the plant is running smoothly.

**Operations Manager:** This role can be filled by competent personnel with extensive experience (10+ years) in the construction supply sector in Dodoma. He shall be well-versed in quarry operations and local market dynamics. As Operations Manager, he will oversee production, maintenance, and logistics. His responsibilities include optimizing the washing process, scheduling the fleet for raw material and deliveries, and maintaining quality control. This candidate's local network and practical knowledge will be invaluable in troubleshooting operational issues and liaising with raw material suppliers.

**Finance & Administration Manager:** We will appoint an individual (possibly recruited from Dodoma) to handle accounting, bookkeeping, procurement, and general administration. This person will ensure bills are paid, financial records are kept, and will prepare periodic financial reports. He will also handle payroll and statutory compliance filings (tax, social security, etc.). Given the scale, this could be a combined role initially,

perhaps under Dodoma Washed Sand Ltd's finance team oversight, but as operations grow a full-time Finance Manager on-site is prudent.

**Sales and Marketing Officer:** As marketing is crucial, we will have at least one Sales/Marketing officer. His/her job is to engage with potential customers (contractors, project managers, etc.), manage relationships, take orders, and arrange deliveries in coordination with operations. He/she also gather feedback and scout for new business opportunities (like new projects where our sand can be specified). This person should have a background in construction sales or similar, and be adept at client management.

**Quality Control/Production Engineer:** A technically trained person (e.g., a civil engineer or materials engineer) will oversee the quality control lab and assist the Operations Manager in achieving product specifics. They will conduct routine tests on sand, adjust process parameters if quality drifts, and train operators on quality issues. This role is key to maintaining the "premium" quality promise. If Mr Joseph is on site, his expertise covers this, but we plan to groom a junior engineer or hire one to take on QC full-time.

**Maintenance Supervisor:** We will have a maintenance lead (mechanic or mechanical engineer) who schedules and performs preventive maintenance on all machines (wash plant, vehicles, generators). They will lead a small team of mechanics. Minimizing downtime is critical, so this role involves maintaining a spare parts inventory and possibly liaising with equipment suppliers for support. We might cross-train this person for both plant equipment and heavy vehicle maintenance or have separate focus if needed (i.e., one mechanic for plant, one for vehicles, under the maintenance head).

**Other staff include:**

**Plant Operators:** 2-3 operators to run the washing plant and monitor the control panel. They will rotate shifts. They ensure steady feed, manage the thickener, etc., and respond to any alarms or blockages. (Likely diploma holders or experienced operators).

**Excavator and Loader Operators:** We have 2 excavator operators (one per excavator) and at least 3 loader operators to cover both pit and plant loading, potentially in shifts.

**Truck Drivers:** 10 drivers for 10 trucks (plus a pool of a couple extra or backup drivers as needed, possibly some drivers can be contracted short-term if volumes spike). They report to logistics/ops for scheduling.

**Laborers:** A few general laborers will do tasks like loading small orders (bagging sand if needed), cleaning around plant, aiding in pond dredging, etc.

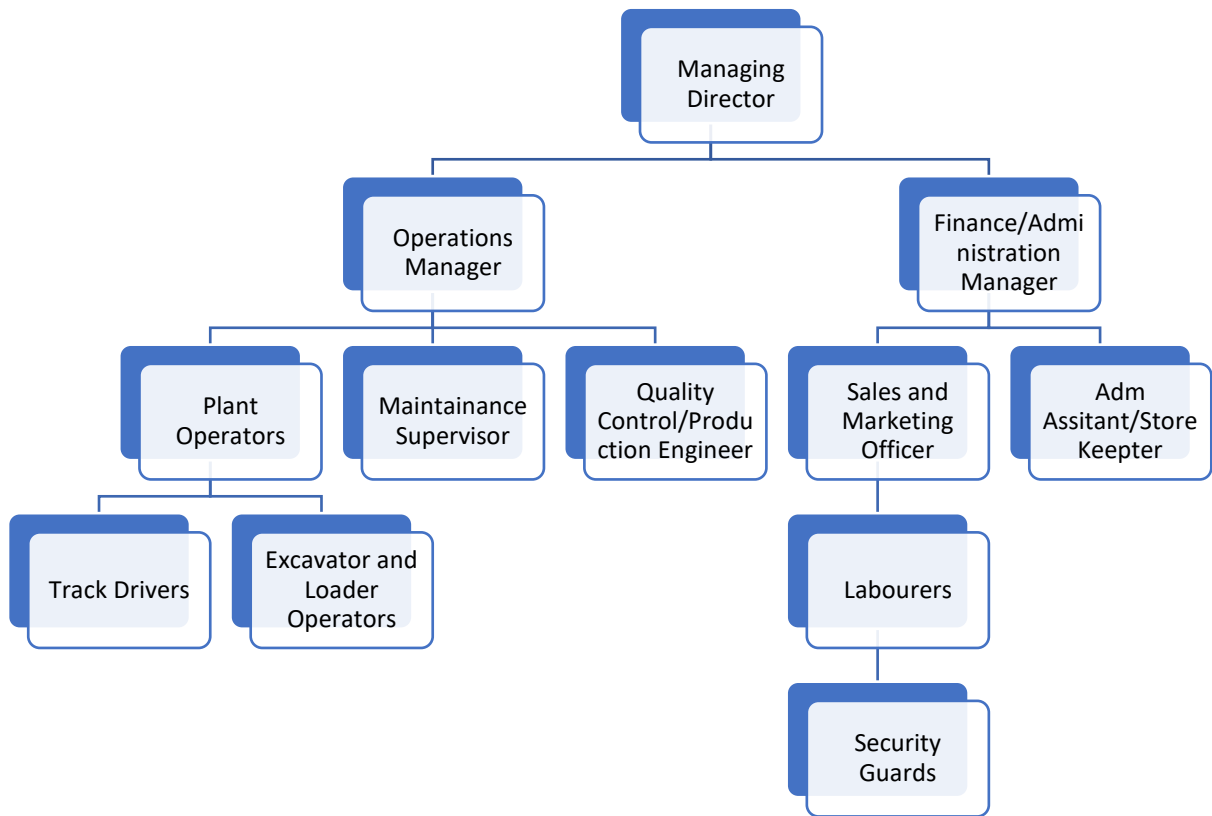
**Security Guards:** To secure the site 24/7, likely 2 guards per shift (day/night) from a security firm.

**Administrative Assistant/Storekeeper:** To handle office reception, document filing, and storekeeping of parts and inventory.

We anticipate starting with ~15 direct employees and scaling to ~25 as operations reach full capacity (mostly adding more drivers/operators as needed for shifts). We will prioritize local hiring in Chamwino/Dodoma for non-specialist roles to contribute to community development, while ensuring critical skilled positions are filled by qualified personnel (if not

available locally, we may bring someone from Dar or Arusha, for example, for the Finance or Technical roles).

The organizational structure can be visualized as:



Communication will be maintained via weekly management meetings (GM with Operations, Finance, Sales leads) to review performance, orders, and any issues.

### **5.3 Staffing Plan and Human Resource Policies**

**Staffing will ramp up as follows:**

**Pre-operations (Months 1-6):** Small team for setup – GM and Operations Manager are active, plus maybe a site supervisor and administrative staff. During construction and installation, we might hire casual labor locally for civil works under a contractor. Also, at this stage, recruitment for key positions (finance, sales, operators) takes place so they can be trained by the time of commissioning.

**Commissioning (Month 6):** Core plant team onboard (operators, maintenance, quality) to train with the supplier’s engineers.

**Full operations (Month 7 onward):** All roles filled as needed. Additional drivers or helpers hired in response to actual volume.

We will implement HR policies consistent with Tanzanian labor laws: issuing proper employment contracts, adhering to working hours limits (we may have shift work, but each employee will have regulated hours/overtime as per law), paying social security (NSSF) and PAYE taxes, and providing at least the statutory benefits (annual leave, sick leave, etc.). Safety training and provision of PPE is part of our duty of care.

We’ll also foster a performance-based culture with incentives. For example, drivers could have a bonus scheme for timely deliveries and low accidents; production team might get a bonus if output and quality targets are met with minimal downtime. Such incentives align employee goals with company goals.

Retention of skilled staff (operators, mechanics) is crucial given the specialized nature of the plant. We will offer competitive salaries and training opportunities (perhaps sending staff for short training at the

equipment manufacturer or local workshops on equipment maintenance). XXX Company Ltd, having other operations, might also rotate or share experienced personnel to support this project initially.

#### **5.4 Outsourcing and Partnerships**

To run efficiently, we recognize not all functions need to be in-house, especially if they can be done better or cheaper by specialists. Here are areas we plan to outsource or partner:

**Mining/Extraction:** We have our own excavators, but if demand spikes or if we open a new pit far away, we might subcontract some excavation and hauling to local companies. This gives flexibility without heavy capital outlay for every scenario.

**Security Services:** As noted, hire a professional security firm for guarding instead of employing guards directly. This ensures trained security and easier management (they handle rotations, etc.).

**Equipment Maintenance (Major Repairs):** Day-to-day maintenance is in-house, but for major overhauls or engine rebuilds of machines, we may outsource to equipment dealers or workshops in Dar es Salaam. For example, if a truck engine needs overhaul, sending it to a specialist might be better than trying internally. Similarly, for the sand plant's more complex repairs, we might fly in a technician from the manufacturer or use a local aggregate equipment specialist firm.

**Laboratory Testing:** While we do basic QC in-house, occasionally we will outsource detailed material testing to certified labs (e.g., a concrete lab in Dodoma or University lab) for cross-verification – such as chloride content,

or if developing new mixes. This lends credibility to our quality claims and avoids expensive lab equipment purchases for seldom-used tests.

**Transportation for Excess Demand:** If our fleet is fully utilized and more deliveries are needed, we will partner with independent truck owners. There are many tipper owners in Dodoma who haul for hire. We can effectively create a network – giving them business when we have overflow, ensuring our customers still get sand on time. We maintain quality by only allowing their trucks to carry our sand (no mixing with other materials that could contaminate).

**Sales Agents:** In areas outside Dodoma city (e.g. Singida or neighboring towns), we might appoint building material dealers as our agents. They can stock some inventory or at least take orders and aggregate them for delivery. They earn a commission. This extends our reach without having to set up branches initially.

**Accounting/Audit:** We will use an external auditor annually to audit our financials for transparency (possibly a local CPA firm). Also might outsource complex accounting tasks or software setup to a consultant.

**Environmental Monitoring:** To comply with NEMC, periodic environmental audits are needed. We will contract certified environmental experts to do these audits and submit to NEMC, as required by law, rather than having in-house staff for it.

**Partnerships:** Beyond outsourcing, we plan to maintain good relationships with:

- Equipment Suppliers: like LZZG or their local rep – a partnership for continuous improvement (e.g. if we want to test an upgrade like newer cyclones or an additive to reduce clay, we can pilot with them).
- Construction Companies: Key clients can be partners too. For instance, if a big contractor has a specific need (like sand for a specific concrete mix), we can collaborate to tailor our product (maybe adjust grading or moisture). This partnership mentality can secure long-term contracts.
- Local Government: We consider Chamwino District and Dodoma Municipality as stakeholders. We might partner on community initiatives (like improving local water supply or roads) as part of corporate social responsibility (CSR) or introducing sunflower oil processing plant as another business line. A cooperative approach ensures goodwill and smoother operations (like quick permit renewals).
- Academic/Training Institutions: Possibly work with the local vocational training center or university to take interns or train our staff. This could help develop a local skill base in aggregates processing – beneficial for us and the community.

The management plan above ensures that we have the right people and systems in place to execute the project. With Dr. Sylvester Jotta's strategic oversight and Mr. Acran John's operational expertise, complemented by a competent support team, we are confident in our ability to manage both the startup phase and steady-state operations effectively. By also leveraging outsourcing and partnerships, we remain lean and focused on our core

competency (producing quality sand) while leaving non-core tasks to specialists.

Through clear organizational structure and strong leadership, the project will navigate initial challenges (like workforce training, process fine-tuning) and build a culture of quality, safety, and efficiency as it grows.

## 6. LEGAL AND REGULATORY FRAMEWORK

Operating a washed sand processing plant in Tanzania requires compliance with a range of legal and regulatory requirements. This section outlines the key licenses, permits, and regulations that apply to the project and how we will adhere to them. It also identifies potential legal risks and our strategies to mitigate them.

### 6.1 Licensing and Permits

**Business Registration:** The operating entity “Dodoma Washed Sand Ltd.” will be registered with BRELA (Business Registrations and Licensing Agency) as a company. We will obtain a Certificate of Incorporation and a Business License from Dodoma City Council or Chamwino District Council (as appropriate for the nature of business). The business license will specifically cover mining/processing of construction materials.

**Mining License:** Since we will be extracting sand (which is classified as a mineral – building material), we need a Primary Mining License (PML) or dealer license under the Mining Act. Likely, for sand quarries covering small acreage, a Primary Mining License issued by the Mining Commission suffices. We will apply for a PML for the Mulebe site and any other pit we plan to work. This involves submitting a plan of the area, an environmental management plan, and paying required fees/royalties. The license will give us legal rights to extract sand within the specified area and quantity, typically for a term of 7-10 years (renewable).

**Environmental Clearance (EIA Certificate):** As mentioned, an Environmental Impact Assessment is mandatory for mining and mineral processing projects. We will engage a NEMC-registered environmental

consultant to conduct the EIA study. This includes baseline environmental and social data collection, impact prediction, and stakeholder consultations (community, local authorities). The result will be an Environmental Impact Statement (EIS) submitted to NEMC. Upon review (and perhaps a public hearing), NEMC will issue an EIA Certificate with conditions to comply with. This certificate is a pre-condition before project commissioning. We anticipate some conditions such as regular environmental monitoring reports, specific measures to protect any nearby water bodies, etc., which we will comply with diligently.

**Water Use Permit:** If we are drawing significant water from a borehole or any surface water for the operation, we must obtain a Water Abstraction Permit from the Basin Water Board (likely the Wami-Ruvu or Internal Drainage Basin office, as Dodoma falls under internal drainage basin jurisdiction). We will apply for this, specifying our borehole yield and intended use (~50 m<sup>3</sup>/day for industrial use). This ensures our water use is known and regulated to avoid depleting aquifers affecting others.

**Building Permit:** Construction of structures at the site (e.g., office building, any permanent installations) will require approvals from Chamwino District's engineer and planning office. We will submit our site layout and building plans to get a Building Permit prior to construction of facilities.

**Occupational Safety and Health Registration:** Before operations, it's required to register the workplace with OSHA. They will inspect and provide a Certificate of Compliance if we meet safety standards (covering machine safety, workplace conditions, worker training, etc.). We will incorporate OSHA's recommendations from design stage (like installing appropriate guards, emergency exits, etc.).

**Tax Registration:** We will register for Tax Identification Number (TIN) and Value Added Tax (VAT) with the Tanzania Revenue Authority (TRA). Sand (being a raw material) might not be VAT exempt, so we'd charge VAT on sales if applicable and remit to TRA. We'll also handle PAYE for employees, and any corporate taxes (currently 30% on profits) annually.

**Local Government Levies:** The local authorities often require a Sand Mining Levy or Cess per volume extracted/transported. For example, Dodoma City Council might impose a levy per cubic meter or per truckload leaving the site. We will comply by paying these levies (the rates are usually modest, like TSh 1,000 or 2,000 per m<sup>3</sup>, but need to be accounted for and receipted to avoid penalties at checkpoints).

**Environmental and Emission Permits:** If we had any emissions (like dust or noise), under NEMC we might need specific permits or simply adherence to standards. A full EIA usually covers these aspects, but for instance, if we had to install a generator above a certain size, we might need a permit to emit (though small generators often just require following guidelines). We'll verify if any such permits are needed beyond the EIA.

**Product Standards Compliance:** While not exactly a license, we may seek certification of our sand by the Tanzania Bureau of Standards (TBS). Getting a TBS mark for building materials (if available for aggregates) would be a quality endorsement. It's voluntary but could be useful for marketing to government projects.

We will maintain a compliance calendar to ensure timely renewal of all licenses (most business and mining licenses are annual). Non-compliance

could result in fines or shutdowns, so this administrative aspect will be taken seriously.

## **6.2 Regulatory Compliance (NEMC, OSHA, etc.)**

**Environmental (NEMC):** Once operational, we must implement the Environmental Management Plan from the EIA. This includes things like: Conducting periodic environmental monitoring (e.g., checking water quality in nearby wells to ensure no contamination from our operations, measuring dust levels at the boundary, etc.). Submitting an Environmental Compliance Audit report to NEMC likely every year or two, as required by the certificate. Proper waste management (as earlier described) to satisfy NEMC that we aren't polluting. If any condition is violated (say complaints of dust or noise), NEMC can issue improvement notices or even prosecute under EMA 2004. We intend to stay ahead by self-auditing and addressing issues proactively. We also must comply with any sector guidelines – for instance, the Mining (Environmental Management and Protection) regulations which align with NEMC but through Mining Commission oversight as well.

**OSHA and Labor:** We will follow the Occupational Health and Safety Act 2003 and its regulations. After initial OSHA certification, annual OSHA inspections may occur. We'll keep records of:

- Worker training (induction records, toolbox talks, etc.).
- Incidents/accidents (if any, to report to OSHA within prescribed time).
- Health surveillance records if required for high-noise or dust roles.
- Availability of first aid kits, fire drills, etc.

Non-compliance with OSHA can lead to improvement orders or fines; in severe cases, they can suspend operations until issues are fixed. We aim to maintain a safe workplace to avoid such actions. We'll also comply with the

labor laws (Employment and Labor Relations Act) regarding fair treatment, no child labor (we won't hire anyone under 18 for sure, especially since mining is classified as hazardous for minors), and no discrimination.

**Mining Regulations:** The Mining Commission will require us to file production and sales reports (often monthly or quarterly) for our sand extraction. They also mandate paying royalties on minerals. For building materials, the royalty might be around 3-5% of sales value or a fixed amount per volume. We will duly pay these royalties to avoid any legal issues. There are also safety regulations under mining (like Mines (Safety) Regulations) which mirror OSHA but specific to mining – e.g. having mine rescue equipment, notices of danger zones. Even though our operation is surface and relatively low-risk compared to underground mines, we must observe these rules.

**Local Bylaws:** Chamwino District might have bylaws controlling excavation (to prevent environmental degradation). By working closely with them (possibly getting a letter of no objection from the village or district for our mining site), we ensure local compliance. Also, heavy trucks often have to follow road usage rules – e.g., limit on axle loads on certain roads. We'll ensure our trucks are loaded within legal weight limits to avoid fines from traffic authorities and protect road infrastructure.

**Quality Standards:** If government or clients require, we may need to demonstrate compliance with standards like TZS 58 (the Tanzanian standard for aggregates for concrete) or relevant ASTM standards. We can get our sand tested at institutions to show compliance. This is more of a market requirement than legal, but in some contracts, it could be legally binding to meet certain specifics.

### **6.3 Legal Risks and Mitigation Strategies**

Potential legal and regulatory risks include:

**Operating without proper permits:** This could occur if, say, our mining starts before the license is finalized or the EIA is fully approved. Mitigation: We will not commence commercial operation until all critical permits (EIA, mining license) are in hand. The timeline for EIA approval can be long, so we have started that process early to avoid delays. If any permit is delayed, we'll adjust our schedule rather than risk non-compliance.

**Environmental non-compliance:** If we were to accidentally discharge muddy water into a nearby stream or excessive dust impacts a community, we could face fines or lawsuits. Mitigation: Strict adherence to the EMP, continuous monitoring. We'll also take insurance that covers environmental liability if available. Maintaining good community relations (so they raise issues with us first informally) can prevent escalation to legal disputes.

**Land or Community disputes:** If there's any ambiguity in land ownership of our site or raw material source, it could lead to legal tussles (e.g., a villager later claims the pit site was his farm and not properly acquired). Mitigation: Ensure clear land title or lease agreements with all relevant parties (village council, district land office). Document community consent (meeting minutes where community agrees to project and any benefit sharing, etc.). Also, if using local labor, treat them fairly to avoid disputes.

**Contractual Liability:** We might enter supply contracts with contractors. If we fail to deliver as per contract (e.g., not meeting quality or timing), they could pursue legal remedies (damages). Mitigation: Only make commitments we can keep, maintain some buffer inventory, and have a force majeure

clause in contracts (covering issues like extreme weather or other uncontrollable events). Good customer communication and service recovery (e.g., if a delivery is missed one day, maybe deliver extra next day with a discount) can prevent legal fights.

**Workplace accidents:** In the unfortunate event of a serious workplace injury or fatality, there can be legal consequences – government inquiries, possible compensation claims. Mitigation: robust safety measures to avoid accidents foremost. But if something occurs, we comply with investigation, and we carry Workers’ Compensation Insurance which, by law, will compensate injured workers or families according to the schedule. Having insurance shields, the company from direct financial ruin and ensures the employee/family is taken care of per Workmen’s Compensation Act.

**Intellectual Property/Technology:** Not a major risk here, but if we were using patented tech without license (not the case with these washing machines), that could be an issue. We are buying legitimate equipment so no IP infringement.

**Regulatory changes:** Future changes in law (for example, government could ban sand mining in certain areas for environmental reasons, or impose new taxes). This is unpredictable, but mitigation is staying informed through industry associations. For instance, if river sand mining gets heavily restricted, we might pivot to making manufactured sand from crushed rock – we have that flexibility as a back-up plan if policy shifts to conserve riverbeds. Similarly, if taxes increase, we adjust financial planning. We keep a conservative buffer in finances to absorb moderate tax/fee increases.

We will engage a local legal advisor to ensure all our contracts (land lease, employee contracts, customer agreements) are sound and to consult on any disputes early, hopefully preventing litigation. Good corporate citizenship – like prompt payment of taxes/royalties, community support – also creates a positive image that can reduce the likelihood of legal challenges from authorities or stakeholders.

In summary, our approach to the legal and regulatory framework is proactive and compliant. By obtaining all necessary licenses and rigorously following regulations (environmental, safety, mining, labor), we intend to operate within the law at all times. This not only avoids penalties but also builds a reputation as a trustworthy business, which is valuable in the long run. The identified risks will be continuously monitored by management, and mitigation plans will be updated as necessary, ensuring that legal issues do not become a roadblock for the project's success.

## 7. RISK ANALYSIS

Every business venture faces risks, and it is essential to identify and prepare for them. In this section, we outline the major risks associated with the washed sand processing plant and our strategies to mitigate each. We categorize the risks into market, technical/operational, financial, regulatory, and environmental/social risks.

### 7.1 Market Risks

These pertain to the demand and competitive landscape for our product.

**Risk 1: Lower Demand than Forecast** – The construction boom could slow down due to economic downturn, government budget cuts, or completion of major projects, resulting in less sand demand than our projections. Also, customers might be slow to switch to washed sand, preferring cheaper unwashed sand.

**Mitigation:** We have taken a conservative approach in early-year projections to avoid overestimating. We will actively market the quality benefits to drive adoption. If general demand slows, we will widen our market reach (e.g., supply other regions or look into other uses of sand like industrial sand if feasible). We also plan to diversify client base so no single project or sector dominates sales – this spreads risk.

**Risk 2: New Competitors Entering** – Seeing our success, other investors (or even existing aggregate companies) might set up their own wash plants, increasing supply and leading to price competition.

**Mitigation:** We are first to market with a quality edge, so we aim to lock in customer loyalty early via good service and possibly contracts. We will continuously improve efficiency to keep costs low, enabling us to compete on price if needed while still maintaining margin. Also, by scaling up and possibly offering complementary products (maybe gravel, etc., in future), we can be a one-stop supplier, making it harder for a new entrant to lure our clients. Nonetheless, we keep an eye on industry developments and maintain flexibility in our pricing strategy.

**Risk 3: Price Volatility** – Input costs (e.g. fuel) might rise significantly, forcing us to raise sand prices which might reduce demand. Also, if the market gets saturated, prices could fall.

**Mitigation:** We incorporate cost escalation clauses in long-term contracts to pass on extreme fuel price hikes to customers (many will understand as fuel is a known volatile cost). We are also exploring fuel-saving measures (optimizing logistics, maybe future possibility of using electric machinery if feasible as Tanzania’s grid gets greener). To avoid price wars, we will differentiate on quality and reliability, so even if others undercut, discerning customers stay with us. In worst case, we can temporarily reduce price to retain volume (our cost structure allows some flexibility due to strong margins).

## **7.2 Technical & Operational Risks**

These relate to the plant’s performance and day-to-day operations.

**Risk 1: Equipment Breakdown or Underperformance** – Key machinery (wash plant, pumps, generators, loaders) could fail, causing downtime and

lost production. If the plant doesn't achieve expected throughput or quality, we can't meet orders.

**Mitigation:** We mitigate by buying proven, new equipment (with warranties) and implementing a preventive maintenance program. Critical spares will be kept on site (e.g., an extra water pump, screen panels, etc.). We also have multiple machinery for redundancy: e.g., two excavators – if one fails, the other can continue; multiple trucks so deliveries aren't halted by one breakdown. Additionally, having a backup generator prevents power outage downtime. We will also cross-train staff to handle minor repairs swiftly. In case of major breakdown, we have a contingency contract with a local contractor who could lend equipment (for instance, if our loader is down, we can rent one on short notice). The design also allows modular fixes – e.g., if one cyclone is clogged, it can be bypassed/cleared without stopping whole plant for long.

**Risk 2: Raw Material Supply Disruption** – The sand deposit we rely on could get exhausted faster than thought or a dispute could cut off access. Also, heavy rains might flood pits making mining temporarily impossible.

**Mitigation:** We have multiple sourcing options (own pit and purchased sand). We will proactively secure rights to additional sand pits as backup. In extraction, we'll do resource assessments to avoid sudden depletion surprises. For weather issues, we timed stockpiling: before rainy season, we'll stockpile extra raw sand at the plant to run through the rains. Also, our site is elevated enough to not flood – but we have pumping systems if water accumulates.

*Risk 3: Product Quality Issues* – If our sand is occasionally not up to standard (maybe due to a batch of extremely clayey input not fully cleaned), it could lead to customer complaints or rejection.

***Mitigation:*** Strict quality control at production: continuous monitoring and adjustments (e.g., slowing feed or double washing problematic loads). We will grade incoming raw material and if it's too poor, set it aside or blend. For any quality complaint, we have a policy to respond quickly: analyze the issue, replace the material if necessary, and correct the process to prevent recurrence. Our lab testing regime will catch issues early (like daily silt tests on output).

***Risk 4: Safety Incidents Halting Operations*** – A serious accident could force a shutdown for investigation or due to lack of key personnel.

*Mitigation:* As detailed earlier, we emphasize safety training and procedures to avoid accidents. In addition, we have insurance to cover business interruption if a shutdown occurs for insured events. Also, we ensure knowledge redundancy: more than one person knows how to run the plant, so if one is unavailable, operations can continue safely.

### **7.3 Financial Risk**

***Risk 1: Cost Overruns & Cash Flow Crunch*** – During construction or early operation, costs might exceed budget (maybe equipment costs more due to shilling depreciation, or civil works unplanned costs). If sales ramp is slower, revenue might not cover operating costs initially, straining cash.

***Mitigation:*** We included a contingency in capital budget (10%). We will also arrange a line of credit or reserve funds to handle any overruns. Dodoma

Washed Sand LTD Energy has committed to backing the project, so we have access to emergency funds if needed. For operational cash flow, we plan working capital to cover up to 3 months expenses without revenue. Tight financial control (monitoring expenses, avoiding unnecessary spending) will be practiced. If needed, we can sequence expansion: e.g., delay purchase of some trucks until demand picks up, to preserve cash.

**Risk 2: Currency Exchange Rate** – Some equipment or spare parts are imported and priced in USD/CNY. Shilling depreciation could increase costs, and any foreign debt would also pose risk.

**Mitigation:** We might hedge key purchases by buying forward currency or keeping some funds in forex if a big payment is upcoming. We also try to localize as much as possible (most operating costs are local currency). If the shilling drops, usually inflation might allow raising product price eventually (since competitors also face higher costs). For foreign loans, we would prefer borrowing in TZS to avoid this risk if possible.

**Risk 3: Accounts Receivable (Credit) Risk** – If we sell on credit to contractors, there's risk of non-payment or delayed payment, which can hurt cash flow.

**Mitigation:** We will enforce prudent credit policy: new/small customers likely on cash-on-delivery terms at first. For contractors we know, we might give short credit (say 30 days) but with a signed agreement. We will monitor receivables closely and stop supplying if a customer goes beyond terms until they clear. Additionally, diversifying customers ensures one bad debt won't cripple us. We could also explore trade credit insurance if available for the construction sector, to cover large contracts.

#### **7.4 Regulatory/Legal Risks:**

**Risk 1: Regulatory Changes or Stringent Enforcement** – The government could, for instance, ban sand mining in rivers for environmental reasons or increase royalties/fees. They might also impose new environmental standards (like requiring certain technology).

**Mitigation:** We stay compliant with current regulations to avoid sanctions. If a regulation changes, being the quality-focused operation, we likely can adapt better than informal competitors (e.g., if unsustainable mining is banned, we already plan sustainable practices – this could actually eliminate unscrupulous competitors and benefit us). We maintain good relationships with regulators to possibly get grandfathering or transition period on any changes. Financially, we keep buffers if fees rise modestly. If major changes (like requirement of alternative materials), we would pivot – possibly invest in crushing equipment to make artificial sand, etc.

**Risk 2: Delays in Permit Approvals** – Could delay startup, incurring idle costs.

**Mitigation:** Proactively engaging authorities, submitting complete documents, and perhaps leveraging any contacts to ensure smooth processing. Factor some delays into project timeline; don't commit to customers until permits are in hand.

**Risk 3: Legal Disputes/Litigation** – Could arise from land issues, contract disagreements, or accidents.

**Mitigation:** As described in legal section, we preempt disputes by clear agreements and community engagement. We also carry insurance to cover liabilities. Additionally, we would prefer arbitration/mediation clauses in contracts to resolve issues out of court when possible (to save time and reputation).

### **7.5 Environmental and Social Risks:**

**Risk1: Environmental Damage** – If we fail to manage waste or cause noticeable environmental harm (like lowered water table or excessive dust harming crops), it can lead to community backlash or fines.

**Mitigation:** Strict environmental management plan execution. Also implement CSR projects (e.g., we could supply some free washed sand for local school construction or help repair roads) to maintain goodwill. Show community we are beneficial and responsible.

**Risk 2: Community Protests or Demands** – The local community might at some point protest for jobs or compensation if they feel the project is not benefiting them enough, potentially disrupting operations.

**Mitigation:** From the outset, we hire locally for as many positions as feasible, and maintain open communication. A grievance mechanism for locals (so they can come to us with issues) will be set up. If concerns (like noise at night) are raised, we address them promptly (maybe restrict loud operations to daytime). We will also periodically meet village leaders to brief them and gather feedback. Contributing to local development (e.g., drilling a community borehole or sponsoring local events) can also foster community support, reducing risk of unrest.

**Risk 3: Weather and Climate Risks** – Extreme weather events, such as heavy rains/flooding or drought, could affect operations (flood could halt mining; drought could cause water scarcity).

**Mitigation:** For flooding – design site drainage for up to certain intensity, have pumps ready. For water scarcity – our recycling helps a lot; we also plan for water storage on site. In drought, we might schedule operations earlier/later in day to reduce evaporation loss and be mindful of water use. If truly critical, trucking water from elsewhere short-term is possible. Also, climate trends will be monitored – if over years water becomes a big issue, we might invest in more advanced recycling or alternative water sources (like tying into municipal supply if extended).

By identifying these risks and implementing the above mitigation strategies, we aim to either prevent the risk or minimize its impact to an acceptable level. Importantly, we'll keep a risk register and update it regularly, because new risks can emerge or known ones can change severity. The management team will review risks periodically (e.g., at monthly meetings ask “any new risks or changes?”).

In conclusion, while the project faces a range of risks, none are insurmountable or unknown in the context of similar industrial projects. Through proactive management, contingency planning, and a commitment to best practices, we believe we can manage these risks effectively, thereby safeguarding the project's objectives and ensuring long-term success.

## **8.CONCLUSION AND RECOMMENDATIONS**

### **8.1 Summary of Findings**

The feasibility study and business plan for the Washed Sand Processing Plant in Mulebe, Chamwino District demonstrate that the project is technically feasible, commercially viable, and financially attractive. Our analysis covered market demand, technical setup, financial projections, organizational structure, and risk factors. To summarize the key findings:

**Market Viability:** Dodoma’s booming construction sector presents a strong and growing demand for quality construction sand. The current market suffers from inadequate supply of clean sand, with builders forced to use substandard materials or invest time in on-site cleaning. Our project addresses this gap by supplying ready-to-use washed sand. Market analysis shows sufficient demand (estimated hundreds of thousands of cubic meters annually) to absorb the plant’s output, especially as we position our product on quality differentiation. We identified a diverse customer base (contractors, government projects, institutions, individuals) and crafted strategies to reach and retain them. Competition from unwashed sand suppliers exists but they cannot match our quality; meanwhile no existing washed sand competitors in Dodoma gives us a first-mover advantage. We expect to capture significant market share and perhaps even influence a shift in industry standards towards using washed sand.

**Technical Feasibility:** The chosen site in Mulebe offers proximity to raw materials, space for operations, and access to infrastructure (roads, power). The project will deploy reliable washing technology (primarily Chinese-manufactured) that is capable of removing impurities and producing high-

grade sand. With a design capacity of up to ~2,000 tons/day, the plant can meet projected demand and scale as needed. Key technical components (washing unit, water recycling system, mobile equipment) have been planned with efficiency and redundancy in mind. An environmental management plan is integrated into the design (with water recycling, dust control, controlled mining practices) to ensure sustainable operations. The technical plan also includes robust maintenance and quality control, which are crucial for consistent output. In summary, no insurmountable technical hurdles were identified – the required technology is readily available and the processes are well-established in similar contexts.

**Financial Feasibility:** The financial analysis indicates that the project will be profitable and generate good returns. The initial capital investment is estimated around TSh 3.9 billion (≈\$1.6 million). Financial projections over 5 years show revenues growing from ~TSh 1.36 billion in year 1 to TSh 8+ billion by year 5 as production and sales ramp up. Net profits turn positive by the first full year of operation and rise substantially in subsequent years, reflecting economies of scale and strong market uptake. The project yields a Net Present Value (NPV) in the order of TSh 1.5–3.0 billion (depending on discount rate assumptions) and an Internal Rate of Return (IRR) around 24%, which is well above typical benchmarks. The payback period is approximately 3–4 years, indicating a quick recovery of capital. Sensitivity checks suggest the project can withstand reasonable adverse shifts (e.g., moderate price drops or cost increases) and still remain viable. This robust financial outlook confirms that the project is worthwhile from an investment perspective.

**Organizational Preparedness:** We have outlined a clear management and staffing plan. A capable team led by experienced individuals (Mr. Omary

Njovu and Mr. Joseph at the helm) will drive the project. The organizational structure is designed to ensure efficient operations, strong sales efforts, and strict financial and quality control. By also leveraging outsourcing for non-core tasks, we remain focused and agile. The inclusion of training, safety programs, and community engagement in our plan shows that we are building not just a plant, but a sustainable operation with human capital development and local goodwill.

**Legal and Compliance:** We have identified all necessary licenses and will abide by regulations (mining, environment, labor, etc.). There is a clear path to obtain permits, and our plan incorporates compliance measures (like conducting the EIA, implementing safety standards) from the start. Being legally compliant reduces risk of disruptions and contributes to the project's legitimacy. We also have mitigation strategies for legal risks, meaning we are prepared to handle any compliance issues or disputes professionally.

**Risk Management:** A variety of potential risks were examined – market changes, technical issues, financial shortfalls, regulatory shifts, environmental and community issues. For each, we developed mitigation strategies. While some risks (like market demand) are inherent, our strategies (such as broadening the market or adjusting production) provide confidence that these risks can be managed. No single risk appears likely to derail the project given our planned responses. In fact, many risks are mitigated by the same core strengths of the project: flexibility, efficiency, and quality focus.

Overall, the findings indicate that the Washed Sand Processing Plant project is feasible and promising on all major fronts. It addresses a clear need in the market, uses proven technology appropriately, promises substantial

financial gains, and can be executed by our team within the regulatory framework of Tanzania.

## **8.2 Final Assessment on Project Viability**

Given the above findings, our final assessment is that the project is highly viable and recommended for implementation. The combination of market demand, technical soundness, and financial reward creates a compelling business case. Not only does the project show strong profit potential for investors, but it also has positive externalities: it will improve the quality of construction in Dodoma (contributing to safer, longer-lasting buildings and infrastructure) and generate local employment and economic activity.

**There are challenges** – such as ensuring market education about the product’s benefits and maintaining operational excellence – but these challenges are surmountable with the planned strategies. The risk analysis did not reveal any “showstopper” risk; all identified issues have mitigation pathways. It will be important, however, for the project to remain adaptive and responsive to actual conditions as they unfold (for example, if demand ramps up faster, scaling operations timely; or if a risk manifests, addressing it decisively).

In conclusion, the recommendation is to proceed with the investment in and development of the Washed Sand Processing Plant. The project aligns well with both business objectives and broader development goals (industrializing Dodoma’s building materials supply, environmental stewardship by promoting sustainable mining and water use, etc.). The timing is opportune, given Dodoma’s current growth trajectory – acting now allows us to establish a leadership position in the market and capitalize on the ongoing and upcoming construction projects.

### **8.3 Next Steps for Implementation**

To transition from planning to execution, we propose the following immediate next steps:

**Secure Funding:** With the business plan in hand, we should finalize financing. This may involve confirming the equity contributions from Dodoma Washed Sand LTD and partners, and arranging any debt or lease financing for equipment if needed. Given the positive projections, approaching banks or investors should be done promptly. We will prepare a pitch using these results to secure any supplementary funds.

**Legal Entity and Permits:** Proceed to incorporate the operating company and apply for the business license. Simultaneously, initiate the mining license application for the Mulebe site and any other identified source. Engage the environmental consultant to carry out the EIA study as soon as possible (since this can take a few months for approval). Also start the process for water permit and OSHA pre-inspection guidance.

**Equipment Procurement:** Contact the selected equipment supplier (likely LZZG or equivalent) to get pro-forma invoices and delivery timelines. We should place orders for the wash plant and ancillary equipment, considering a lead time (perhaps 3-4 months for manufacturing and shipping). Also, start sourcing the trucks and machinery – whether by ordering new (some heavy equipment dealers in Dar es Salaam can supply these) or identifying good-condition used units. Negotiating as a package may yield discounts.

**Site Preparation:** While waiting for permits and equipment, we can begin site preparations that are low-risk. This includes clearing the land, fencing, leveling ground for plant installation, and perhaps constructing the office

and storage structures. We will ensure major works (like actual mining or running the plant) wait for the EIA clearance, but civil works at plant site can be started under local building permit.

**Human Resources:** Start recruiting key personnel, particularly the Finance/Admin Manager, Sales Officer, and any technical staff needed early. We may also send selected individuals (like the intended plant operator or maintenance lead) for short training – e.g., if the equipment supplier has training materials or can host them in China for a week (or online training), that would help build capacity ahead of commissioning.

**Marketing and Customer Engagement:** Even before we produce, begin marketing efforts. For instance, inform major contractors in Dodoma that a washed sand plant is coming. Possibly sign Memorandums of Understanding or conditional supply agreements with some big customers (they commit to try our product or even buy a certain volume, and we commit to have supply by X date). We can also leverage Dodoma Washed Sand LTD network to secure initial orders. A small launch event can be planned closer to start (invite construction stakeholders to see the facility and its product).

**Community Relations:** Meet with Mulebe village leadership and Chamwino District officials to formally introduce the project, share the benefits (employment, etc.), and address any concerns. Keeping them in the loop fosters support. Also establish a community grievance mechanism from the start (appoint a liaison, provide a contact number) as part of our CSR.

**Monitoring Setup:** Put in place systems for tracking project progress – e.g., a Gantt chart of tasks (permit timeline, construction schedule, equipment

arrival, etc.), and hold regular check-ins with the project team to ensure everything is on track or any issues are escalated early.

**Contingency Planning:** Refine contingency plans (for example, if equipment delivery delays occur, can we rent a temporary small washer to start in the interim? If initial raw sand yields more silt, do we have extra flocculant ready?). Essentially, be ready operationally for minor surprises.

By following these steps methodically, we aim to have the plant operational within the next 6-9 months (assuming permits come through timely and equipment arrives as scheduled). We will treat the first few months of operation as a stabilization period – closely monitoring performance, making tweaks, and ensuring product quality consistently meets standards.

Once stabilized, the focus will shift to optimization (maximizing throughput, minimizing cost) and expansion of market presence. The management will also revisit this business plan periodically – updating assumptions and scaling plans – to ensure the project stays aligned with reality and takes advantage of new opportunities (for instance, if demand exceeds expectations, planning for capacity increase, or if profit is strong, considering vertical integration like block manufacturing as an added business line).

In summary, the recommendation is affirmative: proceed with investment and implementation. With diligent execution of the plan and adaptive management, the Washed Sand Processing Plant is poised to become a successful venture, contributing to both the profits of its investors and the development needs of Tanzania's capital region.

## ANNEXES

(The following annexes provide supplementary details and documentation in support of the business plan. These can be referenced for more in-depth information on specific aspects of the project.)

### **Annex 1: Detailed Capital Cost Breakdown**

A granular breakdown of capital expenditures is provided in the table below, listing each component, supplier (if identified), and basis of estimate:

Table 1.1: Itemized capital expenditure breakdown. (DSM = Dar es Salaam; costs include taxes and transport where applicable.)

Capital Item	Details/Specs	Supplier/Source	Cost (TZS)
Land Acquisition	5 ha at Mulebe (title #12345)	Mulebe Village Council	40,000,000
Access Road Upgrade	Grade 8km, add murrum	Local Civil Contractor	20,000,000
Site Earthworks	Leveling plant area (cut/fill ~5000 m <sup>3</sup> )	Local Civil Contractor	15,000,000
Fencing (perimeter)	1.5 km barbed wire on poles + gate	KK Security (contract)	15,000,000
Main Wash Plant Unit	LZZG LZ series (approx 120 tph)	LZZG (China)	300,000,000
Cyclone & Dewatering System	Integrated with above (fine sand recovery)	Included in LZZG package	–

Auxiliary Pumps & Pipes	Slurry pump 50 kW, return pump 10 kW, piping	China (via LZZG)	40,000,000
Thickener Tank	20m diameter high-rate thickener + bridge	CDE or India supplier	100,000,000
Flocculant Plant	Mixing tank, dosing pump (1 set)	WaterTech Co. (India)	20,000,000
Generator Set	200 kVA Cummins diesel genset	Car & General (DSM)	60,000,000
Transformer & Elec. Install	33 kV/0.4 kV, 250 kVA transformer + lines	TANESCO approved vendor	60,000,000
Borehole Drilling	80m depth, casing, test yield	BoreWell Co. (Dodoma)	18,000,000
Borehole Pump & Tank	10kW pump, 2×50,000L plastic tanks	Davis & Shirtliff (DSM)	12,000,000
Office Building	60 sqm prefab + furnishing	Dodoma Construction Ltd.	25,000,000
Laboratory Setup	Sieves set, oven, balance, etc.	World Instruments (DSM)	5,000,000
Workshop & Tools	Tools, welding kit, compressor	Jubilee Hardware (DSM)	10,000,000

Weighbridge	50 ton pitless electronic weighbridge	Avery/Tanzania	60,000,000
Trucks (Tipper 10t)	10 units (FAW model 2022)	XCMG Dealer (Tanzania)	1,850,000,000
Loaders (3m <sup>3</sup> )	3 units (XCMG ZL50)	XCMG Dealer (Tanzania)	360,000,000
Excavators (20t)	2 units (Sany SY215)	Sany Dealer (Tanzania)	350,000,000
Spare Parts Inventory	Initial critical spares (belts, pump impellers, filters)	Various	30,000,000
Pre-op Training & Travel	Team training in China (2 people, 1 week)	LZZG / travel agency	15,000,000
Permitting & Legal Fees	EIA, Mining license, legal consultant	NEMC, Mining Comm, Lawyer	15,000,000
Total (approx)			3,920,000,000

This detailed budget confirms earlier aggregate figures. We will revisit these quotes at time of procurement; some negotiation might save costs (for example, a discount on buying multiple machines from the same dealer, or opting for slightly used equipment for trucks to cut cost by maybe 20%). The contingency line item in the main analysis (10%) covers any deviations from these estimates.

## **Annex 2: Projected Financial Statements (Years 1-5)**

Below are simplified projected financial statements for the first five years of operation, assuming the base-case scenario.

Table 2.1: Income Statement (Projected):

Income Statement	Year 1	Year 2	Year 3	Year 4	Year 5
Sales Revenue	1,360	4,080	6,800	7,480	8,400
Cost of Goods Sold (COGS)	408	1,224	2,040	2,245	2,450
Gross Profit	952	2,856	4,760	5,235	5,950
Gross Margin	70%	70%	70%	70%	71%
Operating Expenses:					
– Salaries & Wages	84	180	200	220	240
– Administration & Other	60	60	70	80	90
– Maintenance	100	150	180	200	220
Total OpEx	244	390	450	500	550
EBITDA	708	2,466	4,310	4,735	5,400
Depreciation	238	475	475	475	475
EBIT (Operating Profit)	470	1,991	3,835	4,260	4,925
Interest Expense (if any)	0	0	0	0	0
Profit Before Tax	470	1,991	3,835	4,260	4,925
Income Tax (30%)	141	597	1,151	1,278	1,478
Net Profit After Tax	329	1,394	2,685	2,982	3,448

(Figures in TSh millions. Year 1 is slightly lower volume assuming mid-year start; from Year 2 full year. Interest assumed zero in this equity-funded base case.)

**Table 2.2 Cash Flow Statement (abridged):**

Cash Flow	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Cash Flow (EBITDA)	–	708	2,466	4,310	4,735	5,400
Income Tax Paid	–	0 (deferred)	(597)	(1,151)	(1,278)	(1,478)
Changes in Working Capital	–	(100) *	(200) *	(100) *	(50) *	(50) *
Operating Cash Flow after Tax	–	608	1,669	3,059	3,407	3,872
Capital Expenditure (CapEx)	(3,920)	(100)	(50)	(50)	(100)	(100)
Free Cash Flow	(3,920)	508	1,619	3,009	3,307	3,772
Financing (Equity/Debt inflow)	3,920	–	–	–	–	–
Debt Service (if any)	–	–	–	–	–	–
Net Cash Change	0	508	1,619	3,009	3,307	3,772
Cumulative Cash Balance	0	508	2,127	5,136	8,443	12,215

\* Working capital increase assumed as sales grow (for simplicity). †Small ongoing capex for additional equipment or replacements.

This cash flow shows that even after initial investment, the project generates positive cash from Year 1 and becomes self-sustaining, able to fund any expansions or pay dividends by Year 3 onward.

**Table 2.3: Balance Sheet (snapshots): (in TSh million)**

Balance Sheet	Year 1	Year 3	Year 5
Assets:			
Cash & Equivalents	508	5,136	12,215
Accounts Receivable	200	800	1,000
Inventory (Sand, etc.)	100	200	250
PP&E (Net of Depreciation)	3,682	2,732	1,807
Total Assets	4,490	8,868	15,272
Liabilities:			
Accounts Payable	100	200	250
(Assume no debt)	–	–	–
Total Liabilities	100	200	250
Equity:			
Share Capital	3,920	3,920	3,920
Retained Earnings	470	4,748	11,102
Total Equity	4,390	8,668	15,022
Liabilities + Equity	4,490	8,868	15,272

The balance sheet indicates a strong equity build-up from retained earnings, and minimal liabilities aside from normal operational payables.

(These financial statements are estimates and actual results may vary; they are meant to illustrate the financial trajectory.)

### **Annex 3: Sand Market Survey Results**

During the preparation of this plan, a brief survey was conducted with local stakeholders to gauge their perceptions and demand for washed sand:

Sample: 15 respondents including 5 contractors, 3 site engineers, 2 government works officials, 3 hardware store owners, and 2 individual home builders in Dodoma.

**Key Findings:**

Sand Quality Concerns: 80% of respondents (especially engineers and contractors) indicated they are “not satisfied” with the current sand quality in Dodoma. Common issues cited: presence of soil/clay (67% of respondents), salty sand (40%), and inconsistent grain size (33%). One engineer noted, “We often see white salt patches on walls due to the sand – it’s a serious issue.”

**Willingness to Pay:** When asked if they would pay more for guaranteed clean sand, 12 out of 15 said yes. On average, contractors were willing to pay about 20-30% more than the going rate of unwashed sand, provided it is certified to improve strength. (This aligns with our pricing strategy – a premium but within acceptable range.)

**Estimated Usage:** The 5 contractors together reported using about 250 truckloads (~2,500 m<sup>3</sup>) of sand per month. All expected their usage to increase or remain high given ongoing projects. Government officials pointed to upcoming projects (municipal roads, new hospital) that will require substantial sand volumes and will likely include quality requirements in tenders.

**Competitor presence:** None of the respondents were aware of any existing washed sand supplier. A few mentioned that sometimes for critical works they source sand from distant rivers or wash it themselves on site (“We hire labor to wash sand in water drums for columns casting” one contractor said). This indicates latent demand for a convenient solution.

**Environmental Attitude:** Interestingly, 60% of respondents also expressed concern about the environmental impact of sand mining around Dodoma

(citing examples of pits left unfilled). They reacted positively to our described approach of controlled mining and rehabilitation – this could be a PR selling point for us as an ethical supplier.

**Preferred Ordering Method:** Contractors prefer phone/WhatsApp ordering with delivery to site. Hardware store owners showed interest in stocking washed sand in smaller lots (e.g., 1-ton bags) for retail customers, which opens a potential distribution channel.

Overall, the survey reinforced that there is a keen interest in our product, especially among technical professionals who understand its value. It also highlighted the importance of education – a couple of individual builders were unaware of how sand quality affects construction but said they’d follow their fundi’s (foreman’s) advice. So, our marketing should also target those foremen/masons.

(Survey conducted informally; results used to inform the market analysis section.)

#### **Annex 4: Technical Specifications of Proposed Equipment**

This annex provides sample technical specs for one of the primary pieces of equipment – the sand washing and recycling machine – to illustrate its capabilities:

##### **Model: LZZG LZ30-120 Sand Washing & Recycling Machine**

Type: Dual Wheel Bucket Washer with Polyurethane Dewatering Screen and Hydrocyclone Recovery

Capacity: 120 tons per hour (feed rate) for sand with ~10% mud content.

Power Requirement: 55 kW total (2×11 kW bucket motors, 1×30 kW slurry pump, 2×1.5 kW vibrating motors for screen).

Water Requirement: ~15 m<sup>3</sup>/hour makeup water (with recycling over 90%).

Recovery Rate: Can recover ≥ 95% of fine particles (0.16-3mm range)

Output Moisture Content: 12-15% by weight in final sand

Features:

Bucket wheels scoop up and drain the sand gently, reducing loss of fine sand.

The hydrocyclone cluster (250mm diameter cyclone) separates out fine sand from wash water which then gets dewatered on the screen.

High-quality PU screen mesh ensures durability with aperture sizes tailored to desired sand grade (e.g., 0.2mm mesh to capture fine sand).

Adjustable overflow weir in the tank to control the water level and thus the cut point of fines removal.

**Lining:** All material contact surfaces are lined with 10mm abrasion-resistant rubber to prolong life (in pump casing, cyclone, etc.).

Comes with an automatic lubrication system for bearings, and sensors for critical parameters (e.g., vibration sensor on screen, pressure gauge on cyclone feed).

**Dimensions:** approximately 6m (L) × 3m (W) × 3.5m (H); weight ~12 tons.

**Manufacturer Support:** Includes one-year warranty, and availability of spare parts like bucket teeth, screen panels, cyclone liners ex-stock via local agent.

**Installation:** Can be mounted on a simple concrete slab with bolt anchors. Requires a feed height of ~3m (so either feeding by conveyor or by loading hopper).

**Operational Notes:** Best performance when feed gradation is <10mm; recommended to pre-screen above 10mm. Optimum slurry feed density ~20% solids by weight for cyclone.

**Compliance:** CE certified (for export), meets Chinese GB quality standards for mineral machinery.

We also have spec sheets for the other equipment like the thickener (e.g., AquaCycle A1500 – treats 150 m<sup>3</sup>/h, 15m diameter, 5m high, motor 5.5 kW rake drive) and a typical 10-ton tipper truck (e.g., FAW Model: 6x4 drive, 10m<sup>3</sup> dump box, 280 HP engine). These are available on request and will be used during procurement to ensure we get the right models.

(The above is an illustrative spec. Final equipment selection will be confirmed at purchase, with exact specs possibly varying slightly.)

## **Annex 5: Maps and Photos of Project Site**

Included here are a location map and site photographs to give visual context:

**Location Map:** Mulebe, Chamwino District relative to Dodoma City (highlighted area). This shows major roads, the project site, and nearby notable features. (Embedded map image or reference).

### **Site Photographs:**

**Current State of Project Site:** A wide view of the mostly flat land earmarked for the plant, with sparse vegetation. One can see the dirt access road in the frame and gentle slopes – indicating minimal earthworks needed.



Sample of Unwashed vs Washed Sand: Side-by-side close-up photo: the unwashed sand appears darker with clumps (due to clay) and some organic debris, whereas the washed sand (from our test batch or a similar plant) is cleaner, uniform in color and texture. This will be useful for marketing as well to visually demonstrate the difference in quality.



Unwashed sand



Washed sand