

INDUSTRIAL SUB-SECTOR MASTER PLAN FOR CONSTRUCTION MATERIALS

MASTER PLAN



Ministry of Trade and Industry



And:
**GIMCO LIMITED,
TWO EMS ASSOCIATES LIMITED,
GREENWISE CONSULT LIMITED,
E.D.G. & ATELIER.**



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EXECUTIVE SUMMARY

The Rwandan population is expected to double to around 16 million by 2020. Given that the major aspiration of Vision 2020 is to transform Rwanda's economy into a middle-income country, this will require an annual growth rate of at least 11.5 %. This will be achieved only through transformation from a subsistence agriculture economy to a knowledge-based society, with high levels of savings and private investment, thereby reducing the country dependence on external aid. The construction industry has great potential to generate wealth and employment to the citizenry and is envisaged to contribute immensely towards this growth.

It is in this regard that the Ministry of Trade and Industry hired a consortium of four firms (GIMCO Limited, Two Ems Associates Limited, GreenWise Consult Limited and E.D.G & Atelier) to develop an industrial subsector master plan for construction materials industries. This master plan has been developed to enable the construction materials industry to achieve an increased contribution to national GDP, increased the employment, improved balance of trade of the construction materials industry and to lead green growth of the industrial economy through the vision:

“A Globally-Competitive, Sustainable Construction Materials Industry To Achieve Rwanda Vision 2020.”

This master plan has been presented in three volumes and with six chapters as listed below:

- VOLUME ONE: INTRODUCTION:
 - Chapter 1- Background to Study
 - Chapter 2- Methodology
 - Chapter 3- Global Industrial Trends, Benchmarking and Theory
- VOLUME TWO: SITUATIONAL ANALYSIS:
 - Chapter 4- Current Status of the Construction Materials Industry in Rwanda
- VOLUME THREE: ACTION MECHANISMS:
 - Chapter 5- Proposed Strategies and Action Plans
 - Chapter 6- Product Niche

This master plan covered all districts in Rwanda, with three over-riding objectives, which included:

- Conducting a comprehensive mapping of the industrial resource base for the construction materials industry.
- Carrying out prefeasibility studies for the development of resource based industries.
- Designing a subsector industrial master plan to guide future development.

The development of this master plan was done through detailed analysis of the construction materials industry by in-depth literature review, baseline surveys of construction industries (naturally-occurring materials and man-made product industries) and contractors, GIS mapping and key informant interviews. The development of Master Plan has also been done with careful analysis of the existing policy environment, which has a direct or indirect impact on the sub sector. Stakeholder participation was a key component in the development of this document with client validation workshops held that helped in refining both the problem identification and plan formulation stages.

Globally, the construction industry is a major component of investment, as it is closely related to economic growth. Numerous studies have shown that construction output grows particularly fast, often exceeding the rate of growth of the economy as a whole, as countries put their basic infrastructure in place to facilitate development. The construction industry output accounts for about 10% of the global GDP (approximately US\$ 7.5 trillion). Worldwide, the main construction industry concerns are raw material prices, skills of workforce, technology, resource scarcity, climate change and urbanization and corruption.

An industrial sub-sector master plan for timber exploitation in Sarawak, Malaysia provided good insights into industrial master planning approaches and strategies. Sarawak had experienced one of the most rapid log clearances in the whole Southeast Asian region, and thus within the same year, the government decided to establish a Forestry Industry Master Plan. Its aim was to mitigate further destruction of the forest as Malaysia plays a major role as a producer and supplier in the international wood markets. Three master plans were developed in phases (raw materials/ wood tapping, manufacturing and value-addition, and ICT integration) to respond to the challenges facing the industry. After the introduction of the master plans the timber industry began to flourish with higher production volumes, increased exports, product diversification and employment creation. The lessons learnt from this case study include the need for a participatory approach, ensuring environmental sustainability and an institutional coordination and M&E framework for implementation.

Rwanda's building and construction industry has rapidly grown in the past couple of years with both government and private sector engaged in the construction of buildings and roads infrastructure triggering what is now dubbed as a "construction boom in Rwanda". The construction industry contributes immensely towards the GDP of the Country mainly through direct income and massive employment opportunities generated from various infrastructure projects, rehabilitation and maintenance. It is estimated that the construction sub-sector of the larger industrial sector contributes the highest to the country's industrial GDP with 52% of industrial output in 2010, up from 41% in 2002. However, there has been over dependence on imported building materials, which depletes the meager foreign exchange resources while denying the citizens the opportunities of production of the materials locally.

Within Rwanda, commercially viable amounts of clay, wood/timber, sand and stone exist that are not fully exploited for industrial growth. A district such as Nyarugenge has 700,000 cubic meters of confirmed clay deposits that exhibits Rwanda's rich natural resource base. There is however a need for detailed geology studies to establish the exact quantities of these construction materials nationwide and establish their lifespan and quality, an aspect too wide to have been undertaken in preparation of this master plan.

The construction materials industry in Rwanda was profiled with a sampled analysis of eleven natural construction materials extractors, seven man-made products manufacturers and twelve contactors. The emerging issues highlight the following opportunities: vast quantities of natural construction materials, plenty of traditional knowledge in construction, a willing human resource base, availability of construction industry related technical institutions, regional integration and political will by the government to revitalize the industry.

The constraints and weaknesses to development of this industry were identified as: an inefficient and inconsistent supply of raw materials, limited skilled manpower, capital-acquisition difficulties, high competition from other regional players (from Kenya and Uganda), inconsistent and inadequate energy/power supply and low quality production output.

Through this master plan, it is projected that the construction industry will contribute beyond the current 7% of the GDP and 52% of the industrial sector and overall 26% growth rate of the industrial sector as

projected in the VISION 2020. To achieve this, four main naturally occurring construction materials that can be manufactured/produced locally have been identified (clay, timber/wood, stone and sand) and mapped, and strategies for their tapping proposed. This will be possible through the marshaling of requisite technological and human capital capabilities, mobilizing financial resources and harnessing existing markets locally and in the EAC especially the DRC, Burundi, Southern Uganda and Western Tanzania. Since most of the raw materials are located in the rural areas, establishment of industrial zones at the district level and composite production units at the villages will result into a sizable population being engaged through the value chain. A considerable number of youth and women will be engaged in the extraction, transporting, processing, packaging and marketing activities and disengaging them from the subsistence farming activities. This will help the country achieve the 1.4 million off farm jobs.

Environmental issues are essential in the building materials industry as environmental cost is especially heavy to the society if not addressed. In order to nurture a dynamic construction industry these issues must be given priority as they affect the productivity of the industry. The study has shown that there is a critical need and gap in the current status of the industry in relation to the environmental issues and also the health and safety issues. Key strategies that would assist in ensuring environmental sustainability in the sector include focusing on production of eco friendly production building material, adoption of internationally accepted environmental standards, introduction of Green Public Procurement (GPP), having a Green Rating system for buildings, use of resource efficient and clean production tools and introduction of Sustainable Financing mechanisms through the Rwanda Environment and Climate change Fund (FONERWA) Funding.

In terms of policy direction proposals, the existing policy recommendations relevant to development of the construction materials industrial sub-sector need to have their implementation fast-tracked.

In conclusion, two particular product niches have been identified that can be the runaway projects from this master plan: engineered lumber and clay ceramics. Rwanda has abundant resources that are sufficient for the establishment of a viable ceramics and engineered lumber industry. The current emphasis is based on traditional technologies, which are not efficient to satisfy local demand and offset material imports. For the purpose of value addition and therefore substitute for some imports, this master plan aims at creation of ceramic and engineered lumber production units. It is forecasted that jumpstarting of these two projects will result in job creation, foreign exchange income and an infusion of about 40 million USD per annum into the national GDP. Additional growth scenarios have been developed for products such as iron-ore/ metal, paint, stone/ cement/ limestone and gypsum, which though aren't strong local niche products; also require interventions to enable the entire sector to grow in line with the master plan vision of "A Globally-Competitive, Sustainable Construction Materials Industry".

VOLUME 1: INTRODUCTION

CHAPTER 1: BACKGROUND TO STUDY

1.1 Justification:

The industrial sector in Rwanda contributes about 15% of the National Gross Domestic Product (GDP) and is therefore a crucial component of the national economy. Rwanda Vision 2020 projects an overall growth of the industrial sector by an additional 5%, to 20% of National GDP. The construction industry in particular, contributes about 49%¹ of Rwanda's industrial GDP making it a vital industrial sub-sector in the country.

The 2011 Industrial Policy prioritizes the construction industry sub sector's potential to spur the overall industrial sector growth and development, enabling Rwanda to become a middle-income country. It is in this context that the elaboration of various Industrial Subsector Master Plans identifying potentialities of industrial resources available, their location, how they can be exploited sustainably, and by whom have been initiated.

Producing and implementing the Industrial Subsector Master Plans is an affirmative action desired to develop Rwanda's industrial sector as a key driver of economic growth. The plans will serve as important planning instruments in expanding the drivers of economic growth and promoting Rwanda's long-term industrial competitiveness in the selected subsectors. In the pursuit of the long-term industrial competitiveness, industries will be encouraged to shift towards higher value-added activities and productivity-driven growth initiatives, as well as adoption and application of technology innovativeness. This ultimately will allow the sectors be progressively integrated into the regional and global production networks and supply chains.

The growth of the sectors will entail concomitant development of human capital focusing on available and gaps of technically skilled, knowledgeable, creative and ICT – trained workforce to match the requirements of the industries and services. At the managerial level, the focus will be on nurturing corporate leadership capabilities and skills, in areas such as product branding and international marketing.

The Master Plan informs on investments potentials, both foreign and domestic, on what, where and the how's of the targeted subsectors and attendant policy requirements that drive and promote growth as well as sustainability and competitiveness.

It is in this regard that the Ministry of Trade and Industry hired a consortium of four firms (GIMCO Limited, E.D.G & Atelier, GreenWise Consult Limited and Two Ems Associates Limited to develop an industrial subsector master plan for construction materials industries.

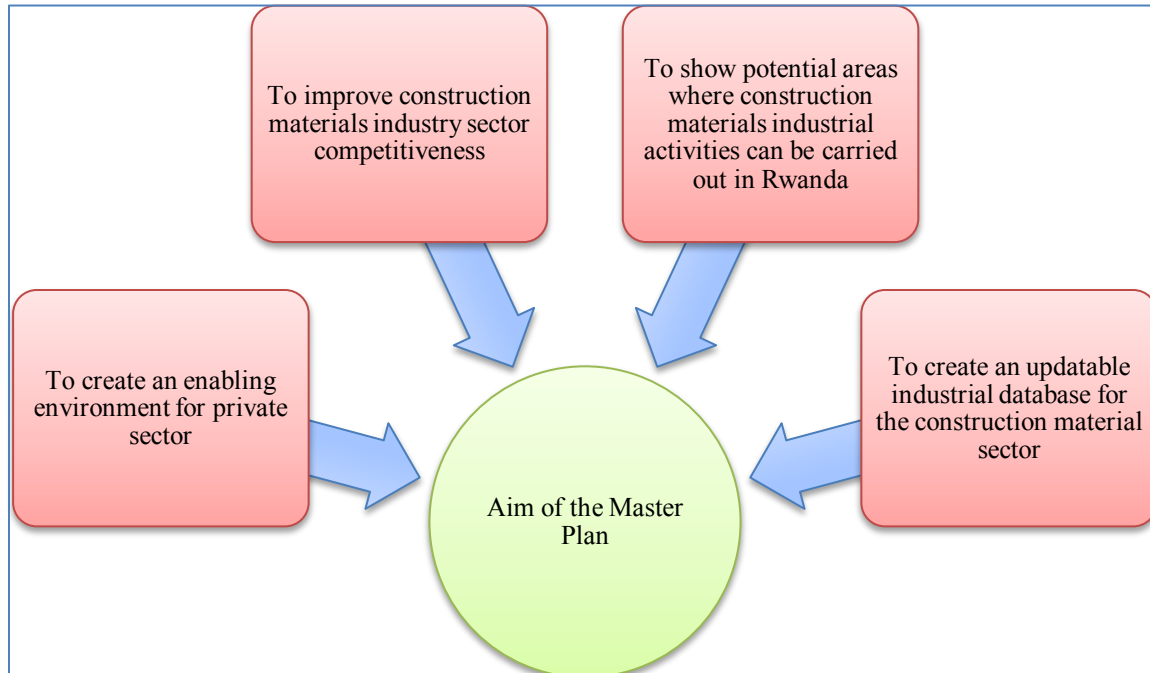
¹ National Institute of Statistics Rwanda; *Statistics for Entrepreneurs*, 2007

1.2 Study Objectives:

There are three over-riding objectives of this study and they include:

- To conduct a comprehensive mapping of the industrial resource base for the construction materials industry.
- To carry out prefeasibility studies for the development of resource based industries.
- To design a subsector industrial master plan to guide future development.

Figure 1: Aim of the Master Plan



1.3 Study Terms of Reference & Duration:

The Industrial Subsector Master Plan document covers the following:

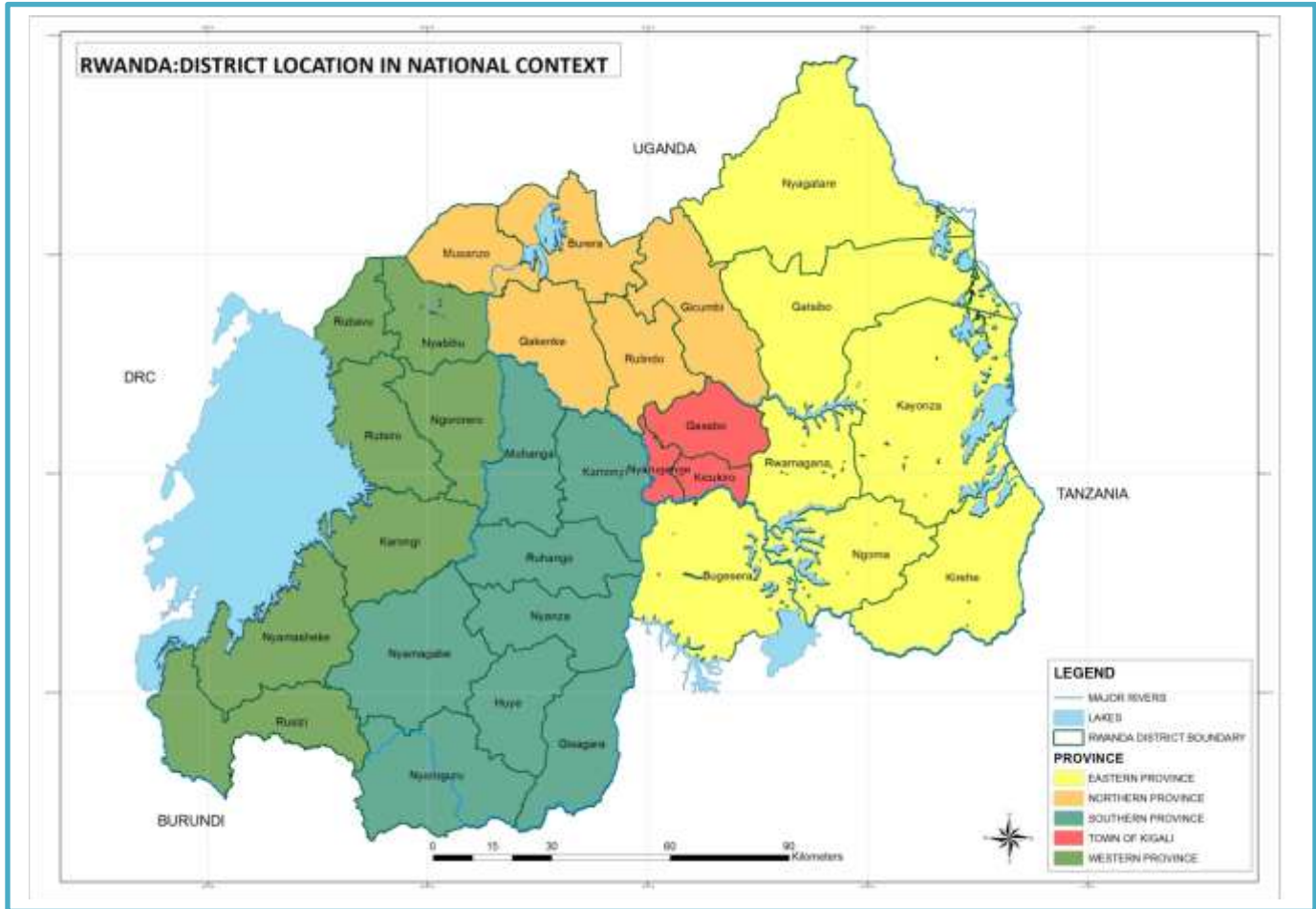
- Performance and Challenges of the industrial subsector;
- Current status and mapping of the industrial subsector by District, identification of major strengths, weaknesses, opportunities and threats (SWOT);
- Industries that are most suitable for Rwanda as a country and for each district, recommendations and delimitation of the most suitable industrial areas (zones) in each district;
- Industry (Small, Medium, large) to put in place and classification of the existing industries. Proposed way to develop and to sustain the Small and Medium Enterprises to support the manufacturing subsector;
- Liberalization impact on the industrial subsector;
- Proposed growth scenarios especially with regards to exports;
- Entrepreneurship development & Private Sector Mobilization strategy;
- Infrastructural development plan & implementation;
- Investment promotion including inter-company partnership;
- How to build the capacity of the institutions that support the industrial development;

- A strategy to upgrade the existing industries and make them more competitive at national and regional level;
- Human Resource Development Requirements;
- Transaction advisory Services to conclude investment deals

This study covered:

- All construction industries in Rwanda
- All 30 Districts in Rwanda and the City of Kigali

Map 1: Districts in Rwanda



This master plan has been presented in three volumes and with six chapters as listed below:

- Volume One: Introduction:
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 - Chapter 4- Current Status of the Construction Materials Industry in Rwanda
- Volume Three: Action Mechanisms:
 - Chapter 5- Proposed Strategies and Action Plans
 - Chapter 6- Product Niche

CHAPTER 2: METHODOLOGY

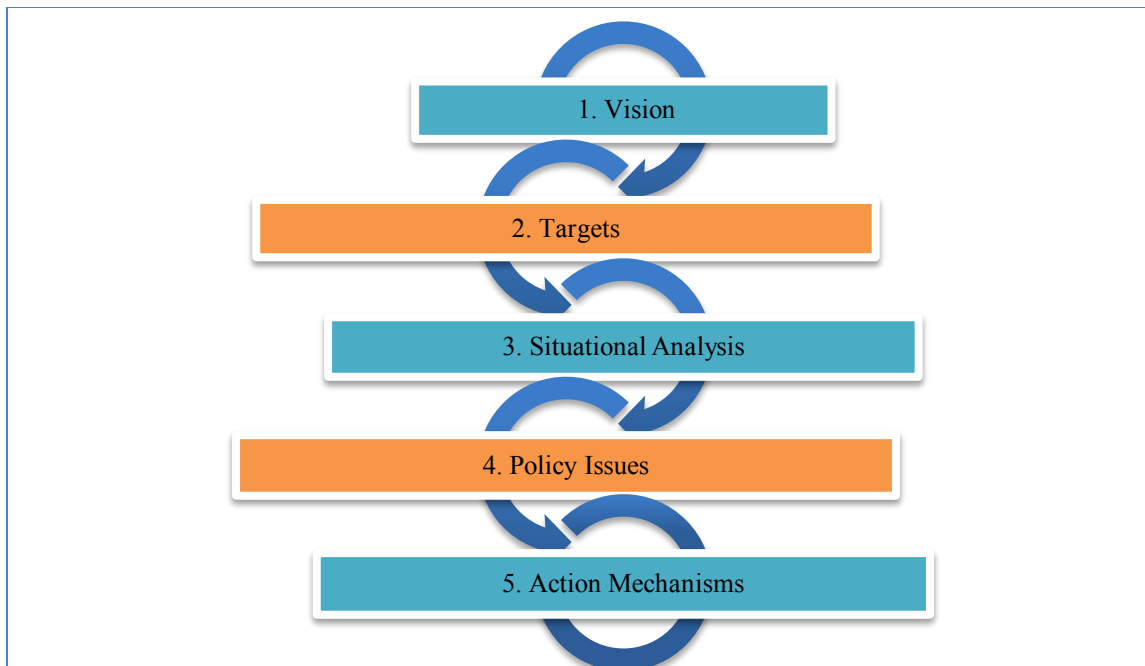
2.1 Aims of Methodology Adopted:

The aim was to produce a master plan that is:

- Lean (only relevant data!)
- Readable (linkage of information in various chapters)
- Sharply focused (concise!)
- Updatable/ flexible
- Implementable (anchored on policy)
- Sustainable (through stakeholder participation)

To respond to these six parameters therefore, this Construction Industry Sub-Sector Master Plan has the following five main ingredients:

Figure 2: Ingredients of the Construction Industry Sub-Sector Master Plan:



- Vision**—The master plan clarifies the purpose of industrial promotion, including why this industry is important in national development, what role it plays in stimulating other sectors, Rwanda’s positioning in the global, regional, and national markets, and so on.
- Targets**—Long-and medium- and short term targets, quantitative and/or qualitative, have been presented with a clear time frame, extending over a few to several years. Long-term and medium-term targets are ambitious but realistic. Before setting any targets in the final master plan however, a thorough discussion with all stakeholders, including policy makers, private businesses and experts, will be held for the proper configuration of such targets.
- Situation analysis**— Information was collected from the stakeholders and in addition to the secondary has been used to analyze the current status, potentials, and obstacles of the construction

industry in Rwanda. Data has been presented in tables and graphs, with the results of surveys and benchmarking also being reported.

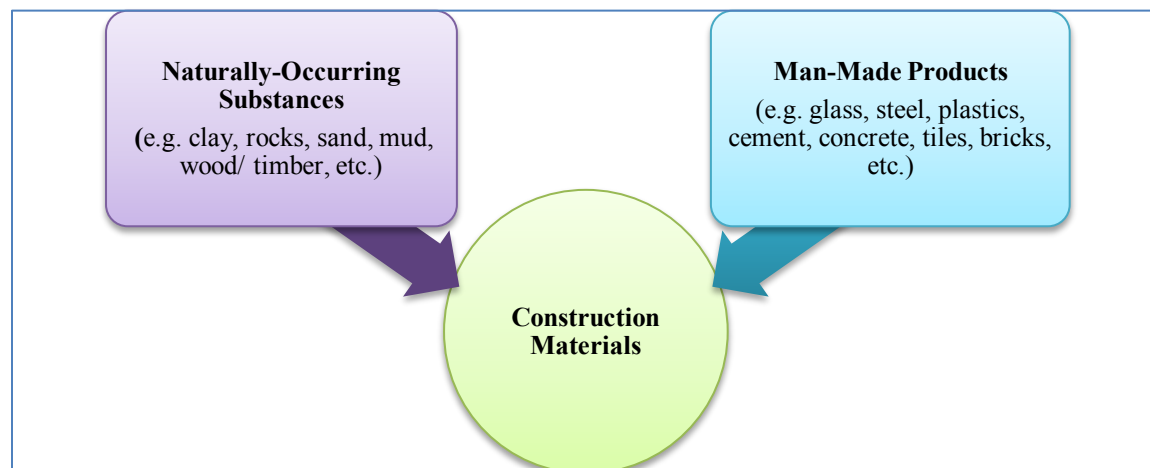
- d) **Policy issues**—After the industry situation was reviewed comprehensively, specific aspects that need to be fortified by policy to realize the vision and targets above have been identified, prioritized, and analyzed. The issues have involved either removal of negatives or strengthening of positives. Actions have been proposed and elaborated into detailed action plans.
- e) **Action plan or action mechanism**—An action plan matrix or an action mechanism is essential to ensure implementation. An action plan matrix is a large table that has translated analyses and proposals conducted in previous chapters into concrete actions. The implementation procedure, such as who will report what to whom by when, has also been clearly stated alongside the action plan matrix.

2.1 Working Definitions Adopted

Construction is a general term meaning the art and science “to form material or immaterial objects, systems or organizations, and comes from Latin *constructionem* (from *com-* "together" and *struere* "to pile up"). It refers to an object, item or substances that are used in the construction industry to create buildings and structures. Include materials like Compressed Earth Blocks, Mud bricks, Cement, Wood, Iron sheets etc.

Construction materials can also be defined as materials or substances used in the erection/creation of buildings or structures towards their completion². Construction materials can either be:

Figure 3: Construction Materials Categorization



Adapted From: International Code Council, 2012

According to the International Standards of Industrial Classification (ISIC Rev 4), Classification of Construction³ is given in three categories as:

² International Code Council, 2012, International Building Code

Department for Business Innovation and Skills, 2013, UK Construction, An economic analysis of the sector

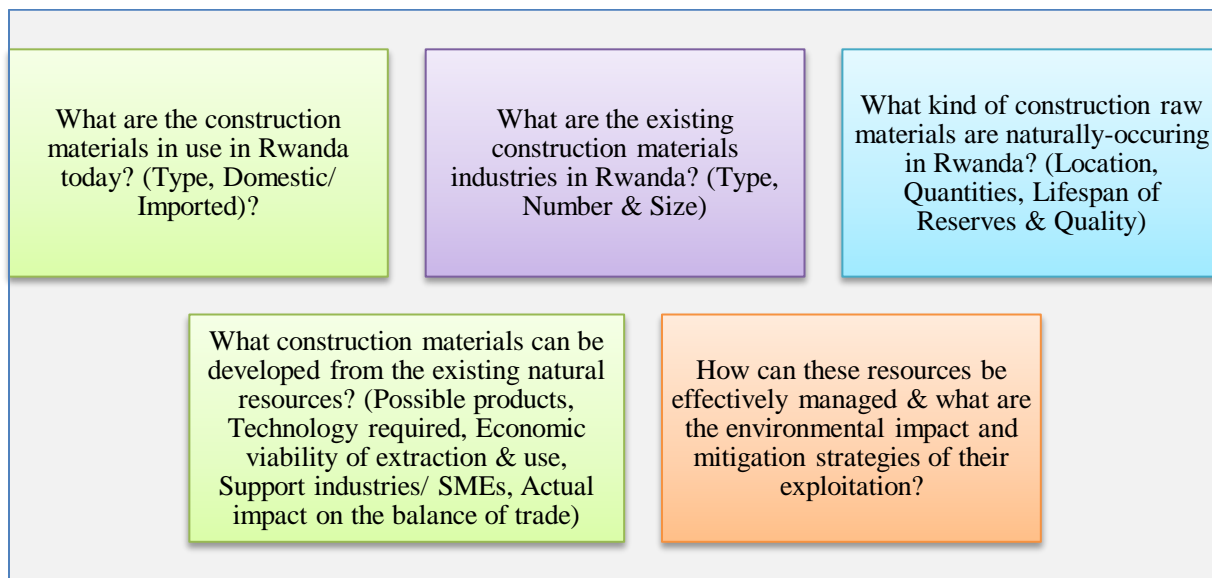
- Construction of buildings.
- Civil engineering (including construction of roads and railways and utility projects).
- Specialized construction activities (Demolition and site preparation, electrical, plumbing and other construction installation activities, building completion and finishing.)

Construction is a labor-intensive activity with capacity to provide extensive employment with limited investment. The industry provides a point of entry into the labor market to some of the least educated and most disadvantaged section of the society. Worldwide, construction is a major component of investment, as it is closely related to economic growth. Numerous studies have shown that construction output grows particularly fast, often exceeding the rate of growth of the economy as a whole, as countries put their basic infrastructure in place to facilitate development (Strassmann, 1970; BERU, 1972; Edmonds and Miles, 1984; Wells, 1986; Bon and Crosthwaite, 2000). Therefore from the above, for purposes of this study, the construction industry/ sector will mainly focus on:

- Provision of construction related professional services
- Construction industry naturally-occurring substances and man-made products

2.2 Approach:

Figure 4: Main Questions Master Plan Answers:



A variety of data collection methods were adopted for comprehensive coverage of the study area, which can be broadly classified into:

- Literature Review
- Reconnaissance Surveys
- GIS Mapping Component
- Field Survey:
 - Key Informant Interviews
 - Administration of Construction Industries Questionnaires
- Stakeholder Participation

³ United Nations Industrial Development Organization, Department of Economic and Social Affairs (Statistical Papers Series M No.4, Rev. 4), 2008, International Standard Industrial Classification of all economic activities, New York

a). Literature Review:

Literature Review was the first data collection method used for purposes of familiarization of the study scope and characteristics of the area under study. This stage involved the perusal through relevant pieces of literature such as:

- Relevant policy documents (Rwanda Vision 2020, EDPRS II, National Industrial Policy 2011, National Investment Strategy, National Export Strategy, TVET Policy 2008, Housing Policy, among others).
- Documentation on Rwanda's construction materials industry (Rwanda Industrial survey 2011, Rwanda Industrial Master Plan 2009-2020, Construction Industry Skills Survey, RDB Building Materials Investment Review, Rwanda Industrial and Mining Survey 2005).
- Other relevant literature on industrial master planning theory, plans and global construction materials documentation.

The outputs of the literature review stage included:

- Industrial master planning theory and empirical studies
- Understanding of regional and world construction industry trends
- Past trends and current status of the construction industry in Rwanda.
- Understanding the policy guidelines for the sector
- Best practice case studies (to guide both methodology & output of study).

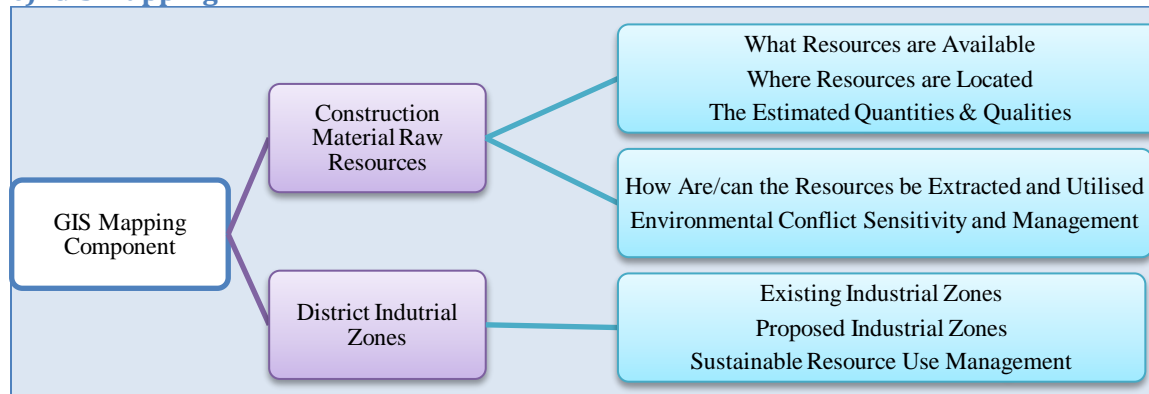
b). Reconnaissance Surveys:

Reconnaissance surveys were crucial for providing an understanding of an area that desk research could not effectively offer. Reconnaissance surveys involved a brief visit to the study area for familiarization purposes, during which data collection instruments were tested.

The outputs of the reconnaissance review stage included:

- Improved project design.
- Improved data collection instruments.

c). GIS Mapping:



d) Field Surveys:

Key Informant Interviews:

The first phase of data collection was the interviewing of key informants, using purposive sampling methods. Both the Consortium and the Client did stakeholder mapping to identify relevant focal persons that needed to be interviewed for this study. The key informants were both national-level focal persons, and persons at each district who gave authoritative information on the construction materials industries for their area of jurisdiction. The data collection instruments used in interviews with these key informants have been attached among the Appendices of this report.

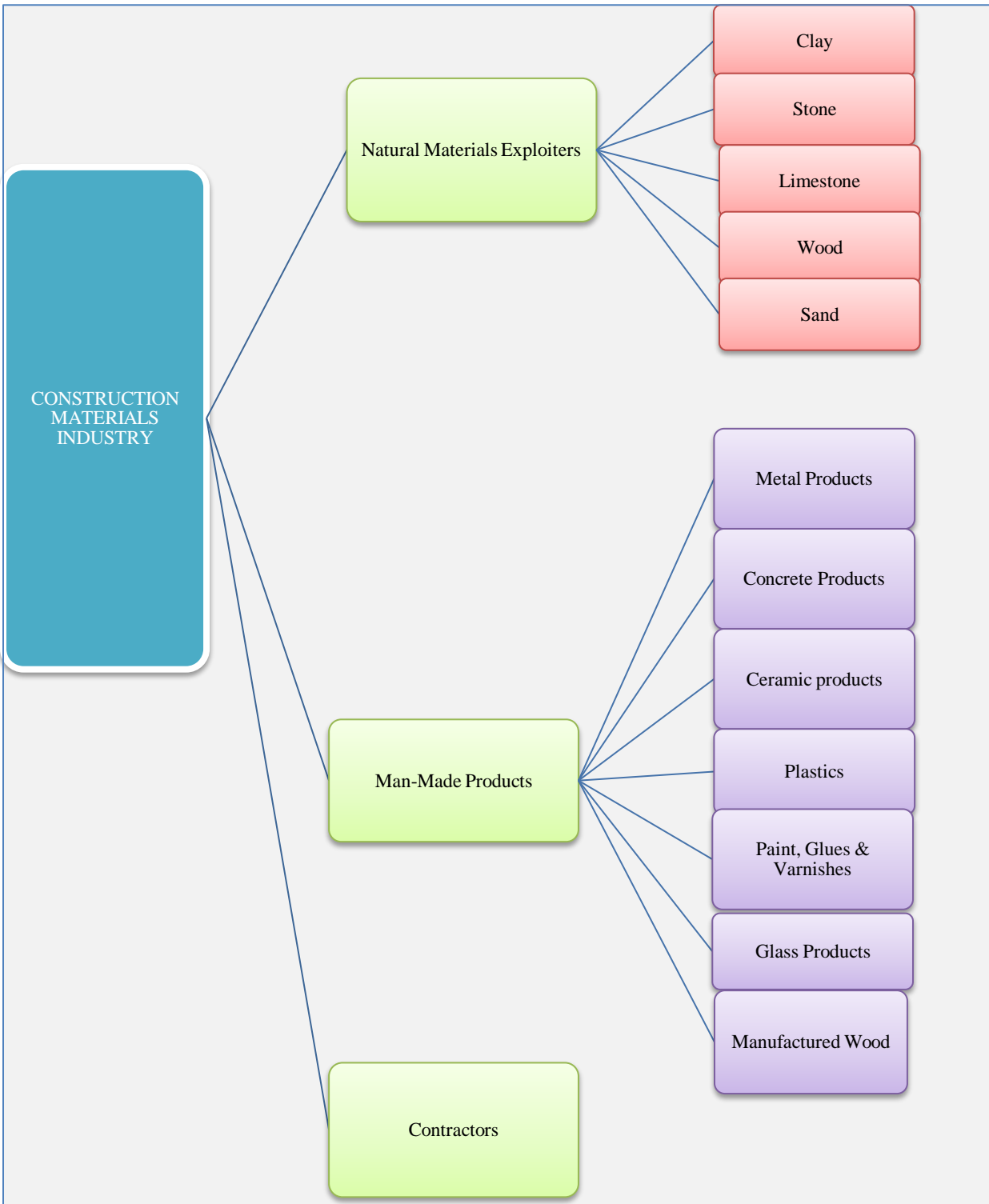
The outputs of the key informant stage included information on:

- Past trends of the construction industry in Rwanda.
 - Output, industry capacity, demand
 - Exports, imports, localization
 - Markets & trends (global, regional & local)
 - Competitors & competitiveness
- Current status of the construction industry in Rwanda.
 - Product mixes, producers and regional distribution of production units
 - Quality, competitors and competitiveness
 - Impediments to further development
 - Demand forecast (possibly with alternative scenarios)
 - Global, regional or domestic market trends that may impinge on the development of the industry
- Strengths, weaknesses, untapped opportunities and threats (SWOT) to the construction industry in Rwanda, at both national and district level:
 - What are the construction materials in use in Rwanda today? (Type, Domestic/ Imported)?
 - What are the existing construction materials industries in Rwanda? (Type, Number & Size)
 - What kinds of construction raw materials are naturally occurring in Rwanda? (Location, Quantities, Lifespan of Reserves & Quality)
 - What construction materials can be developed from the existing natural resources? (Possible products, Technology required, Economic viability of extraction & use, Support industries/ SMEs, Actual impact on the balance of trade)
 - How can these resources be effectively managed & what are the environmental impact and mitigation strategies of their exploitation?

----- Administration of Construction Industry Questionnaires:

Guided by the responses from key informants and based on the literature review conducted, detailed field surveys of construction industries were done. Using construction materials as the population for this study, a random but stratified mode of sampling was done so as to capture the issues representatively for all the diverse construction materials industries in Rwanda.

Figure 5: Construction materials sub-sector overview



Based on the population identified above, the purposive-stratified sampling frame developed for this study is as outlined in the table below:

Table 6: Sampling Frame for Study

	Type of Construction Industry:	Material	Mode of Selection:
1. NATURALLY-OCcurring CONSTRUCTION SUBSTANCES EXPLOITERS:	Clay Extraction		11
	Limestone Excavation		
	Stone Quarrying		
	Wood/ Timber Harvesting		
	Sand Excavation		
2. MAN-MADE PRODUCTS:	Kaolin Excavation		
	Metal Products		7
	Concrete Products		
	Ceramic Products		
	Plastics		
	Paints, Glues & Varnishes		
	Glass Products		
	Manufactured Wood		
3. CONTRACTORS			12

The questionnaire administered to these selected construction industries has been attached among the Appendices of this report.

The outputs of this industry-specific analysis included:

- Past trends of the construction industry in Rwanda.
- Current status of the construction industry in Rwanda.
- Strengths, weaknesses, untapped opportunities and threats (SWOT) to the construction industry in Rwanda, at both national and district level:

e). Stakeholder Participation:

Previous master plan studies have acknowledged that plans that are developed with disregard for stakeholder aspirations are unsustainable and hence fail. For this reason, the need for participation of the community (citizenry), non-governmental organizations (local and international), and other relevant institutions in the entire planning process has been recognized.

The key stakeholders for this study included:

- MINICOM (RDB, PSF, RBS)
- MININFRA (RHA, RTDA)
- MINIRENA (REMA, RRNA)
- MINEDUC (University of Rwanda, IPRCs)
- MIFOTRA (WDA)
- City of Kigali & District Authorities
- Development Partners GIZ, JICA, ADB, World Bank, TMEA)
- Professional Societies (AAR, IER, ABPWC)
- Private Sector Investors

Client validation workshops held throughout the development stages of this master plan were useful in further refining both the problem identification and plan formulation stages.

The outputs of this stakeholder participation stage included:

- Common vision of the master plan
- Agreed upon master plan period
- Agreed upon attainable targets for plan period
- Policy direction proposals on:
 - Skills and technology, cost reduction, quality improvement, product design and development
 - Input procurement (including localization and supplier policy), marketing and export promotion
 - Infrastructure (especially transport and power),
 - Financing (including the use of ODA and external borrowing),
 - Limitation of domestic market size, labor supply and workers
 - Coping with cheap imports and dumping, speed and scope of globalization and international commitments,
 - FDI policy, tariff policy, design of incentive measures and certification and award systems,
 - Legal reforms and international standards (ISO, quality, environment, accounting, etc.)
 - SME support, business matching, industrial associations, public private partnership, use of ITC, testing centers, and so on.
- Action mechanism proposals for:
 - Productivity Improvement
 - Market Expansion
 - Investment and Linkages
 - Human Resource Development, etc.
- Acceptable implementation framework

VOLUME 2: SITUATIONAL ANALYSIS

CHAPTER 3: GLOBAL INDUSTRIAL TRENDS, BENCHMARKING AND THEORY

3.1 Global Industrial Trends

Construction is a labor-intensive activity with capacity to provide extensive employment with limited investment. The industry provides a point of entry into the labor market to some of the least educated and most disadvantaged section of the society. Worldwide, construction is a major component of investment, as it is closely related to economic growth. The construction materials industry encompasses cement, brick, concrete, sand, aggregates and gravel manufacturers.

The construction output accounts for about 10% of the global GDP. With a global GDP of US\$ 75 trillion it means the construct industry has a global GDP of US\$ 7.5 trillion. Construction tends to track GDP growth but specific policies and events have an impact on the growth. From the figures below however, the construction industry is growing faster than the GDP (3.8% versus 4.5%). This growth however is a recovery from the world economic crisis and not a boom. Infrastructure growth is particularly strong especially in the emerging markets with an average growth of +6.8%. This has been called an era of moderate global growth and is, therefore difficult to predict. The greatest growth however is in the emerging markets but investors are warned to have risk versus reward analysis

Figure 7: World Economic forecasts for 2014

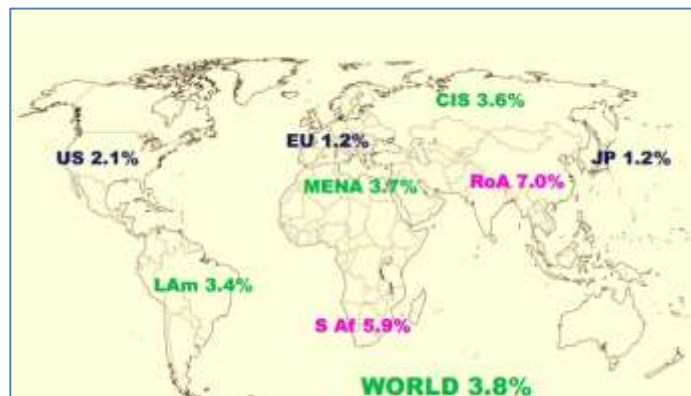
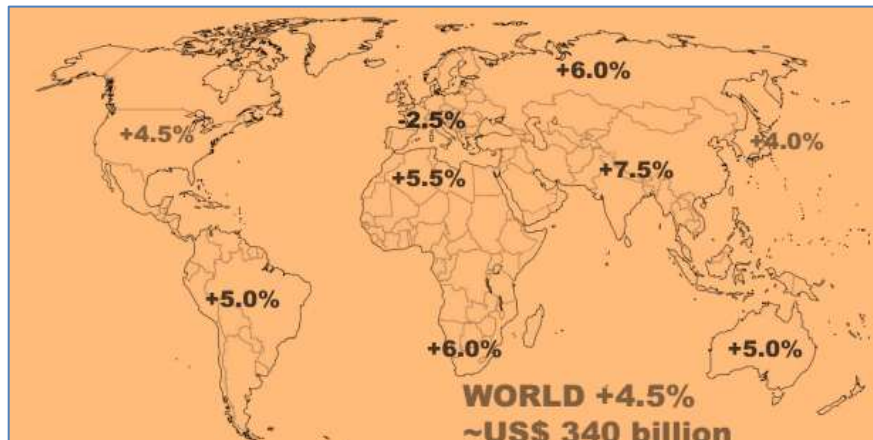


Figure 8: Relative Market Size of the Industry



Figure 9: Construction Growth in 2013



The global building materials market is expected to grow at more than 6% yearly through 2015 to reach almost \$890 billion.

Construction Industry's Top Concerns

- **Raw material prices and workforce-** Engineering and Construction CEOs (76%, vs. just 55% of CEOs overall) are concerned about high and volatile raw material prices. And the workforce is a matter of some concern too. Nearly one-third of sector CEOs are extremely concerned about access to key skills. And 70% worry about rising labor costs in high growth markets⁴.
- **Technology-** The industry sees technological advances as the top trend, which will transform business. Many called some aspect of technology the “next big thing” to impact their business, citing everything from new applications for formwork to techniques to better manage and utilize data. Most engineering and construction CEOs are optimistic about their ability to keep up--only 33% are concerned about the speed of technological change, compared to 47% overall (PWC Report, 2013).
- **Resource scarcity, climate change and urbanization-** Sector CEOs rate both trends more highly. They see a need for change across a wide range of business functions. And they're more confident that some functions, like IT and risk management, are well prepared to cope. But there's a big gap between aspiration and action. Less than a third say their company has already begun or completed a change programme in every area. For example, although 89% believe change in customer growth and retention strategies will be needed, just 21% already have programmes underway or completed, compared to 34% of CEOs overall. Similarly, 85% see a need to alter technology investments but only 25% are already doing so, compared to 35% of CEOs overall (PWC Report, 2013).
- **Bribery and corruption-** Two-thirds of engineering and construction CEOs are concerned that bribery and corruption could slow down growth. Indeed, one-third are extremely concerned, compared to less than a quarter of CEOs overall (PWC Report, 2013).

⁴ PWC, 17th Annual Global CEO in Construction Industry Survey 2013

3.2 Benchmarking Case Studies

It is important to benchmark best practice case studies as this provides an understanding of industrial master planning approaches, and the do's and don't's to guide the study. Overall, industrial master plans can be classified broadly into the following four types:

Figure 10: Types of Industrial Master Plans

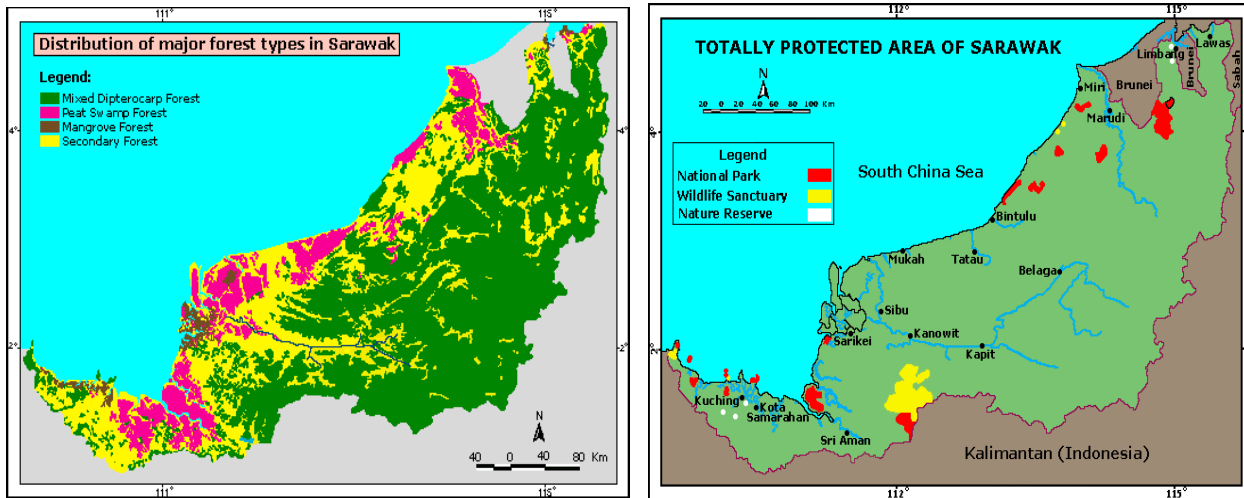
Overall Industrial Master Plans	Sector-Specific Master Plans	Issue-Specific Master Plans	Regional Development Master Plans
<ul style="list-style-type: none"> • These cover multiple industrial activities. Some of them feature sectoral chapters (electronics, machinery, food processing, etc.) while others are organized into issue-oriented chapters (TVET, technology, SMEs, etc.) • Not all countries produce this type of master plans, and the coverage of industries differs from one plan to another. 	<ul style="list-style-type: none"> • These are master plans for the development of one specific industry such as textile and garment, food processing, electronics, and so on. 	<ul style="list-style-type: none"> • These are strategies targeting cross-cutting aspects of national industrial development such as transport and logistics, information technology, small and medium enterprises, education and training, and so on. 	<ul style="list-style-type: none"> • These are strategies for the industrial development of particular regions, corridors, economic zones, and other geographically delineated areas.

Source: Kenichi Onho⁵, 2009

This Construction Industry Master Plan is an example of a Sector-Specific Master Plan. This master plan has reviewed several case studies of industrial master planning from around the globe. For purposes and relevance of this Masters on report however, only one sector-specific industrial master planning case study (Timber Industry Master Plan) from Malaysia has been provided.

⁵ Kenichi Onho; Industrial Master Plans: International Comparison of Contents and Structure (2009)

CASE STUDY: Timber Industry Master Plan (Sarawak Area, Malaysia)



Background/ Relevance to Rwandan Case:

- **Rich natural resource-** (Malaysia boasts of a rich forest base; Permanent Forest Estate (PFE) cover 11.383 million hectares of natural production forest, 183,000 hectares of plantations and 3.21 million hectares of protection forest. The rainforest of Borneo is acknowledged to be among the worlds most distinct and species-rich. About 80 per cent or almost 10 million hectares of Sarawak's total 124,000 Km² land area is covered with forest (natural as well as secondary forests).).
- **Environmentally-unsustainable exploitation of natural resource-** (In the late 1970s, some 76 percent of Sarawak was under forest cover, and 90 percent of it was under logging concessions. It is estimated that, between 1963 and 1986, over 30 percent of the total forest area was logged.
- **Large contribution of industry to national GDP-** The timber industry is the States' major revenue earner, with the royalties from logging being the single largest source of revenue for the state, making up at least 20 to 30 percent of total annual exports.
- **Low value addition for timber related products**
- **High unemployment level**

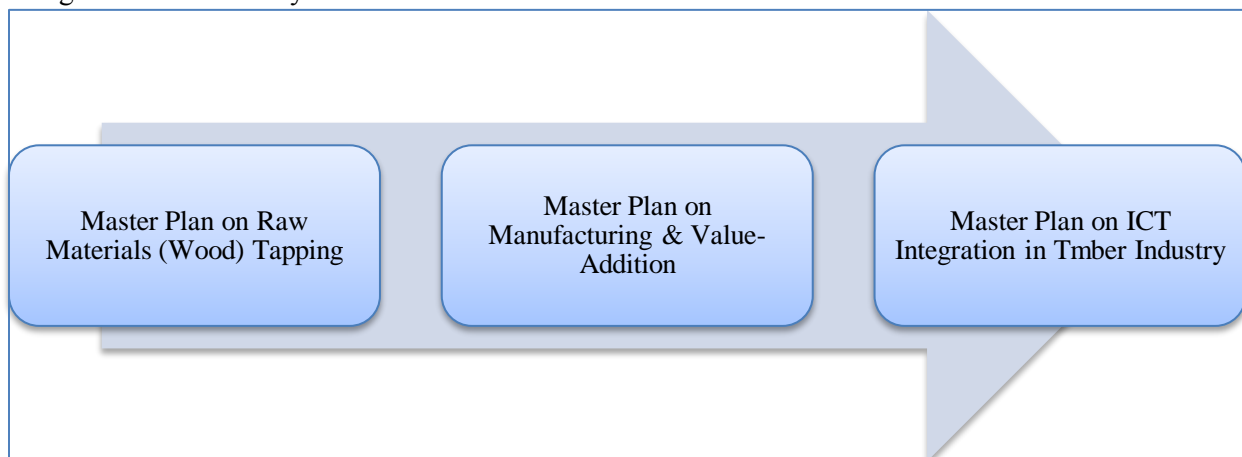
Planning Approaches Used:

Sarawak⁶ had experienced one of the most rapid log clearances in the whole Southeast Asian region, which was detrimental to the environment and needed immediate intervention. The Sarawak Government thus within the same year decided to establish a sector-specific industrial master plan (Forestry Industry Master Plan) to mitigate further destruction of the forest as Malaysia plays a major role as a producer and supplier in the international wood markets.

⁶ <http://www.theborneopost.com/2014/03/11/sarawak-hopes-to-sustain-timber-timber-product-export-value-at-rm7-2-bln-this-year/#ixzz2wrVvLXud>



The Master Plan was developed in three main parts, in sequential phases, to address the main challenges facing the timber industry:



- The First Industrial Master Plan (1986-1995), also known as the Master Plan on Tapping of Raw Materials, focused on the development of an export-based industry by placing emphasis on the promotion and increased investment in the resources-based industry through programs such as income tax payment exemptions, export credit refinancing, training incentives, favorable trade policies and practices, export rules and regulations, and establishment of furniture villages.
- The Second Industrial Master Plan (1996-2005) i.e. the Manufacturing Plus Strategy was aimed at strengthening industrial linkages and value-addition processes and it resulted in an increase in GDP by manufacturing (from 19.7% to 31.4%), increased manufactured exports (3.75 USD to 123 USD) and employment (from 0.85 million to 3.1 million in 20 years).
- The Third Industrial Master Plan (2006-2020) aims at incorporating ICT in industrial development towards achieving global competitiveness.

Results:

After the introduction of the master plans the timber industry began to flourish. Since then the state of Malaysia began to produce a much higher volume and, at its peak, a total of 19.5 million m³ was produced, precisely doubling the recommended critical yield. Moreover, most locally harvested logs were exported directly; since the introduction of the plan, the share processed locally continuously increased to around 60 percent.

In summary, some of the outcomes of the forestry master plan included:

- Increased GDP contribution from the forestry sector.
- Establishment of a forestry policy to guide the industry.
- Double production of trees for logging activities.
- Continuous supply of trees for logging through reforestation plans.
- Increased employment for the locals.
- Product diversification.
- Increased uptake and ICT integration in the forestry sector.
- Proper enforcement of laws through a coordinating body (Sarawak Timber Industry Development Corporation (STIDC)).

Lessons Learnt/ Success Factors:

- **Participatory Approaches-** The plan proposed programs such as the Participatory Development Initiatives, which involves the participation of local people who are interested in planting trees on their own land. By the end of the year 2000, the total area of established was 23,096 hectares.
- **Environmental Protection/ Sustainability-** Sustainable use of the forest resources was established through several forms of environmental protection such as:
 - Zoning regulations- (A timber-processing zone was established in the nearby Bintulu port to take advantage of the vast potentials of timber resources).
 - Reforestation programs
 - Issuance of timber licenses
 - Plantation development (planted forests)
- **Institutional Coordination Framework for Implementation-** The Industry Development Corporation (STIDC) was established as an official body whose main function was to stimulate the planned expansion of wood-based industries throughout Sarawak and ensuring optimum and efficient utilization of timber resources, by encouraging downstream processing and product diversification.
- **Enabling environment for investment in the extractive industry-** Enabling environment for business was created through favorable policy and incentives.
- **Integration of SME's-** e.g. through the furniture villages in industrial master plan that were established throughout the country to aggregate the fragmented furniture manufacturers in a location in order to ensure local synergy and networking.
- **M & E frameworks-** Through the use of explicit annual monitoring reports.

CHAPTER 4: CURRENT STATUS OF THE CONSTRUCTION MATERIALS INDUSTRY IN RWANDA

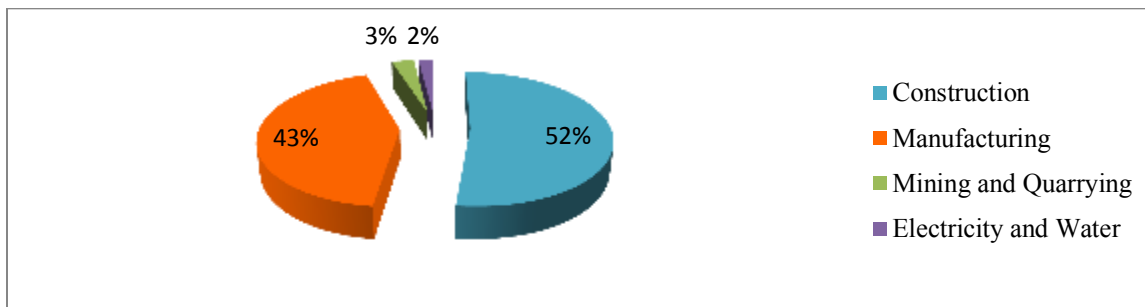
4.1 Overview

Rwanda's building and construction industry has rapidly grown in the past couple of years with both government and private sector engaged in the construction of buildings and roads infrastructure triggering what is now dubbed as a "construction boom in Rwanda". The construction industry in Rwanda industry is being transformed from being state funded to private funding resulting in more private real estate developers coming on board to develop housing estates for commercial use. Similarly, several private investors have come on board to develop commercial and industrial areas using private funds.

a). GDP:

The construction industry contributes immensely towards the GDP of the country mainly through direct income and massive employment opportunities generated from various infrastructure projects, rehabilitation and maintenance. It is estimated that the construction sub-sector of the larger industrial sector contributes the highest to the country's industrial GDP with 52% of industrial output in 2010, up from 41% in 2002.

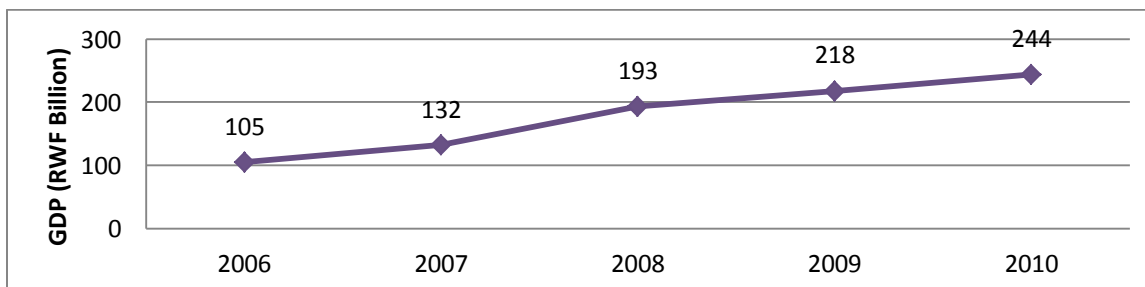
Figure 11: Composition of Industrial Sector by GDP, 2010



Source: National Industrial Policy, 2011

The GDP in the construction industry grew from RWF 105 Billion in 2006 to RWF 244 Billion in 2010 (growing from 6.1% to 7.4% in the same time period).

Figure 12: Construction Industry GDP IN RWF Billion



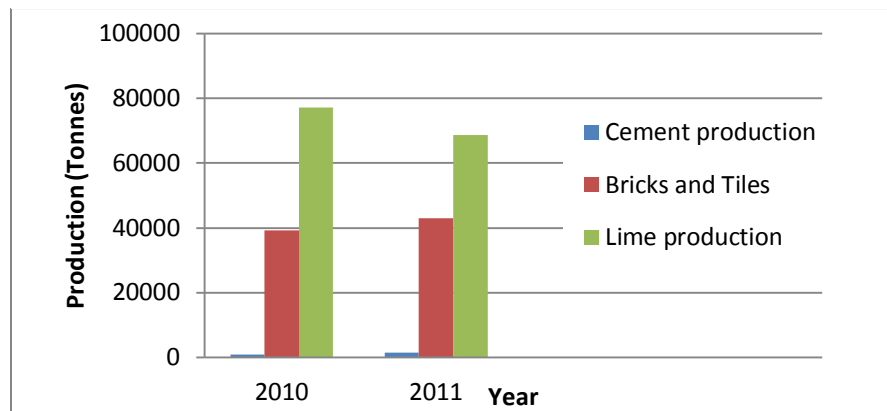
Source: Rwanda Development Board, Rwanda Skills Survey: Construction Sector Report, 2012

The construction sector turnover considerably grew by 29.5% in the 3rd quarter of 2011 as compared to the corresponding period of 2010. This was mainly due to increase road rehabilitations and construction of residential houses, which have been on the rise.

b). Production:

Major products used in the construction and public works industry within the country include; lime production, clay tiles and cement. In 2011, lime production rose to 62.4% reaching 1,405 tons from 865 tons in 2010, which can be attributed to increased post-war reconstruction of damaged roads and a general increase in housing needs in both rural and urban areas. Moreover, bricks and tiles also rose by 10% while cement decreased by 11%.

Table 2: Production of Major Construction Products, 3rd Quarters 2010-2011 (Tonnes)

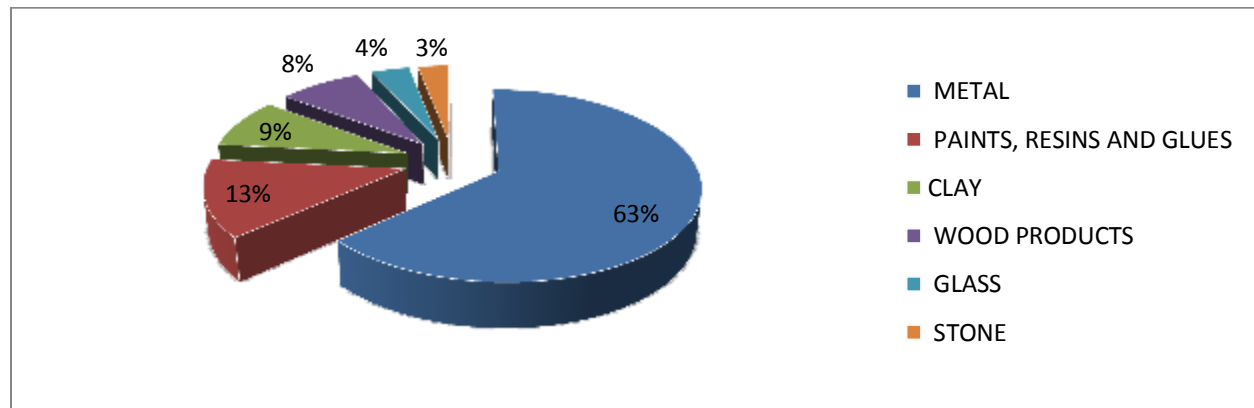


Source: National Bank of Rwanda, Statistics Division, and Quarterly Bulletin, 2011

c). Balance of Trade (Imports and Exports):

Majority of construction materials in Rwanda are locally purchased for construction, however, due to the absence of some of the construction material finished and semi-finished goods in the market, imports become necessary. Metal materials constitute the highest percentage of imported construction materials while glass and stone are the least as illustrated below:

Chart 3: Percentage of Imported Construction Materials 2013



Source: National Institute of Statistics, 2014

The value of imports of construction materials rose by 65% from 2010 to 2013 (from 75,899,078USD to 124,161,353USD). Exports during this same period remained largely unchanged as illustrated below:

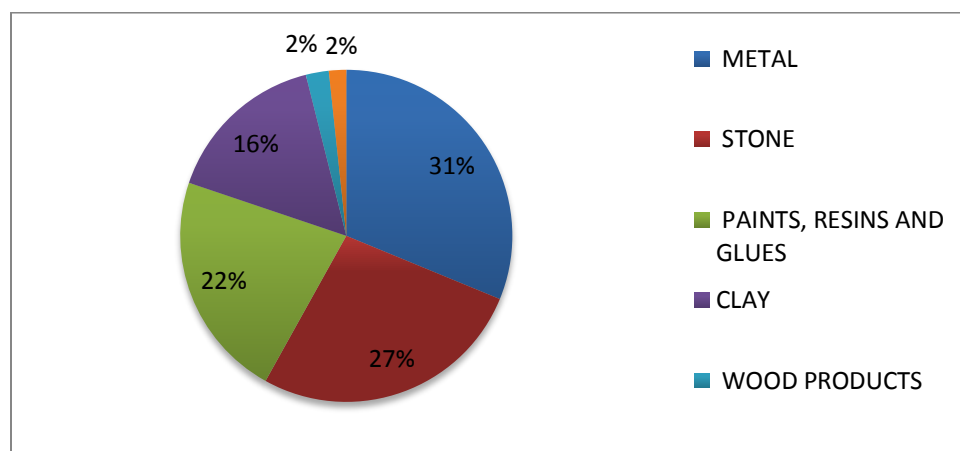
Table 1: Imports and Exports of Construction Materials from 2010 to 2013 (USD)

Year	2010		2011		2012		2013	
Indicators	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
PAINTS, AND PLASTICS	61,374	12,194,269	107,169	14,948,809	40,976	16,006,276	136154.8	16,371,018
WOOD PRODUCTS	14,921	5,085,753	25,467	4,688,622	13,003	5,909,152	13,779	9,940,837
STONE	36,927	1,288,862	3,448,493	2,151,824	43,005	5,530,203	165,551	3,748,221
GLASS	0	2,451,492	285	3,954,049	266	2,339,558	10,396	4,583,520
METAL	375,500	48,202,235	1,157,999	69,763,814	545,325	73,476,417	192,368	78,755,699
CLAY	13,155	6,676,467	359,602	6,675,720	71,274	11,276,287	97,977	10,762,058
TOTAL	501,877	75,899,078	5,099,015	102,182,838	713,849	114,537,893	616,225	124,161,353

Source: National Institute of Statistics, 2014

The main construction material exports are metal, stone, and paints with wood and glass products being negligible.

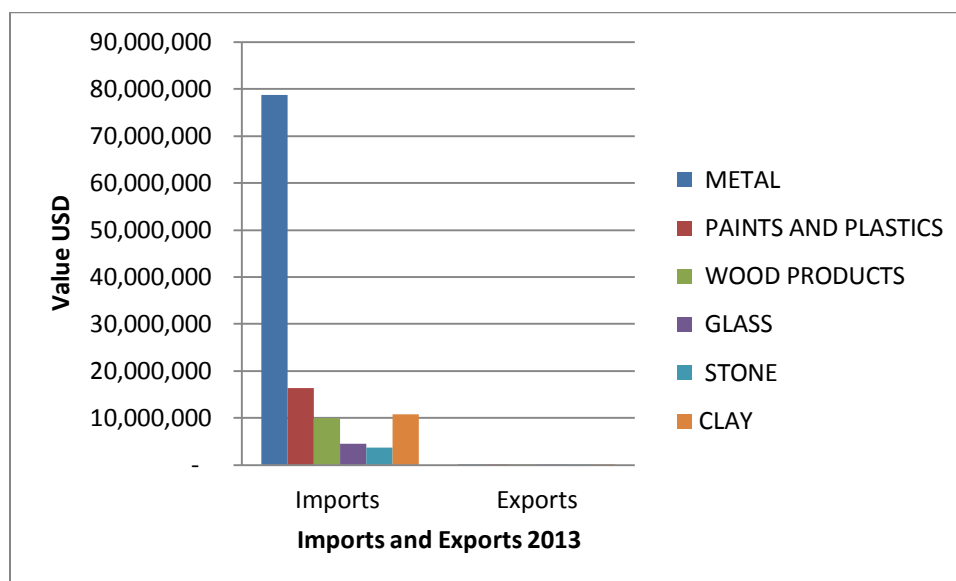
Chart 1: % Exports Of Construction Material In 2013



Source: National Institute of Statistics, 2014

There is therefore an evident need to diversify in greater quantities into alternative sectors for exports to correct this trade imbalance. Rwanda can escape the “commodity trap” by diversifying its exports into targeted products and services, innovating, and increasing productivity, and serving higher margin, niche markets. This can be achieved by producing high quality construction materials targeting emerging markets of DRC, Burundi, Southern Uganda and Western Tanzania.

Chart 2: Summary of Comparison of Imports and Export of Construction materials in 2013

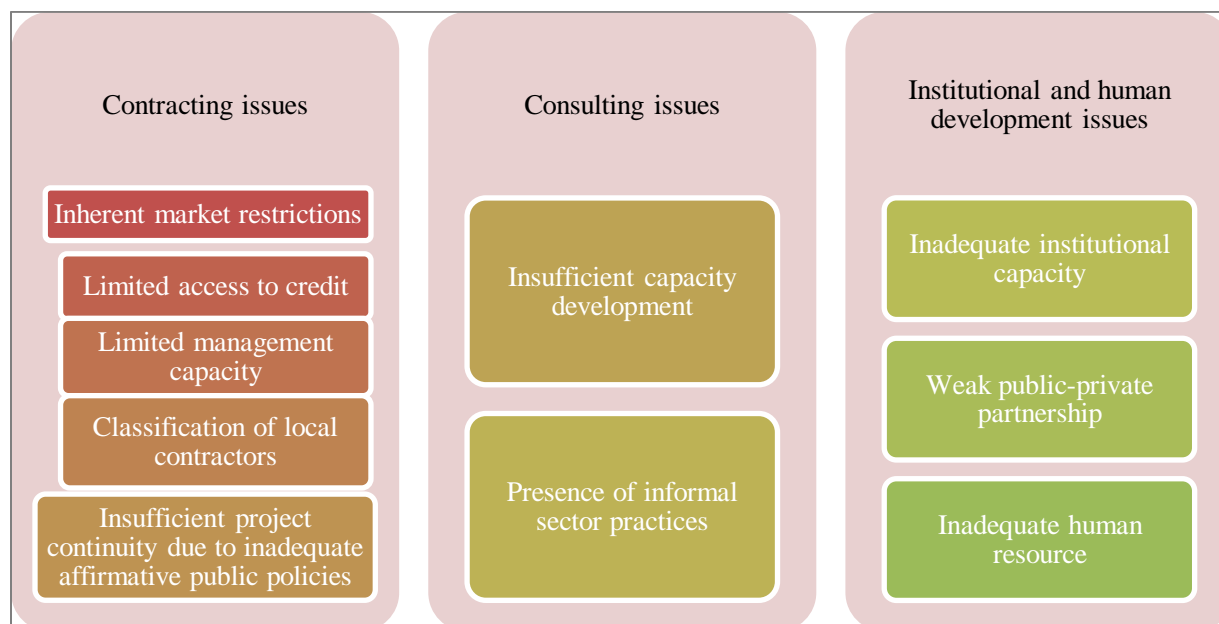


Source: National Institute of Statistics, 2014

d). Liberalization And Its Impact on the Industrial Sector in Rwanda

Liberalization refers to a relaxation of previous government restrictions, usually in such areas of social, political and economic policy. Economic liberalization in Rwanda has been done mainly on the agricultural sector (coffee and tea sub-sectors). These reforms allowed producers to greatly benefit from an export boom, increasing incomes and boosting productivity through capital investments.

Figure 13: Hindrances In The Construction Industry



Source: Rwanda National Industrial Construction Policy, 2009

Generally, liberalization is intended to promote exports and productivity by exploiting comparative advantages. It has been argued that productivity increases more strongly in liberalized industries than in non-liberalized industries (Trefler, 2004). Therefore, ensuring liberalization of the industrial subsector in Rwanda may result in the following:

- Liberalization will promote fair competition in the industrial subsector where all the players can enjoy benefit fairly. Thus, competition results in producers maximizing profit whereas consumers maximize satisfaction. For example, the local industrial subsector such as the clay industry will possibly increase in: output - their processing/refining of clay construction materials for local use and export; and employment.
- Trade liberalization such as tariff cuts improves productivity by shifting resources from less productive to more productive firms within industries, that is, by increasing the aggregate productivity of economies (Melitz⁷, 2003).
- There is a possibility that the industrial subsector will expand. This is because efficiency in the economy of industrial subsector will increase accruing to the ultimate benefit to the operators of the sector and also revenue generated from exports of the industrial subsector products.
- Liberalization ensures enhanced technical development in the industrial subsector because it opens door for foreign competition which improves the efficiency of production
- Access to economies of scale is better realized if liberalization is done
- It results in production of multi-brand products
- Having unilateral liberalization will result in the rise of the general welfare of Rwanda as a country.
- Liberalization sometimes lead to minimizing the work force (unemployment) or even reduction of salaries
- Liberalization (capital market⁸) associated with high interest rates and a strong home currency, may adversely affect productivity growth and income distribution
- Liberalization may magnify pro-worker labor regulations which discourages productivity, investment, profits and output in all industries

4.2 Policy, Legal and Institutional Context

Master Plans are made within a policy, legal and institutional framework. Policies outline the desired development goals of the formulating institutions and the means of achieving the stated goals. This chapter will analyze various policies that anchor the development goals of Rwanda as a nation; this will help ensure that strategies in this master plan are in line with the national development goals. Rwanda's building and construction industry today is rapidly growing and has seen a boom in the past couple of years as it is being transformed from being state funded to private funding.

4.2.1 Policy, Legal and Institutional Framework

Policies outline the desired development goals of the formulating institutions and the means of achieving the stated goals. It is therefore important to analyze various policies that anchor the development goals of Rwanda as a nation; this will help ensure that strategies in this master plan are in line with the national development goals.

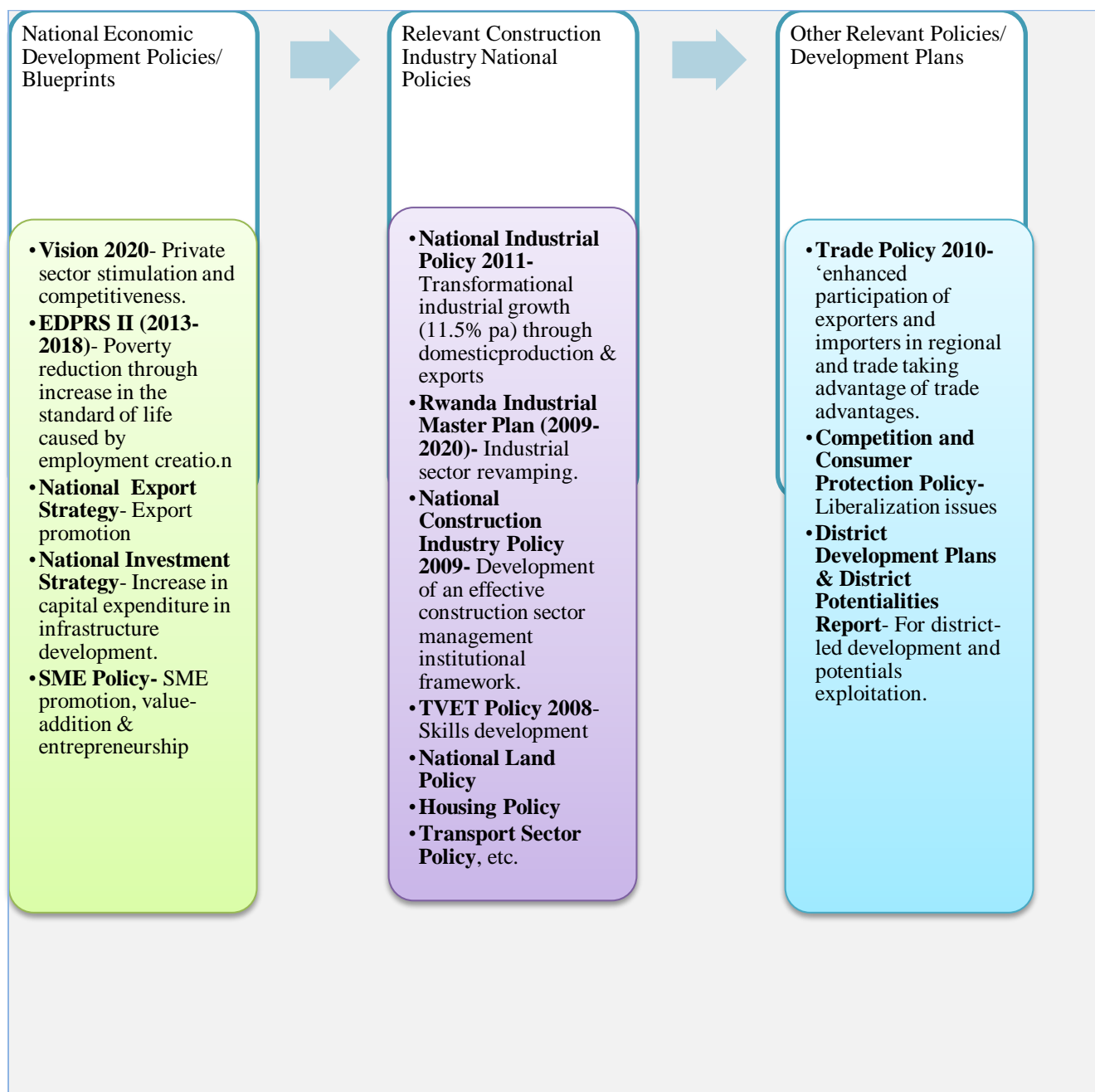
⁷ The Impact of Trade liberalization on Industrial Productivity, 2012, Stockholm school of Economics

⁸ <http://www.twinside.org.sg/title/negat-cn.htm>

The development of the Construction Materials sub- sector Master Plan has been done with careful analysis of existing policy environment, which has a direct or indirect impact on construction materials sub sector.

- Vision 2020
- Economic Development and Poverty Reduction Strategy (EDPRS-2013/14-17/18)
- Organic Law Determining the Use and Management of Land in Rwanda (2005)
- Trade Policy (2010)
- SME Policy (2010)
- Industrial Policy (2011)
- Competition and Consumer Protection Policy
- National Housing Policy
- Technical and Vocational Education and Training (TVET) policy (2009)
- Companies Act (2009)
- Law Regulating Labor in Rwanda (2009)
- UMURENGE SACCO Strategy (2009)
- Environmental Policy
- National Strategy for Climate Change and Low Carbon Development (Green Growth Strategy)
- Mining Policy

Figure 14: Policy Anchors of Master Plan



Source: Author, 2013

All the above policies are supporting policies to the construction materials master plan, the unifying factor being their impact on Rwanda's competitiveness locally, regionally and internationally. Several of these policies address challenges faced by various players in the construction industry who are mainly contractors, professionals, extractors, etc. These include limited access to finance, technology, electricity and human resources, which is addressed in the industrial and trade policy respectively (with new draft policies currently up for review in these areas) as well as the organic land law of 2005, which drives land reform and redistribution in Rwanda and the TVET (Technical and Vocational Education and Training) policy designed to build a skilled workforce and provide job opportunities for youth.

Table 2: Policy Constraints and Opportunities

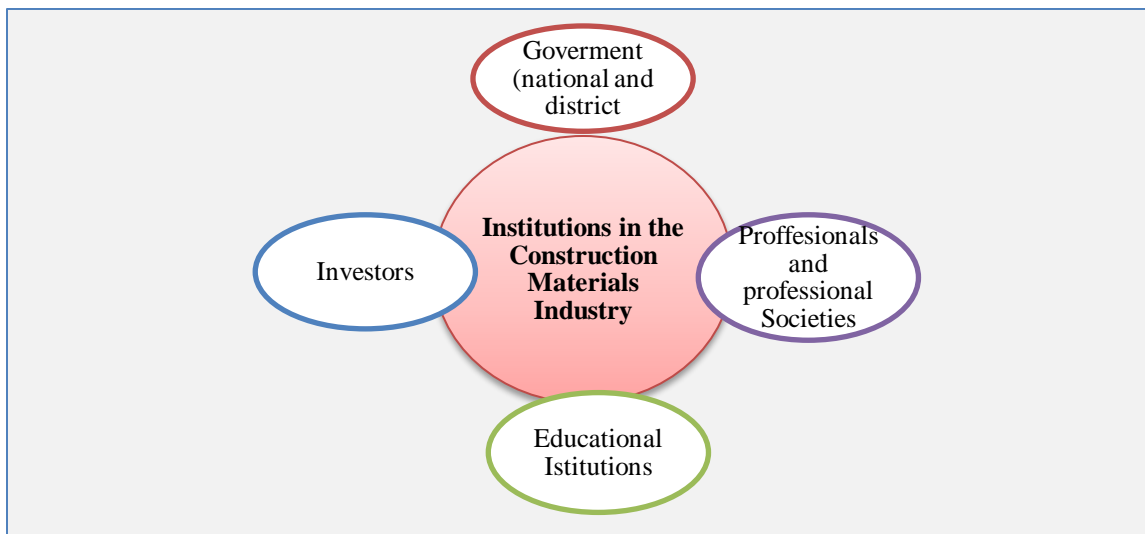
Policy/Strategy	Issues on Construction Materials	Policy Constraints/Opportunities
EDPRS 2	<ul style="list-style-type: none"> • Production of construction materials using local raw materials 	<ul style="list-style-type: none"> • MINICOM should take advantage of the HIGH PRIORITY given to the sub sector in national development
Trade Policy	<ul style="list-style-type: none"> • Trade barriers, NTBs • Movement consolidation of raw materials • EAC Customs Union 	<ul style="list-style-type: none"> • Linkage of the construction materials to internal and external • Storage facilities over 18,000 tons identified through the policy • Negotiate better tariffs for within EAC and CEPGL
SMES Policy	<ul style="list-style-type: none"> • Classification of SMEs involved in construction materials • Low SMEs operators in industrial sector (1.33%) • Improve competitiveness 	<ul style="list-style-type: none"> • SME definition for tenders, taxation issues • Need for support to increase this number • Assist in clustering and value chain analysis
National Construction Industry	<ul style="list-style-type: none"> • Little or insignificant attention given to production of construction materials 	<ul style="list-style-type: none"> • Policy reviews to address the following required: <ul style="list-style-type: none"> - Procurement with affirmative action for SMEs, youth and women entrepreneurs in construction materials - Financing mechanisms e.g. leasing of equipment, GEMS, PEs/VCs, REITS, UMURENGE SACCO, for SMEs in construction materials - Use of appropriate technology - Address Issues for tenders for local/foreign participation
Industrial Policy	<ul style="list-style-type: none"> • Industry to contribute 26% GDP (Vision 2020) • Construction sub-sector is a net contributor to the industrial sector and GDP 52% and 7% respectively. • Cluster Selection Framework 	<ul style="list-style-type: none"> • Support for rural electrification • Revamp district feeder roads and major highways • Anchor Hanga Umurimo, JICA OVOP in construction materials • Clustering for construction materials to be done before 2015
Competition and Consumer Protection Policy	<ul style="list-style-type: none"> • Consumer rights • Dumping • Unfair trade practices 	<ul style="list-style-type: none"> • Institute safeguards for construction materials from EAC, COMESA, EPA etc. • Through RBS create awareness and enforce quality standards
Intellectual Property Policy	<ul style="list-style-type: none"> • Property rights • Innovation 	<ul style="list-style-type: none"> • Create awareness for registration for innovation

Technical and Vocational Education Training (TVET)	<ul style="list-style-type: none"> • Capacity building for contractors, professionals, extractors etc. 	<ul style="list-style-type: none"> • Create formal partnership for developing/training short courses • Collaborate with IPRC for capacity building at district levels
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4.2.2 Institutional Framework

The Construction Industry is interplay between four types of institutions as shown below. As they are agents of delivery, it is important that they be aligned efficiently to achieve their objectives.

Figure 15: Institutional Actors in Rwanda’s Construction Industry



Source: Author, 2013

4.3 Location of the Naturally Occurring Construction Materials

The following naturally occurring construction materials are found in Rwanda:

- Clay
- Wood/ Timber
- Sand
- Stone

a). Clay Products:

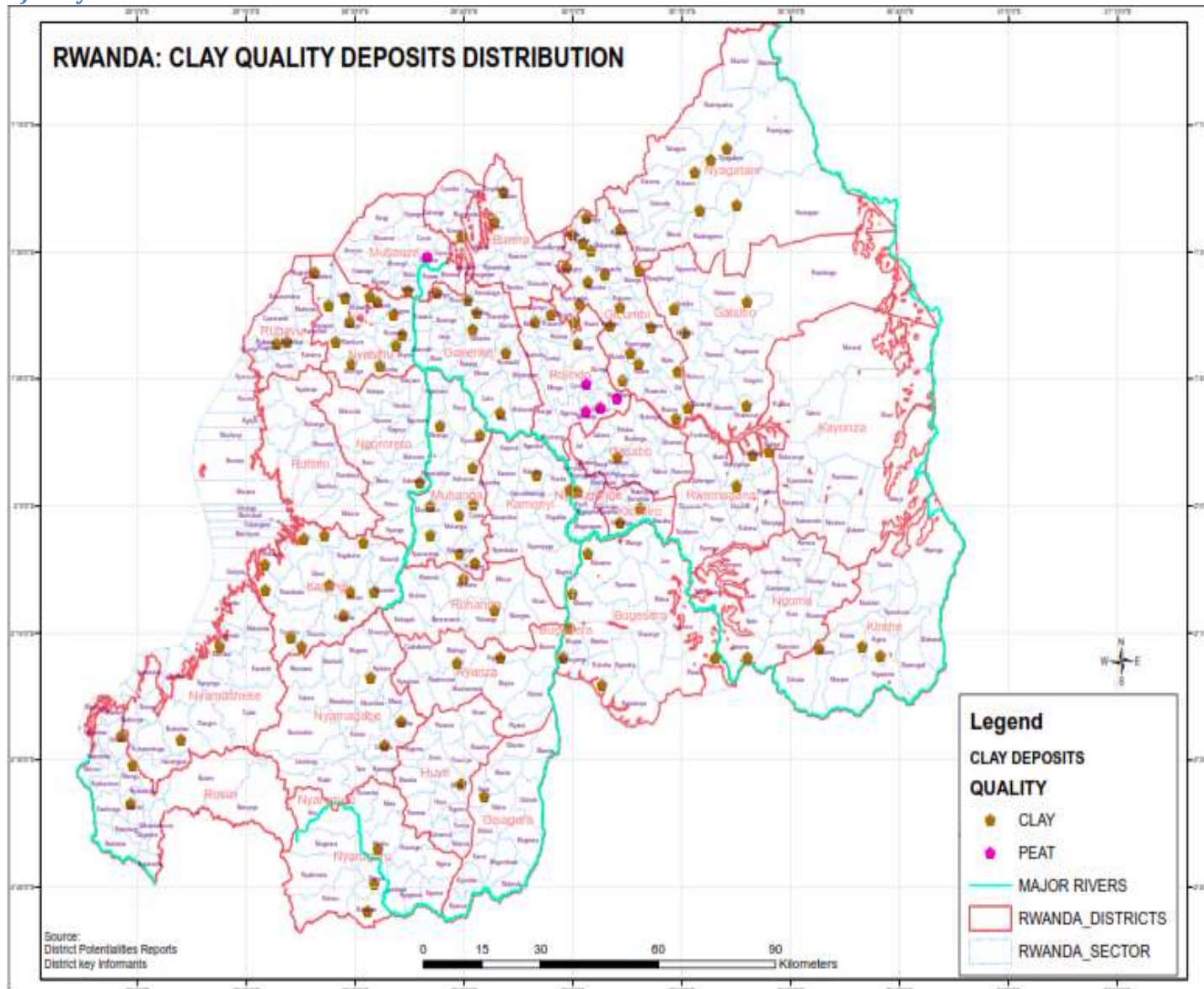
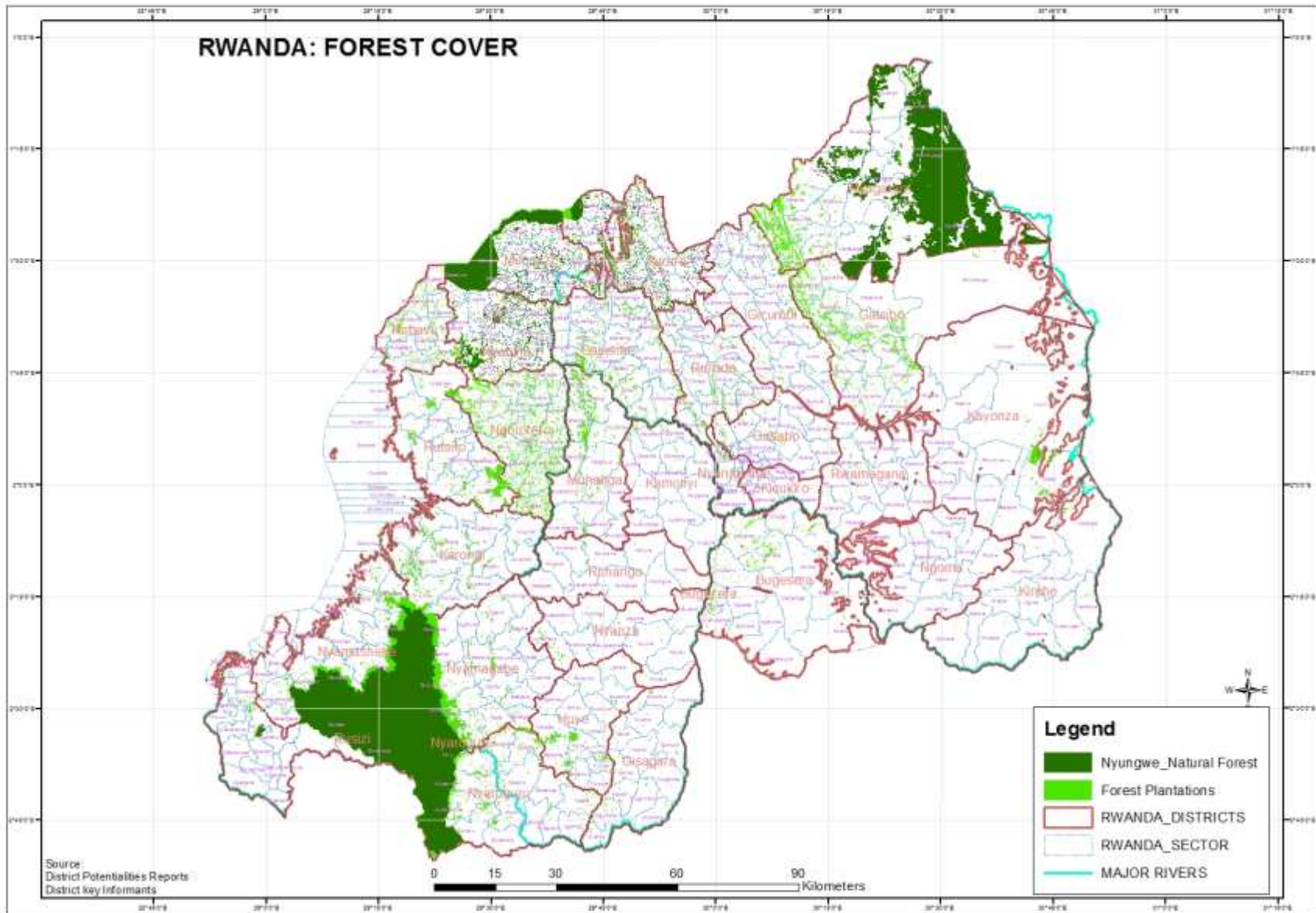


Table 3: Confirmed Clay Deposits

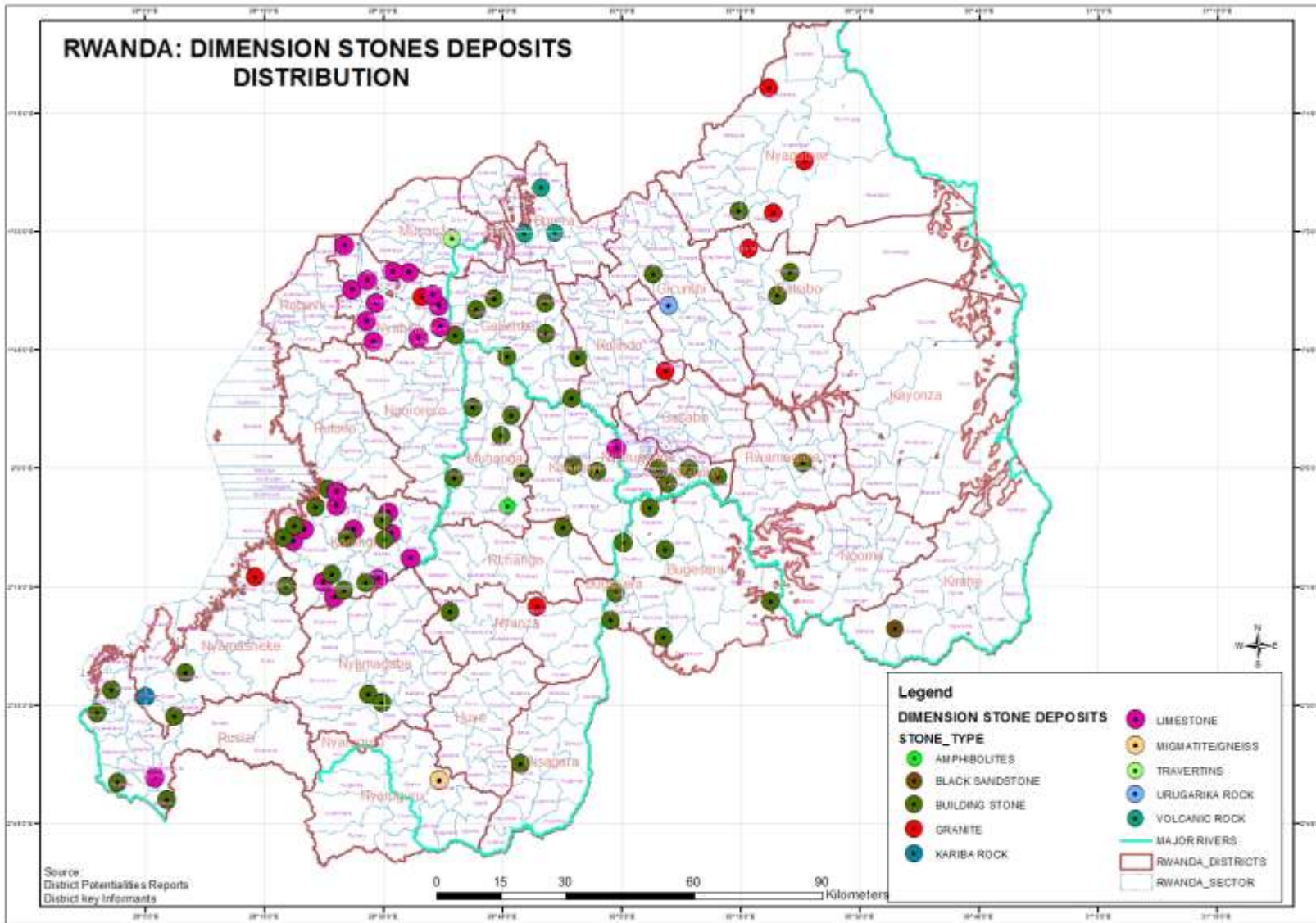
District	Confirmed deposits (M ³)
Musanze	500,000
Rulindo	576,000
Gasabo	400,000
Nyarugenge	700,000
Rwamagana	30,000
Muhanga	310,000
Nyanza	80,000
Huye	600,000
Gisagara	1,000,000

Quantities: High concentrations of rich clay deposits are distributed supporting most of the construction material industries in Rwanda.

b). Wood/ Timber Products:

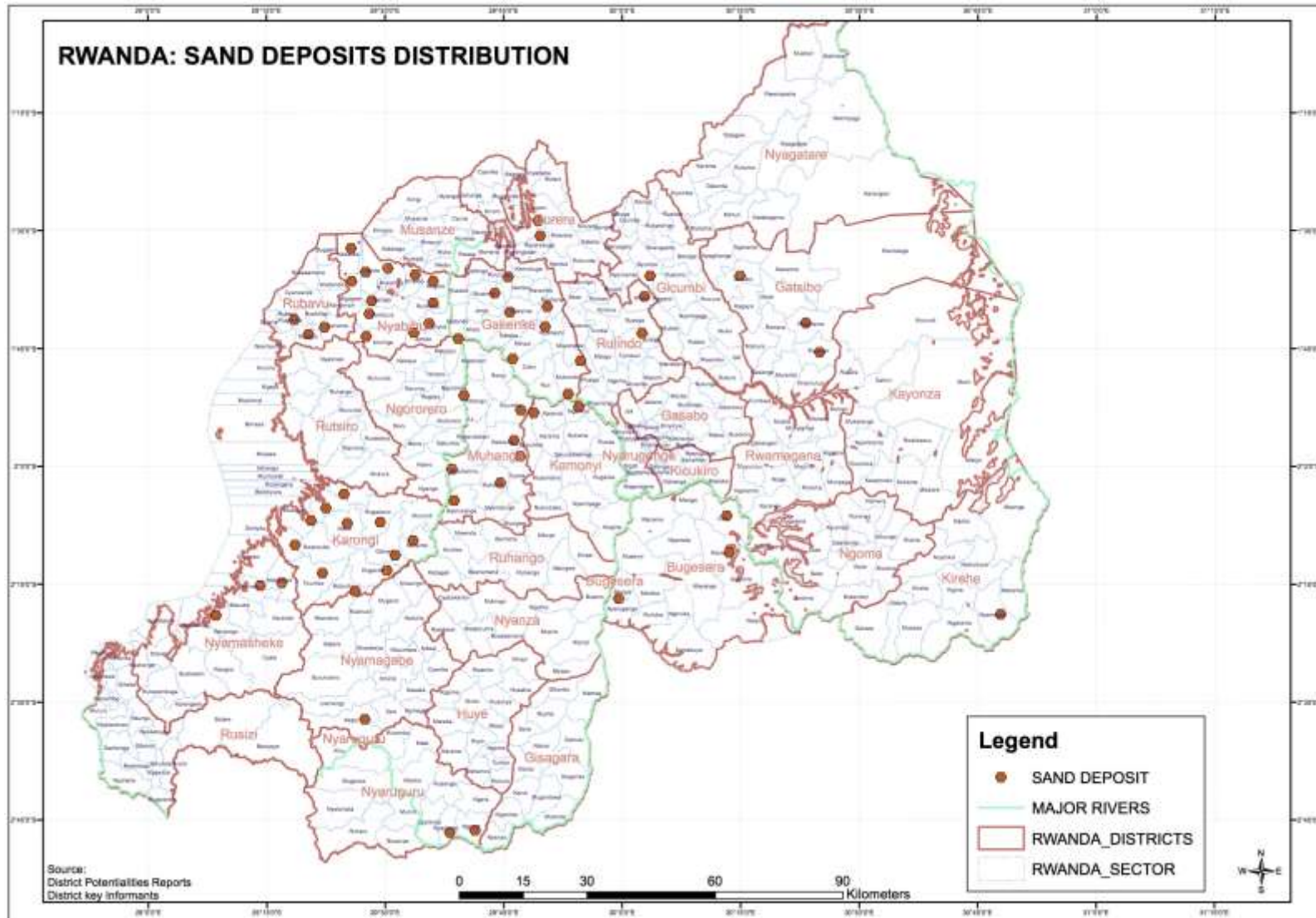


c). Stone Products:



The stone industry is a booming industry within Rwanda. It is the core driver in the county with highly commercially viable reserves.

d). Sand



Sand industry is a rapidly emerging industry in Rwanda

Table 4: Confirmed sand deposits

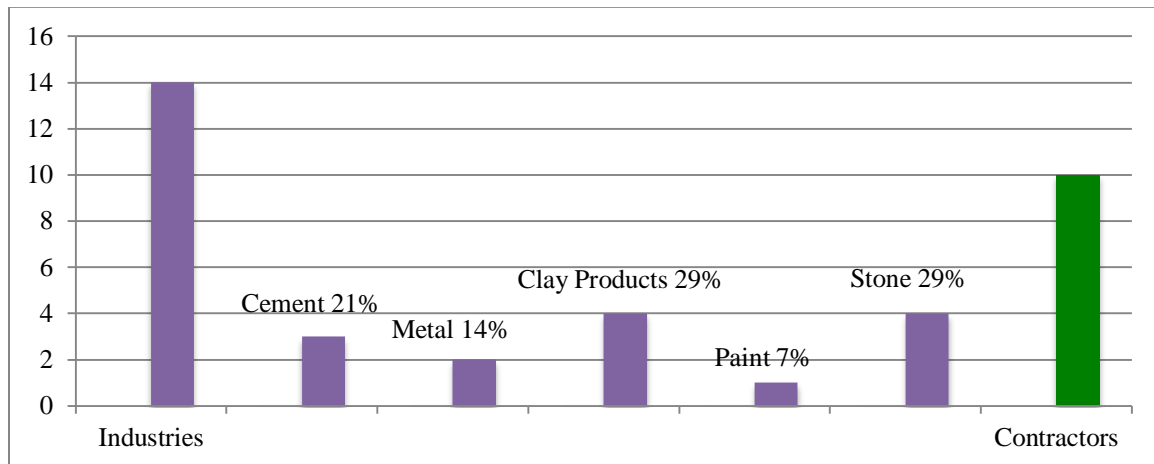
District	Confirmed deposits (M ³)
Gakenke	1,600,000
Nyamasheke	730,000

4.4 Construction Materials Industry Profile

4.4.1 Industries Sampled:

The construction materials industry in Rwanda was profiled with a sampled analysis of the following industries:

Chart 3: Industries Profiled



The construction industries above can be categorized as:

- 1) Natural Construction Materials Extractors
- 2) Man Made Construction Materials Producers
- 3) Contractors

1. *Natural Construction Materials Extractors:*

The **Natural Construction Materials** were categorized as follows:

a) **Clay:**

The following are the main products from clay:

- Clay bricks
- Clay tiles
- Clay blocks

b) **Stone:**

The main products from stone include the following:

- Finished stone (granite, marble, limestone)
- Crushed or cut stone (aggregates, flagstone, 'concasse')

c) **Limestone:**

- Cement

d) **Wood:**

- Lumber mill (rough cut and kiln dried)
- Wood doors, windows, and trim (milled work)

e) **Sand:**

- Construction sand

The following are the main companies in the natural construction industries.

Company	Material
Ruliba Clays	Clay
ETS Amagerwa	Clay
BTN Nyamagabe	Clay
Ameregwa Briqueterie	Clay
Cooperative Dukorane Ingufu	Clay
East Africa Granite	Stone
International Marble	Stone
Station de Concassege	Stone
Horizon	Stone
BEMS S.A.R.L	Stone
Kigali Cement	Limestone
Cimerwa	Limestone
Great Lakes Cement Factory	Limestone
New Forests Company	Wood

2. Man-Made Construction Materials Producers:

The main man-made construction materials were classified as follows:

a). Metal:

- Structural steel
- Hollow sections and profiles
- Rebar
- Metal rolled sheets (iron/steel-roofing, fencing, etc.)
- Aluminium
- Nails
- Metal accessories (nuts, screws, bolts, wires etc.)
- Metal fabrication (windows and door frames)
- Metal hardware (door handles, etc.)
- Roofing sheets

b). Paint:

Some of the products from the paint manufacture include:

- Gloss paint
- Emulsion
- Plastic and petrol chemical products
- Glass products
- Glue and vanishes

The key players in this industry include:

Product:	Company Name:
<ul style="list-style-type: none"> • <u>Companies in Metal Production:</u> 	

	<ul style="list-style-type: none"> ○ Safintra ○ Simaco ○ Tolirwa ○ Ufametal ○ Uprotur
<ul style="list-style-type: none"> • <u>Companies in Paint Production:</u> 	
	<ul style="list-style-type: none"> ○ Sigma Coats Industries ○ Kigali International Paints ○ Ameki Color ○ Rwanda Color ○ Simaco

3. Contractors:

Based on the field survey, the major contractors in the construction materials industry in Rwanda are:

1. NPD COTRACO
2. Real Contractors
3. Fair Contractors
4. Roko Construction
5. Haki Construction
6. Star Construction
7. Aegle Construction
8. Horizon.

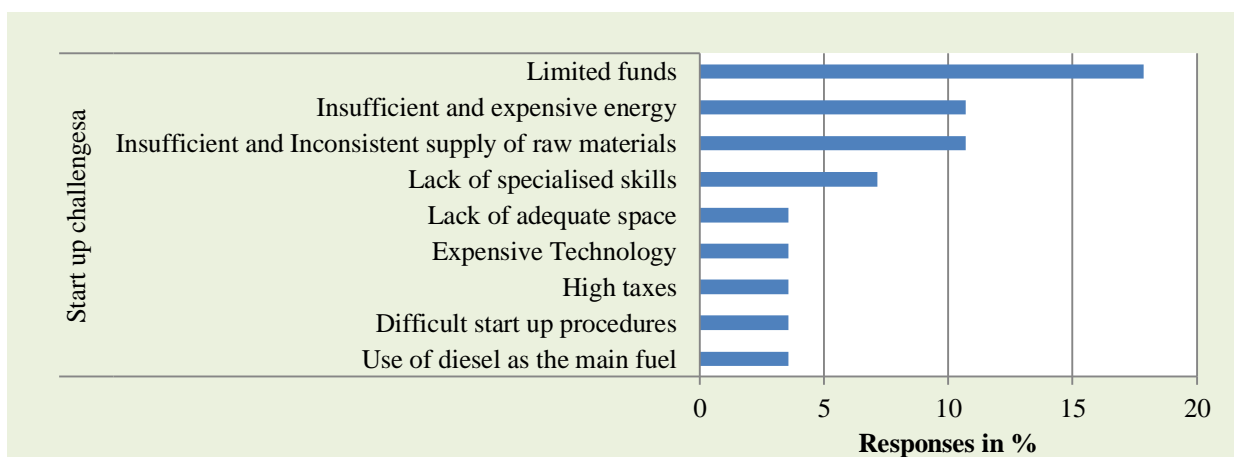
4.4.2 Emerging Issues:

4.4.2.1 OPERATIONAL ISSUES

a) Business Start-up

The main business start up challenges identified by the production companies/industries was the lack of funds, raw materials and inadequate of energy. This is as indicated in the chart below.

Chart 4: Company Start-up challenges

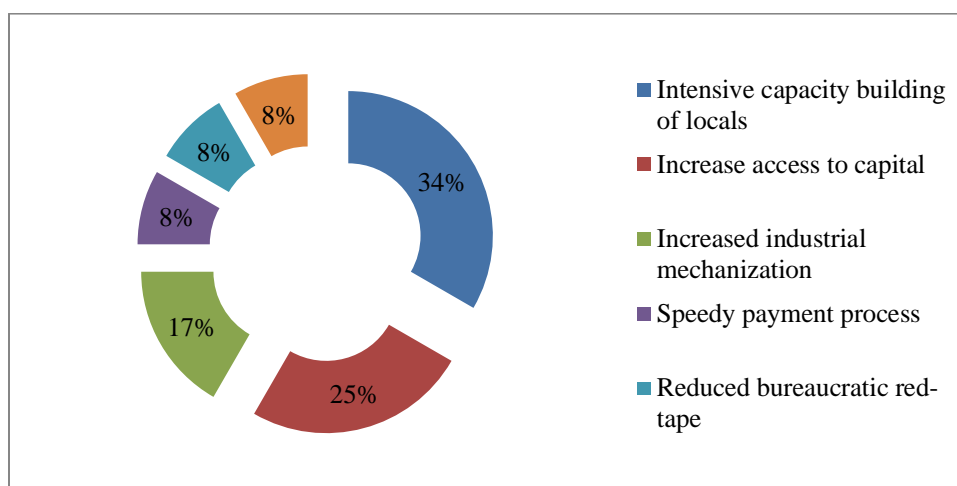


Source: Field Survey, 2014

The contractors surveyed during the field survey mainly complained of low skilled capacity of locals, delayed payment particularly by government agencies and inadequate capital as the major challenge to starting up a construction industry related business. Other challenges mentioned included: bureaucratic red tape, limited power supply.

The proposed solutions to the challenges above include government support including business incubation, shifting to HFO fuel, financing at the district level, provision of sufficient space and reduction of energy cost.

Chart 5: Start-up Solutions



Source: Field Survey, 2014

b) Raw Material Acquisition

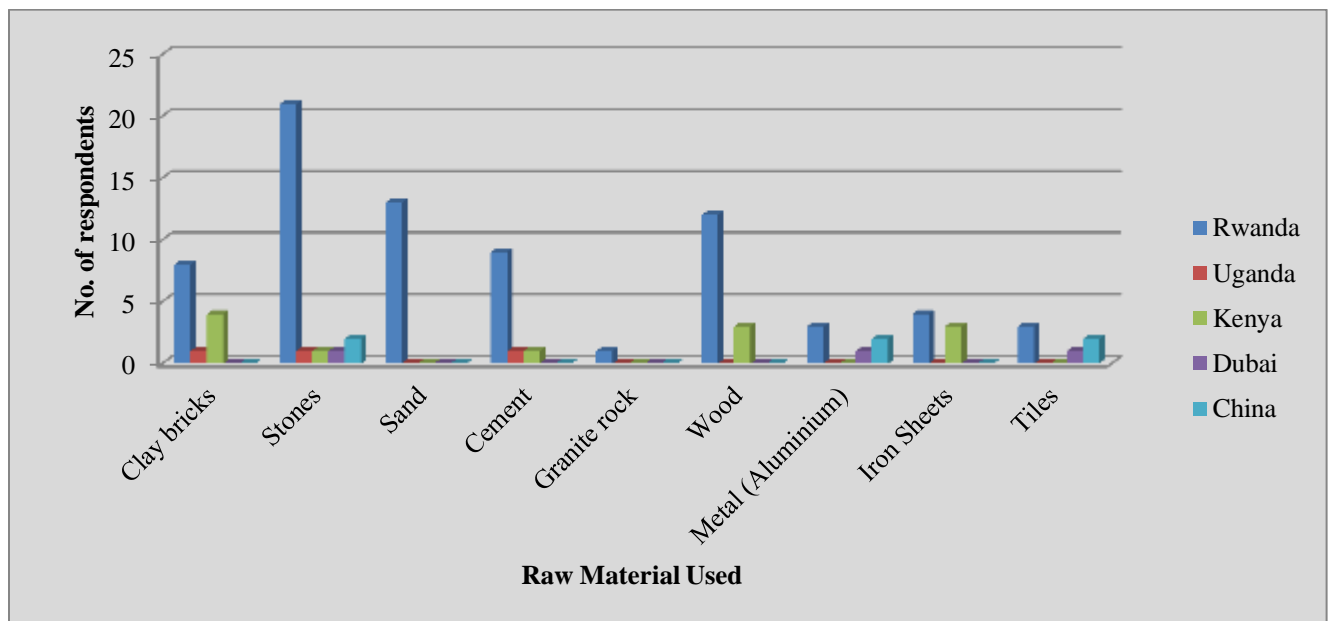
Most raw materials are either not available locally e.g. petroleum based products, some raw materials are not enough to facilitate industrial-scale manufacturing (e.g. gypsum; iron and other metallic minerals for steel manufacturing and some are not the right quality or grade (e.g. locally available lime is not of high grade cement quality). These raw materials and their respective challenges are listed below:

Raw Material	Source	Challenge in acquisition	Suggested solutions
Limestone	Nyakabuye/ Rusizi	<ul style="list-style-type: none"> Short term validity of mining license (5 years) Lack of electricity Competition from cement manufacturers 	<ul style="list-style-type: none"> Medium term validity of mining license Training of workers
Sandstone	Nyakabuye/ Rusizi	<ul style="list-style-type: none"> Short term validity of mining license (5 years) 	<ul style="list-style-type: none"> Medium term validity of mining license (30 years)
Clay	Muganza/ Rusizi Ruramba/Kamonyi Gisenyi Rugende	<ul style="list-style-type: none"> Short term validity of mining license (5 years) Transportation due to long distances to collection point Lack of finances 	<ul style="list-style-type: none"> Medium term validity of mining license (30 years)

Kaolin	Ruyenzi/Kamonyi	<ul style="list-style-type: none"> Negotiations with local occupants 	<ul style="list-style-type: none"> Intervention by the District in acquiring land with raw materials
'Gasenyi/'	Forest	<ul style="list-style-type: none"> Lack of sufficient quantities of Gasenyi 	<ul style="list-style-type: none"> Fabrication of enough quantities
Steel Coil	Kenya	<ul style="list-style-type: none"> High cost of transportation 	<ul style="list-style-type: none"> Transport concessions
Granite	-	<ul style="list-style-type: none"> Inadequate power 	<ul style="list-style-type: none"> Government support in power supply
Timber	Gisenyi Rustiro	<ul style="list-style-type: none"> Limited supply of timber 	<ul style="list-style-type: none"> Artificial wood lots

Majority of the contractors interviewed who use clay bricks, stones, sand, cement and wood source their raw materials locally from Rwanda, and regionally from Uganda and Kenya. Iron sheets, wood and some bricks are sourced from Kenya, while stones, clay bricks and cement are sourced from Uganda. Internationally, metal (aluminum), iron sheets and tiles are mainly sourced from China and Dubai.

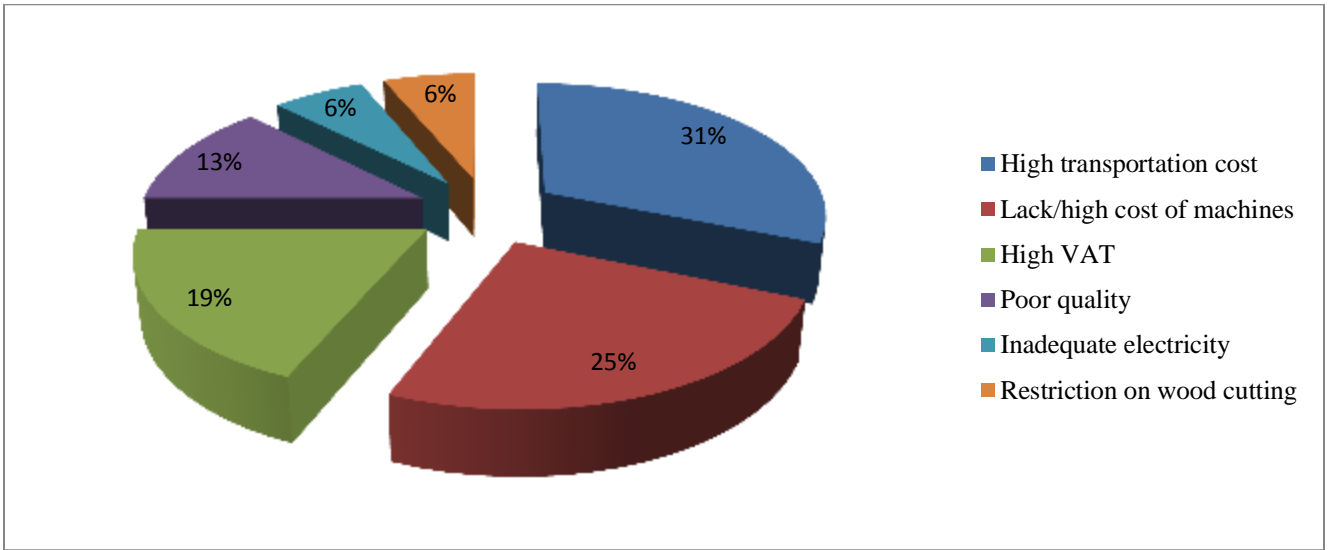
Chart 6: Source of Raw Materials by Country



Source: Field Survey, 2014

Major challenges of sourcing for raw materials were identified as high transportation cost (31%), lack of high cost of machines (25%), high VAT on raw materials (19%), poor quality of the raw materials (13%), inadequate electricity (6%) and restriction on wood cuttings (6%) were also mentioned.

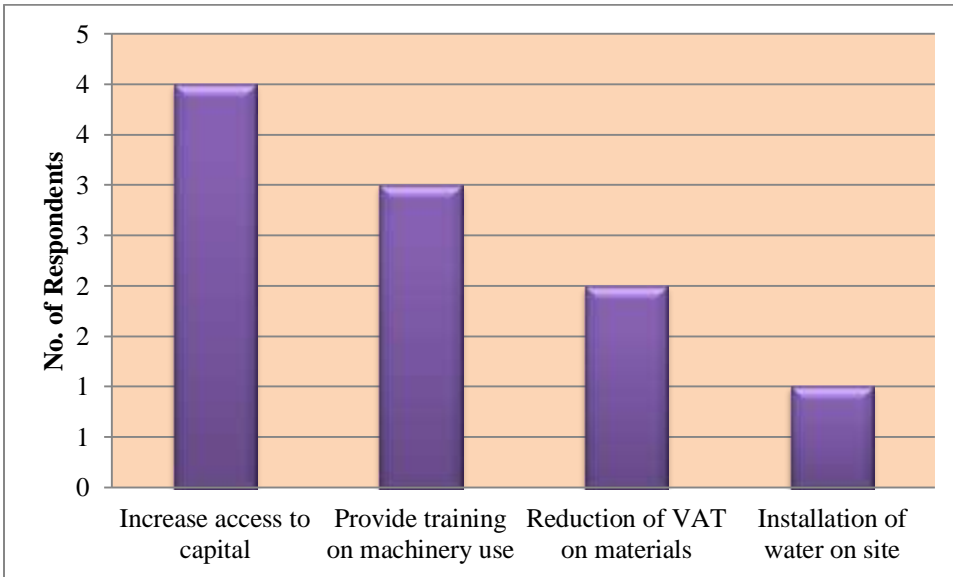
Chart 7: Challenges of sourcing raw materials



Source: Field Survey, 2014

Majority of the respondents interviewed proposed increase access to capital, providing training on machinery use, reduction of VAT on raw materials and installation of water on site as possible solutions to the challenges mentioned above.

Chart 8: Solution to sourcing of raw materials challenges

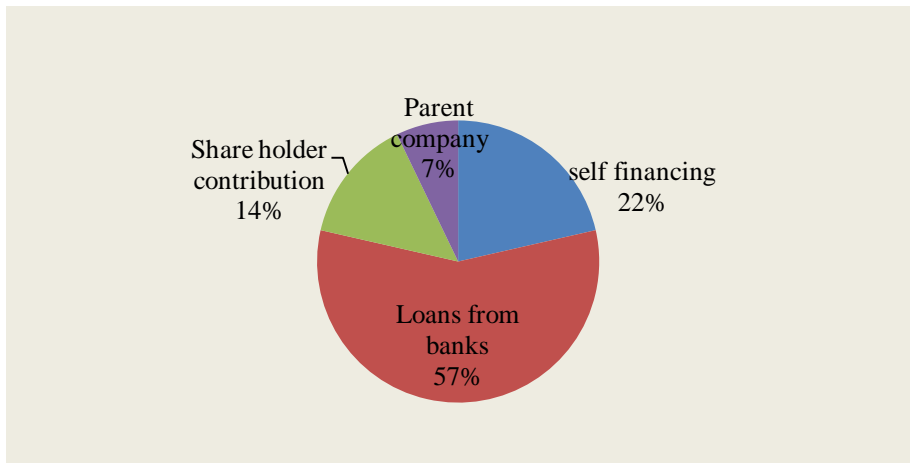


Source: Field Survey, 2014

c) Financing

Financial resources act as enablers of the construction materials industry in Rwanda. The following chart summarizes the major source of finances, the largest being bank loans.

Chart 9: Source of finances



The biggest challenge in sourcing finances is the high interest rates and the inaccessibility to these bank loans. Contractors in particular cited high interest rates on bank loans (50%), late payment by government (30%) and a general lack of adequate capital to financing and invest within the companies (20%) as the main challenges that bog down this industry.

The industry stakeholders suggested government:

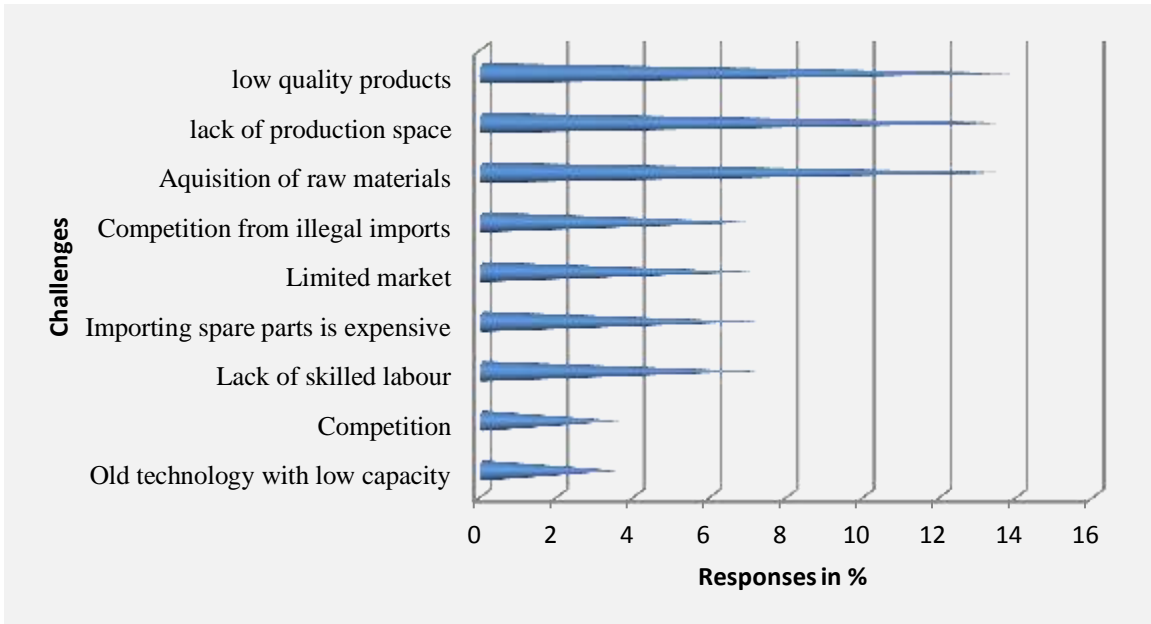
- Reduce bank interest rates
- Facilitate loan acquisition for the industries and contractors in the industry
- Government should nurture a speedy payment process
- Adopt a policy direction to attract foreign banks into the Rwanda market
- Facilitate financing of the industry at the district level.
- Improve market linkages within East Africa.

d) Production

As indicated in the table below, the installed capacity in the companies often does not match the capacity for production. This can be attributed to the challenges in the figures below key among the reasons include, competition from illegal imports, lack of markets and old technology with little productivity:

Industry	Capacity	Output	% Productivity
Cement Industry	100,000 TPA	94,000 TPA	94
Clay Materials Industry	120 tons/day	65 tons/ day	53
Cement Industry	70,000 bricks/ month	60 bricks/month	86
Clay Materials Industry	36,000 MT	16000MT	44
Clay Materials Industry	800m3/month	229m3/month	29
Stone	2000 bricks/hour	2000 bricks/ hr	100
Clay Materials Industry	30 Tonnes	13 Tonnes	43
Stone	150 ton/day	30-40%	27
Cement Industry	50m3/hour	30m2/hour	60
Stone	600 tonnes	500 tonnes	83

Chart 10: Production Challenges

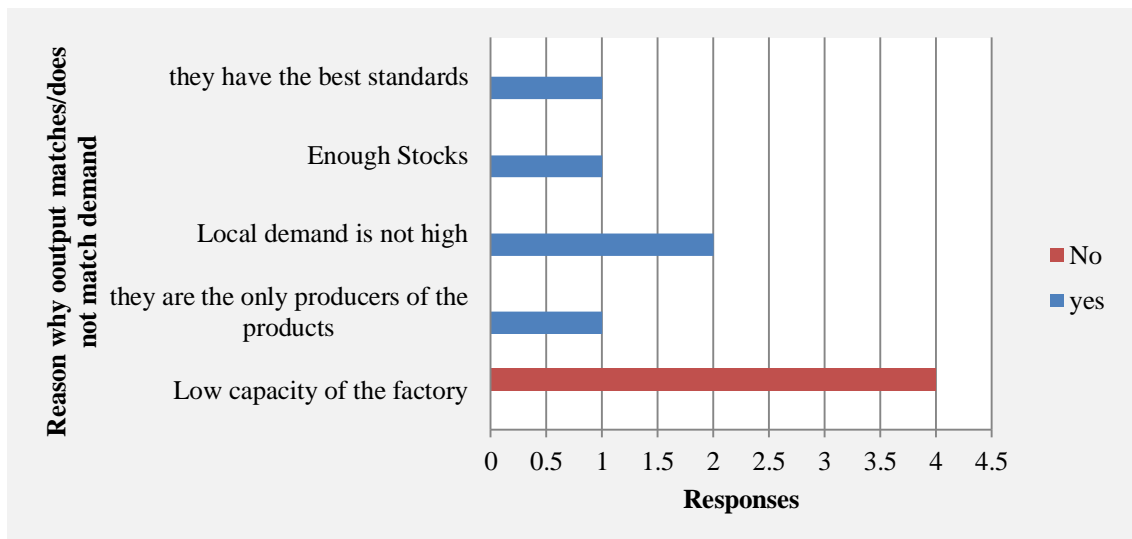


Source: Field Survey, 2014

e) Demand

50% of the industry felt that they met the demand and they attributed this to the good quality products, sufficient stocks and the monopoly in production they enjoy. The other 50% whose output did not meet the demand had only one reason for it; the limited capacity of the factories. This is a clear indication that the industry has room for expansion.

Chart 11: Does Output Match Demand?



Source: Field Survey, 2014

The contractors felt that generally demand within the industry is limited and inadequate, mainly attributed to low capacity of area locals (67%) and high competition among other local companies (33%).

f) Technology

The following table gives a list of the machines used in each industry.

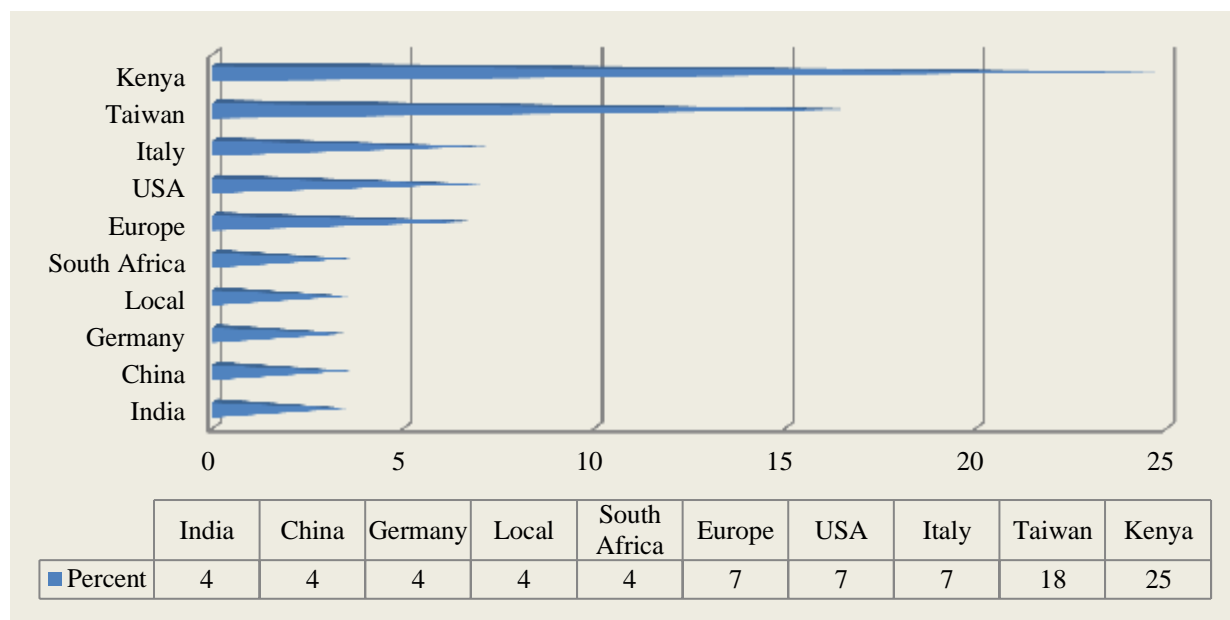
Table 5: Machines Used per Industry

Industry:	Cement Industry:	Clay Materials Industry:	Stone:	Paint:	Metal:
Type of Machine Used	<ul style="list-style-type: none"> • Bulldozers • Excavators • Crusher • Mixer 	<ul style="list-style-type: none"> • Kiln • Mixer • Milling Machine 	<ul style="list-style-type: none"> • Loaders • Mixer • Generators 	<ul style="list-style-type: none"> • Milling Machine • Mixing machine 	<ul style="list-style-type: none"> • Loaders • Furnace • Rolling Mills

Source: Field Survey, 2014

Only 7% of the technology used is obtained from Rwanda. This implies that about 93% of the technology used in the construction industry is imported. The imported of technology used in the manufacture of construction materials is mainly from India and China.

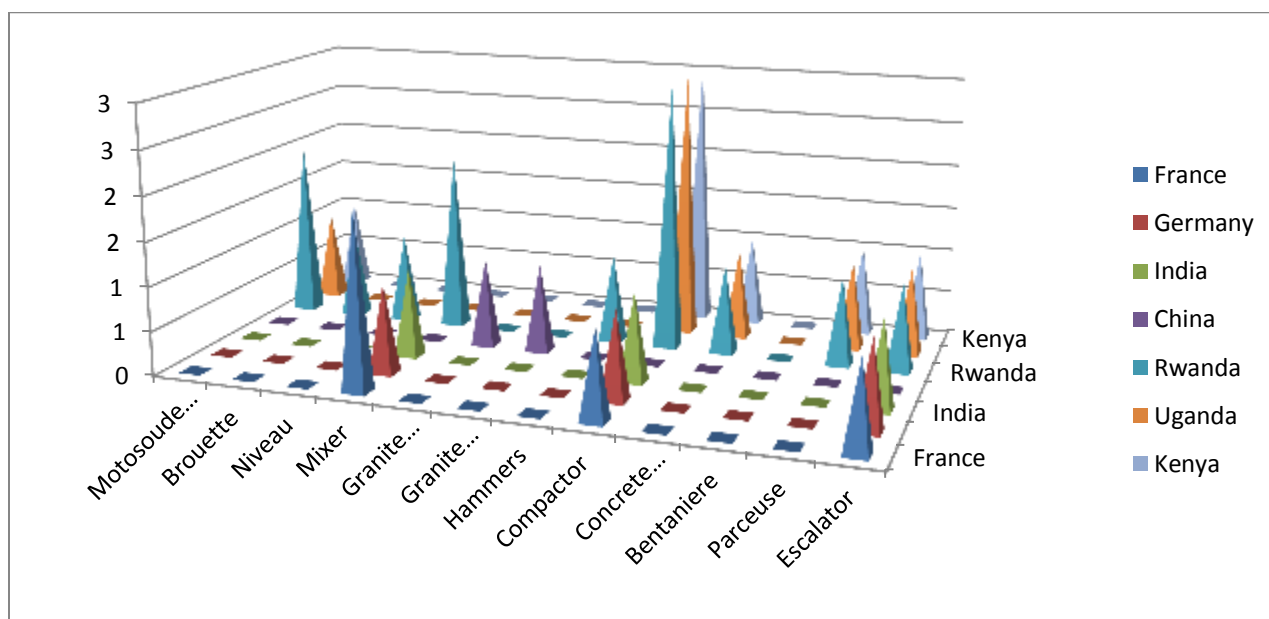
Chart 12: Technology used by Construction Industries by Country Sourced



Source: Field Survey, 2014

Among the contractors, most of the technology used within the industry is electronic, however, some contractors still use manual/traditional technology like hammers to crush stones, during production. Most machinery used is source within the East African region of Kenya and Uganda.

Chart 13: Technology used by Country Sourced



Source: Field Survey, 2014

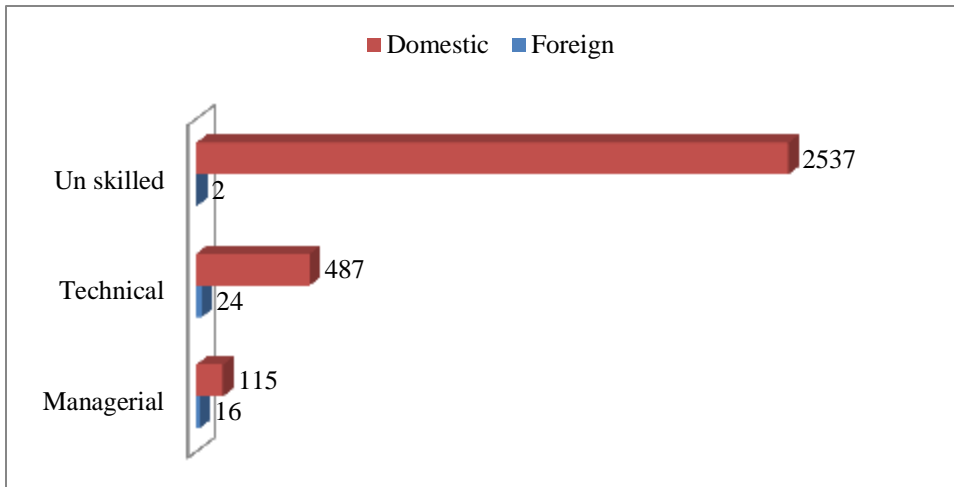
g) Energy

Energy	Source of Energy	Challenge in energy Use	Possible solution
Electricity	<ul style="list-style-type: none"> EWSA 	<ul style="list-style-type: none"> Insufficient Unstable Expensive 	<ul style="list-style-type: none"> Improvement of quality Infrastructure investment Sourcing electricity from Lake Kivu
HFO	<ul style="list-style-type: none"> Imported; Kenya 	<ul style="list-style-type: none"> High cost Long delivery time 	<ul style="list-style-type: none"> Use of alternative fuels such as husks
PEAT	<ul style="list-style-type: none"> Rusizi 	<ul style="list-style-type: none"> Low calorific value Limited resources 	<ul style="list-style-type: none"> Use of alternative fuels such as husks
Husks/ Agri-waste	<ul style="list-style-type: none"> Rwanda Burundi 	<ul style="list-style-type: none"> Need for high stocks 	<ul style="list-style-type: none"> -
Firewood	<ul style="list-style-type: none"> Forests within the districts 	<ul style="list-style-type: none"> Expensive Deforestation Long periods in acquisition 	<ul style="list-style-type: none"> Use of modern fuel costs
Furnace oil	<ul style="list-style-type: none"> Kenya 	<ul style="list-style-type: none"> Long delivery time 	<ul style="list-style-type: none"> Fastening customs processes

h) Skills

Majority (81%) of the work force in the industry receive some form of training on the job. On this group 45% have acquired their skills purely on the job. Only 11% of the sample has received training from formal education. This form of skill acquisition has direct impact on the productivity of the industry and the employer's profit margins as a lot of the financial resources go into training.

Figure 16: Employment by Source



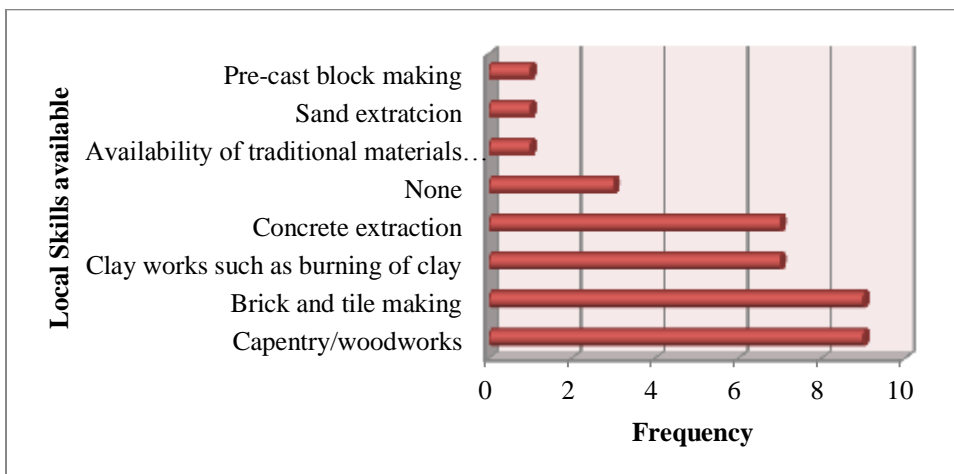
Source: Field Survey, 2014

14% of all managerial employees in the construction materials industry are foreign while 5% of the technical employees are foreign as indicated in the table below:

	Number of Foreign employees	Number Domestic employees	% of foreign employees to domestic
Managerial	16	115	13.9
Technical	24	487	4.9
Un skilled	2	2537	0.1

Nonetheless, there is an availability of local skills and knowledge within the country in the following crafts:

Chart 14: Local Skills/knowledge available in construction industry





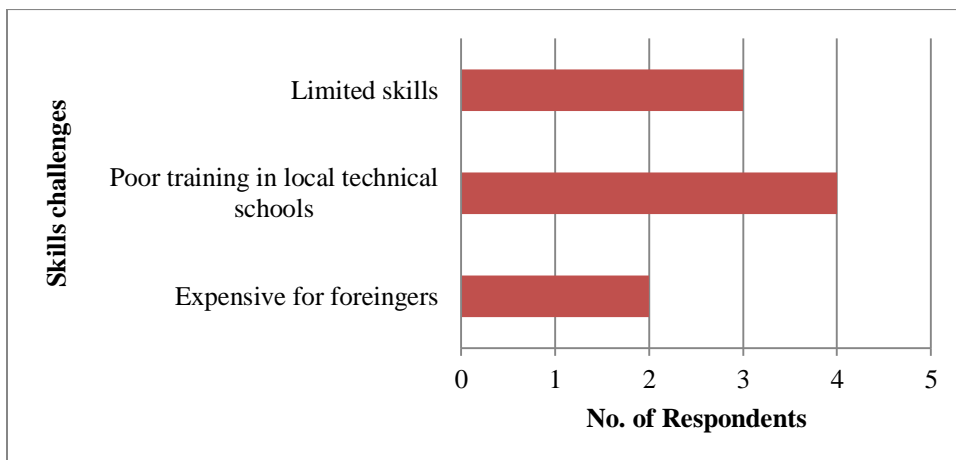
Plenty of traditional knowledge in making some products such as clay that maintains standards regionally.



There is need to promote intensive skills improvement of area locals through establishment of well equipped institutions and revised construction industry course content within existing technical institutions.

Skills challenges reported were mainly poor training in the local technical schools, limited skills and manpower and thus high reliance on foreign contractors who are very expensive to maintain.

Chart 15: Skills Challenges



Source: Field Survey, 2014

Table 6: Technical Training Institutions per District

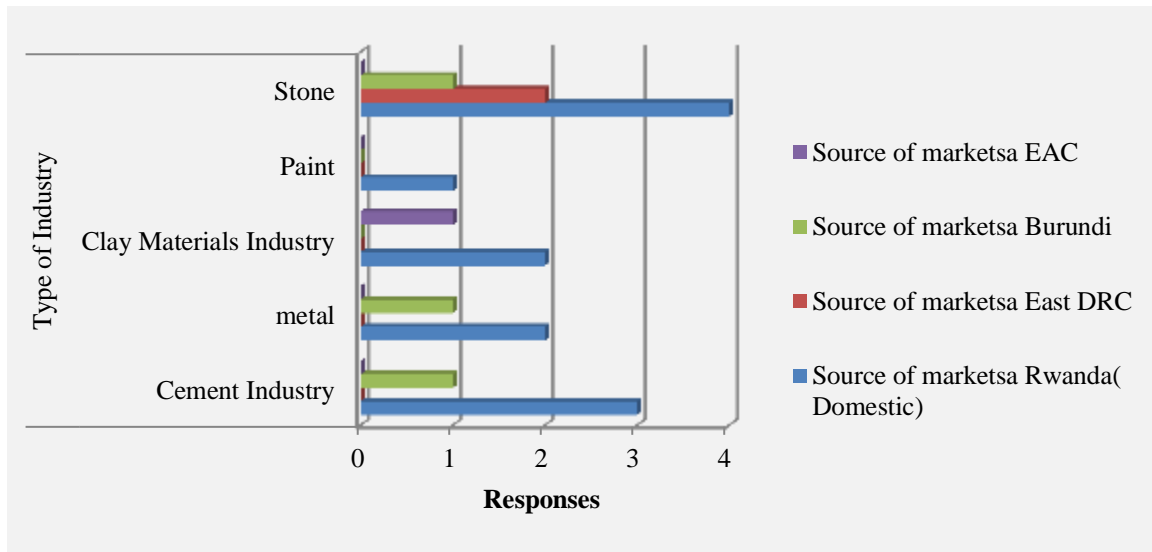
District	Technical Training Institution
Bugesera	REMA RNRA
Burera	None
Gatsibo	Gakoni Polytechnic Gatsibo Polytechnic TVET
Gisagara	St. Joseph Kansi ESS Sawe
Kamonyi	Lunda Sec School ISETAL APEK
Karongi	None
Muhanga	Location Training centre Technical Sec School
Musanze	None
Nyabihu	TVET WDA
Nyagatare	University of Rwanda Technical school
Nyamasheke	SWAT (NGO)
Nyanza	Nyanza Technical CFG Nyanzo
Rubavu	Ntayo
Ruhango	Ecole Technical
Rusuzi	SWAT Suisse ONG Bricks
Rwamagana	UTC Rubona UTC Kigabiro

Source: Field Survey, 2014

i) Marketing

The biggest market for most of the products is the domestic market. However Burundi is a big source of markets for Stone, metal and cement products. The only products that are sold within the East African community are clay products. This implies that there is need for efforts to increase the regional and international markets for products from this industry.

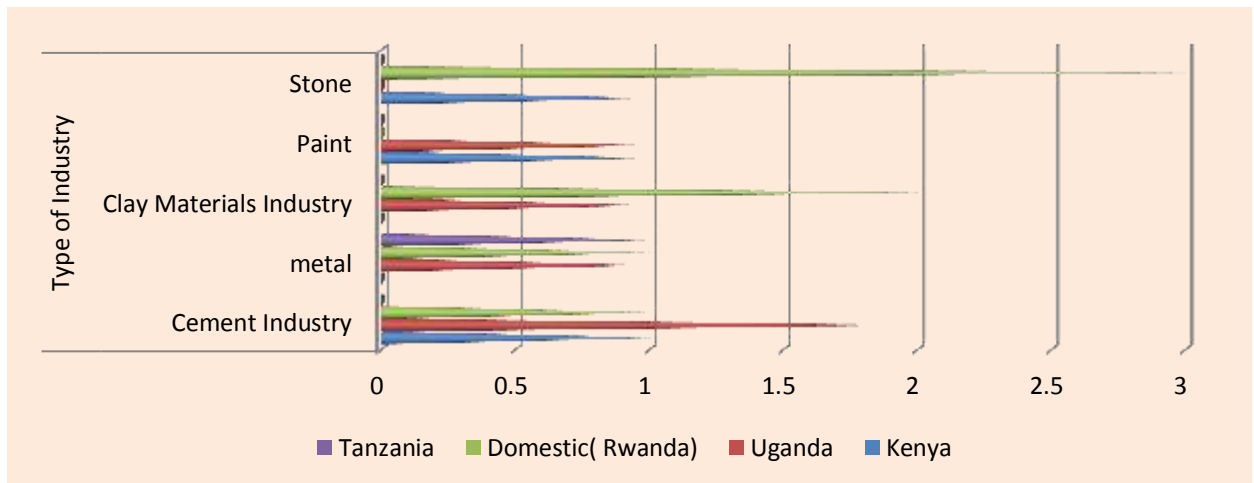
Chart 16: Source of Markets by Industry



Source: Field Survey, 2014

The biggest competitors in the market for stone products are local and from Kenya, Uganda and Kenya on the other hand are big competitors in the paint market. Cement from Uganda is also a big competitor for Rwandese cement manufacture. The competition per product is faced with a lot of competition from products from Uganda and Kenya. This is as indicated in the charts below:

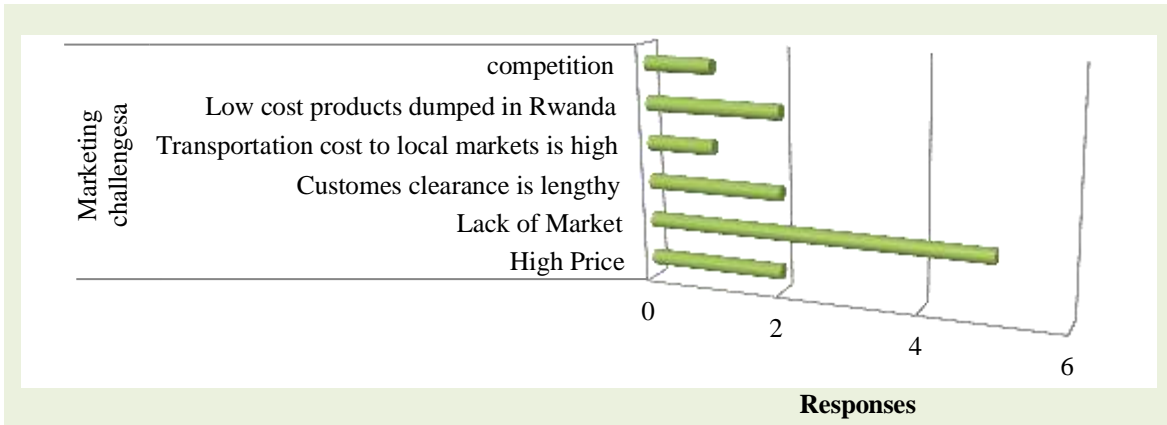
Chart 17: Competitors per Industry



Source: Field Survey, 2014

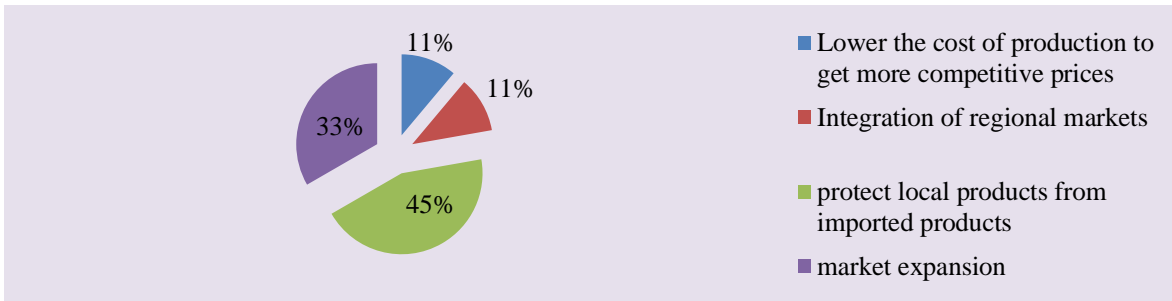
Among the contractors, the major competitors are local companies (57%), Chinese companies (29%) and the Indian granite industries (14%). Competition challenges are mainly due to lack of machines to improve quality and quantity of production (40%), limited access to markets (20%), and lower prices offered by competitors (20%).

Chart 18: Marketing Challenges



Proposed solutions to these challenges above was included:

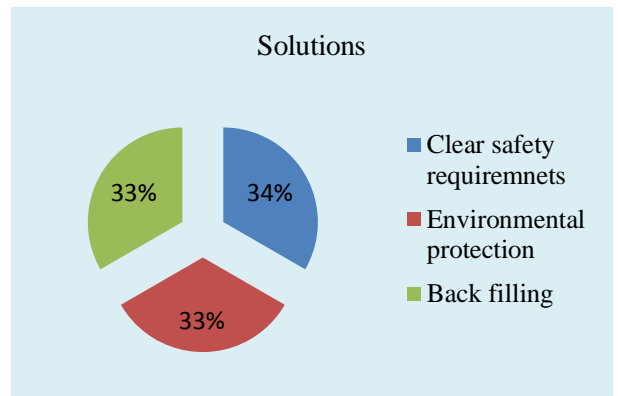
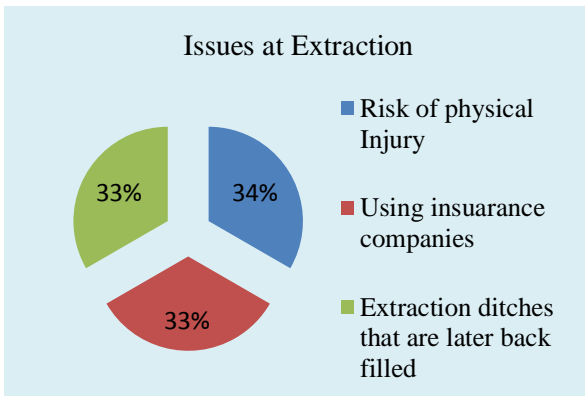
Chart 19: Marketing Solutions



j) Health and Safety

At extraction the biggest health and safety issue is the risk of physical injury and the environmental concern of extraction ditches. To counter this challenge, the industry proposes adoption of safety measures and back filling of extraction ditches. This is as indicated in the charts below:

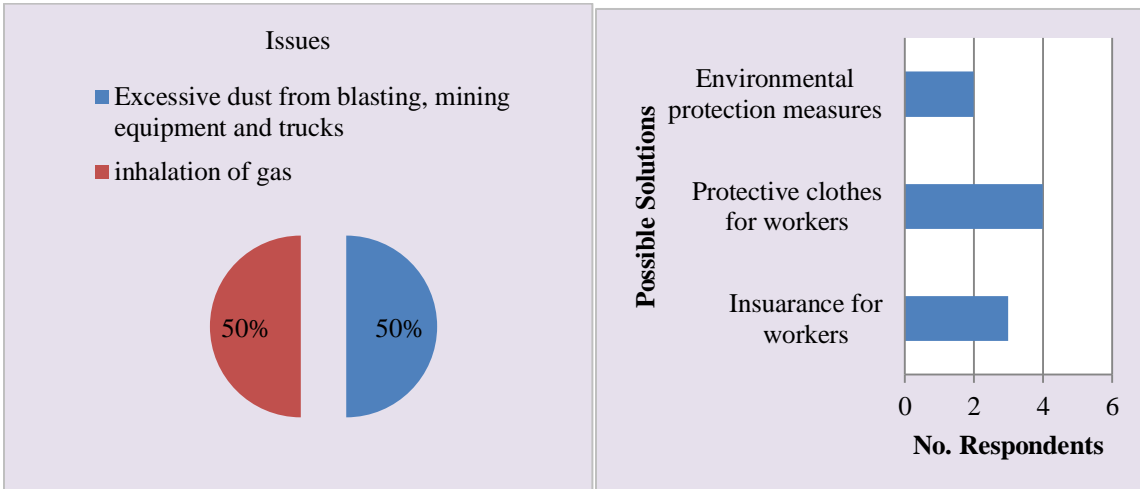
Chart 20: Health and Safety Issues at Extraction



Source: Field Survey, 2014

Health and safety issues from transportation are the excess noise and dust and the proposed solution was the sprinkling of water during the dry season. At production, the biggest health and safety issue was the dust from blasting and mining and the recommended solution is first aid as indicated in the charts below.

Chart 21: Health and Safety Issues at Production

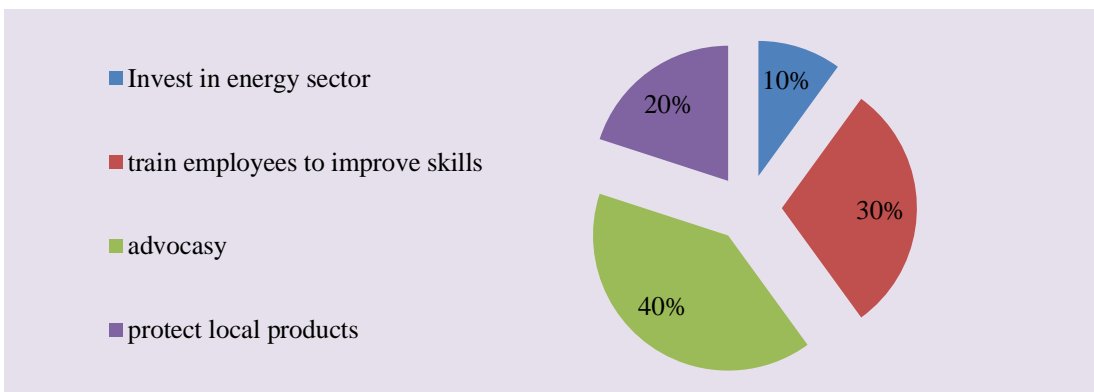


Source: Field Survey, 2014

k) Recommendations

The industry stakeholders recommended that the private sector intervene in training of their employees and also to invest in the energy sector. This is as indicated in the chart below.

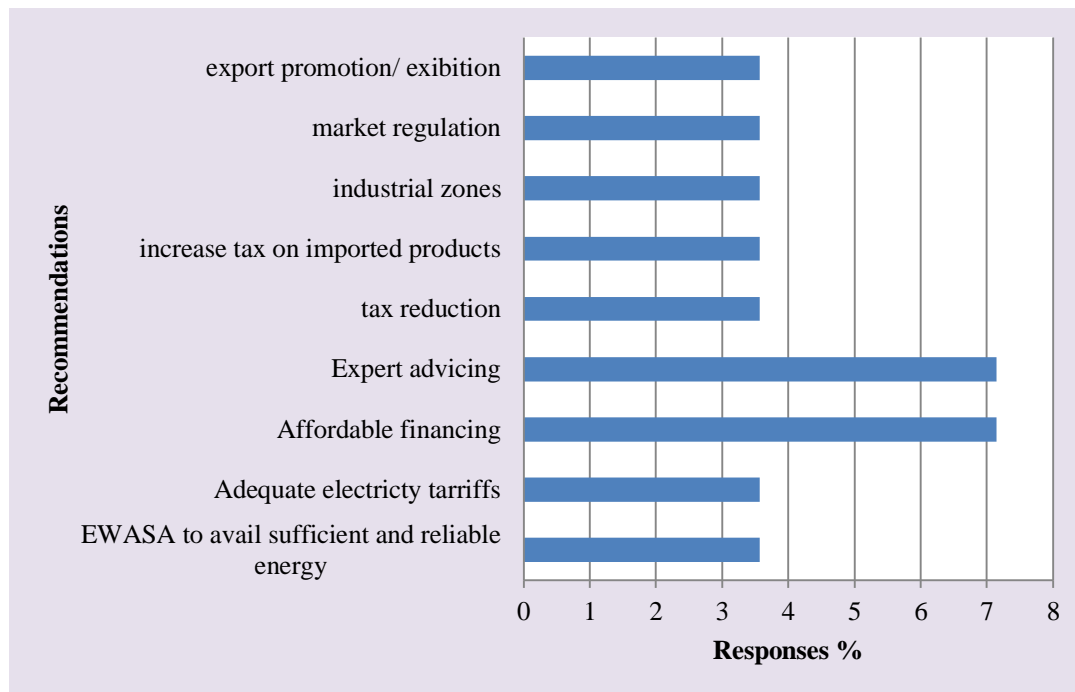
Chart 22: Recommendations to the Private Sector



Source: Field Survey, 2014

Some of the recommendations to the government include the following: Expert advising and business incubation, provision of affordable financing, provision of sufficient, affordable and reliable energy, market regulation among others as indicated in the chart below:

Chart 23: Recommendations to Government



Source: Field Survey, 2014

4.4.2.2 ENVIRONMENTAL ISSUES:

Environment encompasses physical and non-physical medium such as air, water, solid waste/land and also noise pollution. Construction, with exploitation of natural resources such as forest for timber, housing and industry without proper control, contributes to environmental problems. The construction industry has to support a world of continuing population growth and social and economic development. This is happening in a world where the industry is trying to compete in an ever ‘-greener’ market while tackling challenging economic, regulatory and environmental issues.

The industry faces increasing pressure on their response to waste, resource use, carbon and energy management and their supply chain. By virtue of its size and growth therefore, the construction industry is one of the largest users of energy, material resources, and water, and it is a formidable polluter. According to the United Nations Environment Programme (UNEP), buildings worldwide contribute about 40% of global greenhouse gas emissions and are a major consumer of other natural resources such as water and natural materials. The buildings sector must therefore play its part to fight climate change. European commission notes that construction accounts for 24 per cent of global raw materials removed from the earth further support this. In addition, the extraction, processing, transport and installation of materials associated with construction consume large quantities of energy and water.

As noted many of the environmental issues that occur in our country are due to lack of environmental consideration in the exploitation, development and management of resources as well as lack of control of the resulting pollution. These issues if not tackled strategically will further aggravate and exert challenges towards sustainable construction. The industry therefore must not only comply with the ever-growing number of environmental rules and regulations but also go beyond compliance, proactively internalizing environmental performance. The current

study shows that one of the key challenges that faces the sector in Rwanda are the issues of environmental sustainability and thus there is a need to continue putting in places a key focus on the environmental sustainability measure in the sector development. Sustainability holistically examines a products needs, manufacture, use, disposal and indirect impacts.

Current Status.

As noted previously the construction industry which is the main consumer of the construction materials has been one of the fastest and key growth sectors in Rwanda in the last decade and this trend is expected to continued in years to come. This development from an environmental perspective comes in with a price since its calls for imminent use of natural resources to support the industry. The environmental impacts of the sector are the various stages of the industry namely, the extraction, processing, transportation and eventual use of the material. In tackling the issues of environmental management emphasis must be given to the integration of environmental concerns in all project planning and implementation with a focus on the project life cycle thinking.

Table 7: Environmental Impacts of Construction Industry

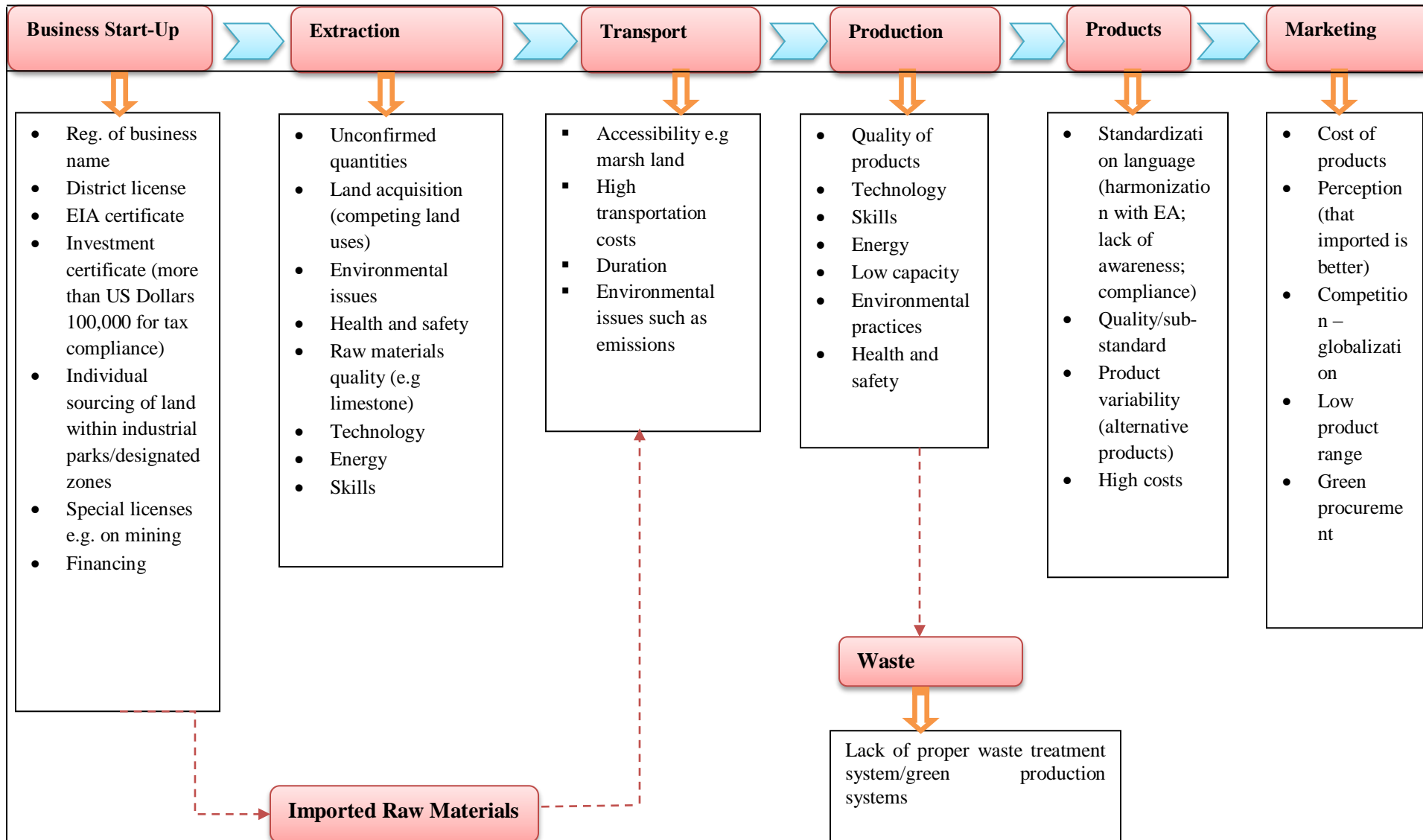
Stage /level	Current Issues	Possible Impacts
Extraction impacts	Removal of topsoil and overburden. Clearing of Surface Vegetation Noise and vibration Competition for rich agricultural land. Soil erosion. Hydrological impacts.	Loss of biodiversity and Ecosystem disturbance Reduced vegetative cover. Water pollution and depletion. Contamination of Soil and Soil Degradation Visual Impact.
Transportation	Air pollution / Exhaust Emissions. Diesel generator (DG) Sets emission Vehicular emissions Road Accidents. Increased pressure on infrastructure.	Green houses gasses increase leading to global warming.
Processing	Material usage (Energy and Water use) Release of greenhouse gases during the production Occupational Health and Safety issues. Noise emissions. Use of old technology	Accidents and injuries to workers. Solid waste generation High water and Energy consumption
Products End Use	Waste Management and disposal Release of greenhouse gases Public health and occupational safety Unsustainable products	Solid Waste Generation

4.5 SWOT Analysis of the Construction Industry in Rwanda

Table 8: Summary of Emerging Issues

Strengths	Weaknesses
<ul style="list-style-type: none"> a) Government policy; Rwanda has a anti corruption policy that is key to promoting free market ideals and therefore attractive to foreign investors b) Plenty of traditional knowledge in making some products such as clay that maintains standards regionally c) Ample local supply of some raw materials d) Big industrial groups of industry are getting into the construction industry subsector and with them, skilled knowledge, capital, existing knowledge on sourcing raw materials etc. e) Availability of willing human resource f) Availability of construction industry related technical institutions g) Good regional rapport within the East African region providing a potentially strong regional linkage to a larger market base h) Political will by the government to revitalize the industry 	<ul style="list-style-type: none"> a) There is an inefficient and inconsistent supply of raw materials b) Skilled man power (technical skills) is limited in Rwanda c) Land acquisition in Rwanda d) Difficulties in acquiring capital e) Regional products from Kenya and Uganda are big competitors to the Rwandan products putting them at a price disadvantage especially given the high cost of production in Rwanda f) Inconsistent and inadequate energy/power supply to drive the industry g) Low quality production output
Opportunities	Threats
<ul style="list-style-type: none"> a) Potential to achieve transport cost efficiencies b) Most firms in the industry operate below capacity, there is room to improve the industry by improving the efficiencies c) There is significant interest in the construction industry in Rwanda with big companies making production very competitive d) The construction industry in emerging markets is growing at the fastest rate globally. This means that there is increased demand for construction especially luxury housing/ accommodation e) Rwanda has a high population of semi skilled labor, this can be easily trained for this labor intensive industry. f) Investment in alternative sources of energy 	<ul style="list-style-type: none"> a) Transport costs are very high b) Energy costs are very high c) The domestic market is relatively small compared to the region d) Building materials attract a lot of environmental concerns e) Infiltration of the industry by foreign industries f) Low returns to workers of the industry g) Limited local skills reduces local company preference by the government

Figure 17: Summary of Emerging Issues within the Construction industry Value-Chain



VOLUME 3: ACTION MECHANISMS

CHAPTER 5: PROPOSED STRATEGIES AND ACTION PLANS

5.1 Vision & Targets of the Master Plan:

The vision of this master plan is:

“A Globally-Competitive, Sustainable Construction Materials Industry To Achieve Rwanda Vision 2020.”

This master plan aims at enabling the construction materials industry to achieve the following targets:

- Increasing the contribution of the construction materials industry to national GDP to over 10% by 2018.
- Increase the contribution of the construction materials industry to 60% of overall industrial GDP in Rwanda.
- Increase the employment of the sub-sector to help Rwanda achieve 1.4 million off farm jobs.
- Improve the construction industry’s balance of trade through increased exports and reduced import levels.
- To lead green growth of the industrial economy.

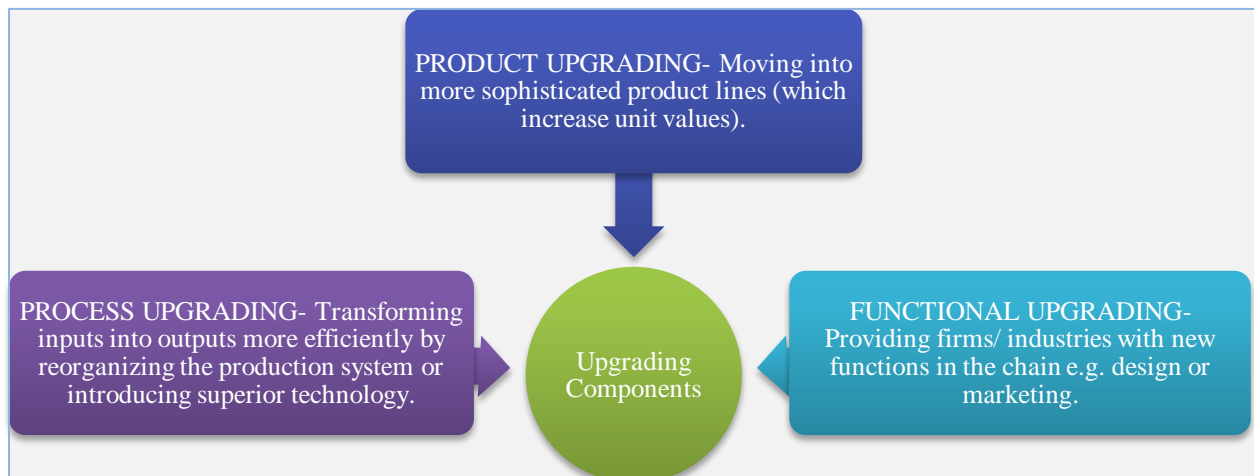
5.2 Investment Promotion and Value-Chain Development:

Guiding Concepts:

1. Upgrading:

The most viable response to competitiveness suggests is to “upgrade”- to make products more efficiently, to increase value-adding activities by making more sophisticated products and taking on more sophisticated processes. This concept therefore proposes 3 different shifts:

Figure 18: Proposed Upgrading Shifts



2. Clustering:

Clustering is important as competitive advantage is derived from a constellation of local factors that sustain the dynamism of leading firms, while emphasizing the importance of local rivalry and supplier networks. Clusters affect competition in three broad ways:

- By increasing the productivity of companies based in the area;
- By driving the direction and pace of innovation;
- By stimulating the formation of new businesses within the cluster.

Geographic, cultural, and institutional proximity provides companies with special access, closer relationships, better information, powerful incentives, and other advantages that are difficult to tap from a distance. The more complex, knowledge-based, and dynamic the world economy becomes, the more this is true. Competitive advantage lies increasingly in local things--knowledge, relationships, and motivation--that distant rivals cannot replicate⁹.

Table 9: Criteria for Cluster Selection Framework

DESIRABILITY	FEASIBILITY
Potential for economic and social returns Potential for linkages to other sectors Dynamic technological trajectories	Export potential The presence of domestic demand Availability of inputs

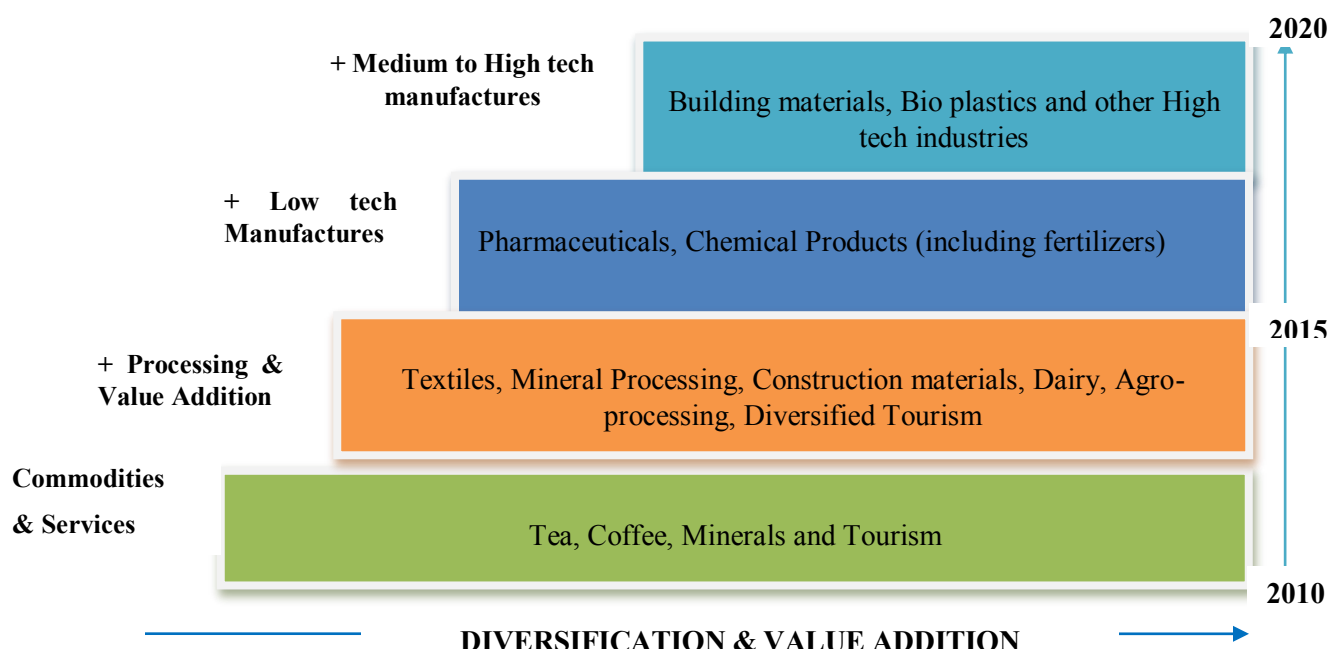
Source: National Industrial Policy, 2011

The key overarching factors for selecting dynamic clusters are desirability and feasibility. The Government in the short-term should support the new feasible sectors while promoting the future viability of desirable sectors. In the medium-term, desirable sectors can also receive support as they become feasible. In the long-term, resources can be shifted to new sectors that are feasible and Government can wean off successful sectors through reduced support.

Through the National Industrial Policy, 2011, the following clusters have been identified for development in the short term, medium and long term.

⁹ "Clusters and the New Economics of Competition" Michael E. Porter, Harvard Business Review, November-December 1998

Figure 19: Cluster Progression Ladder, 2011-2020



Source: National Industrial Policy, 2011

It is therefore evident that this Construction of Raw Materials Master Plan sub sector could not have come at a better time as per the cluster progression ladder; the processing and value addition should start in 2015. Therefore, this Master Plan provides the road map for the implementation of processing and value addition for construction materials. It provides overall guidance on the locations, quantities, technological requirements and market potentials for construction materials.

Upgrading and Functional Upgrading will help to reposition Rwanda's construction materials industry in the regional/ regional markets, as the cluster begins to produce different products for different types of customers.

Construction Materials With A Niche In The Market

The following products were found to have sufficient quantities and potential to create a niche in the Rwandese market and for export:

- Clay
- Wood
- Sand
- Stone

Figure 20: Clay Value-Chain Issues and Proposed Product Actions

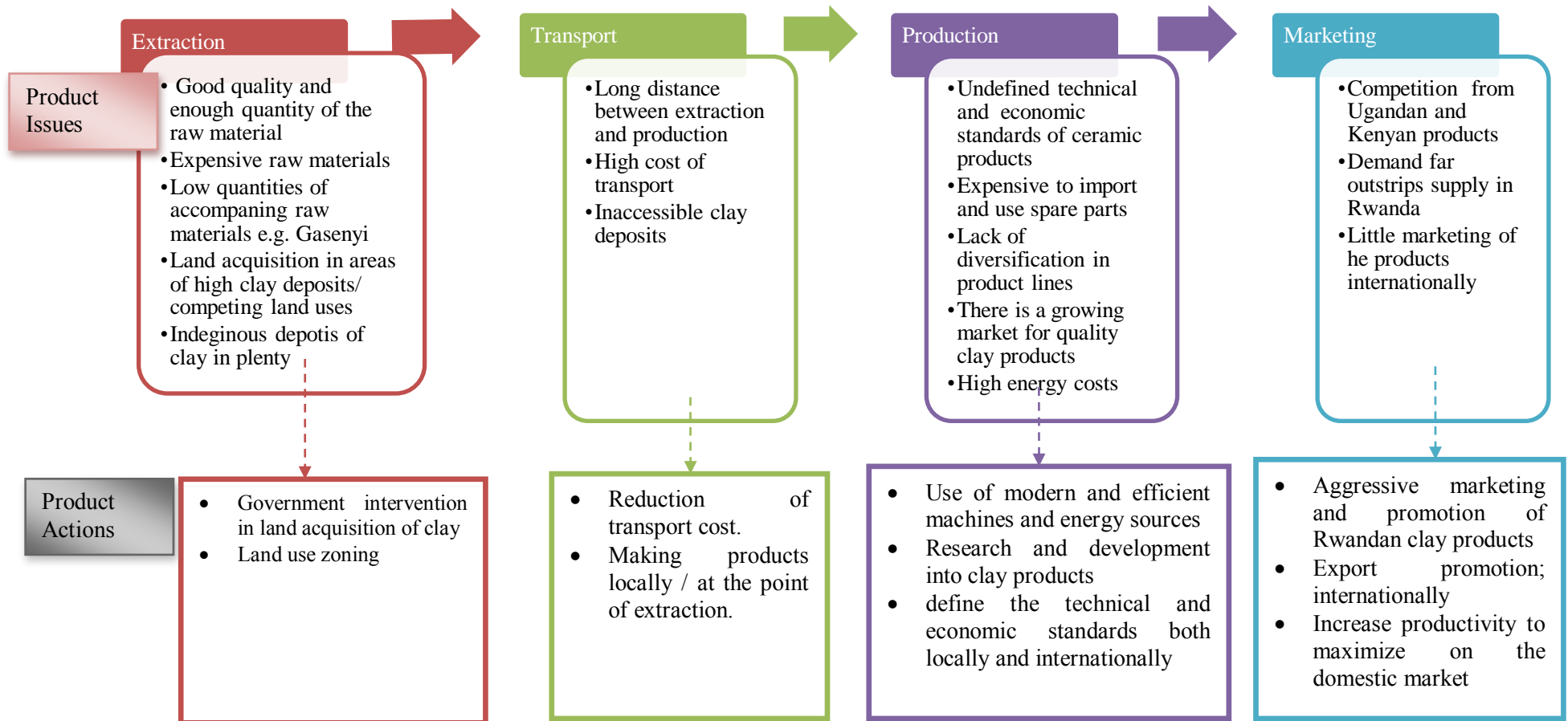


Figure 21: Clay Products Diversification

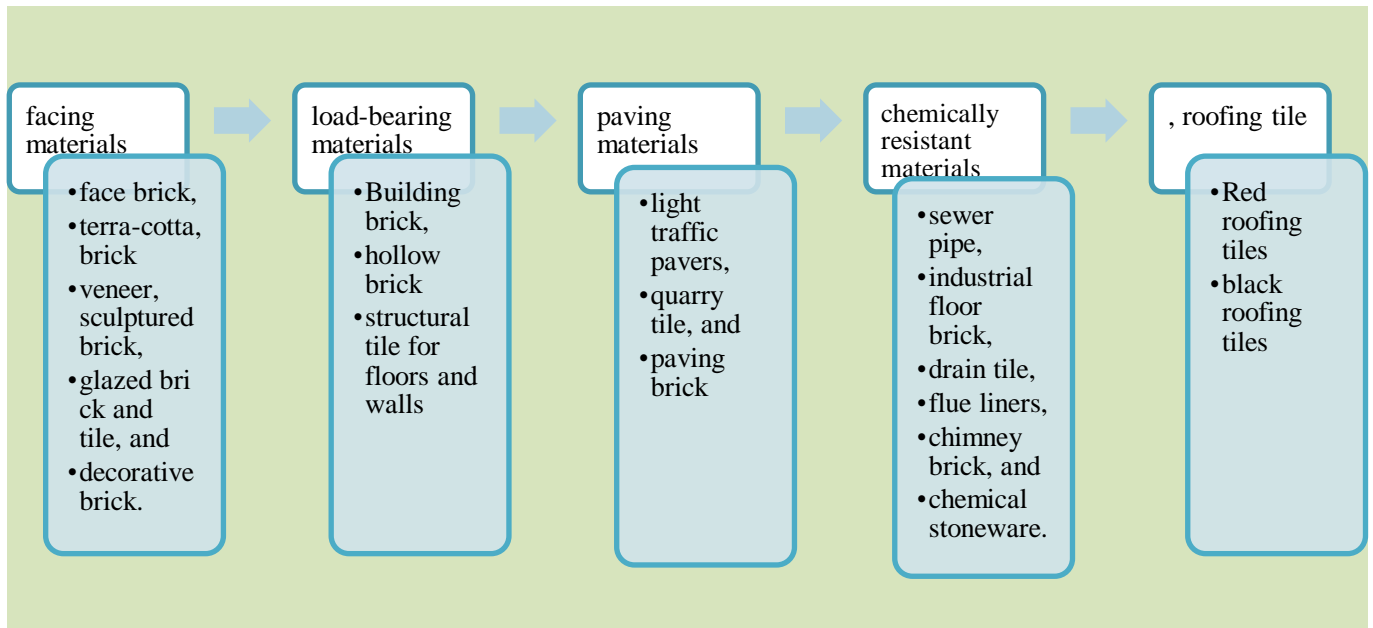


Fig: Examples of Clay products



b). Wood/ Timber Products:

Figure 22: Timber Value-Chain Issues and Proposed Actions

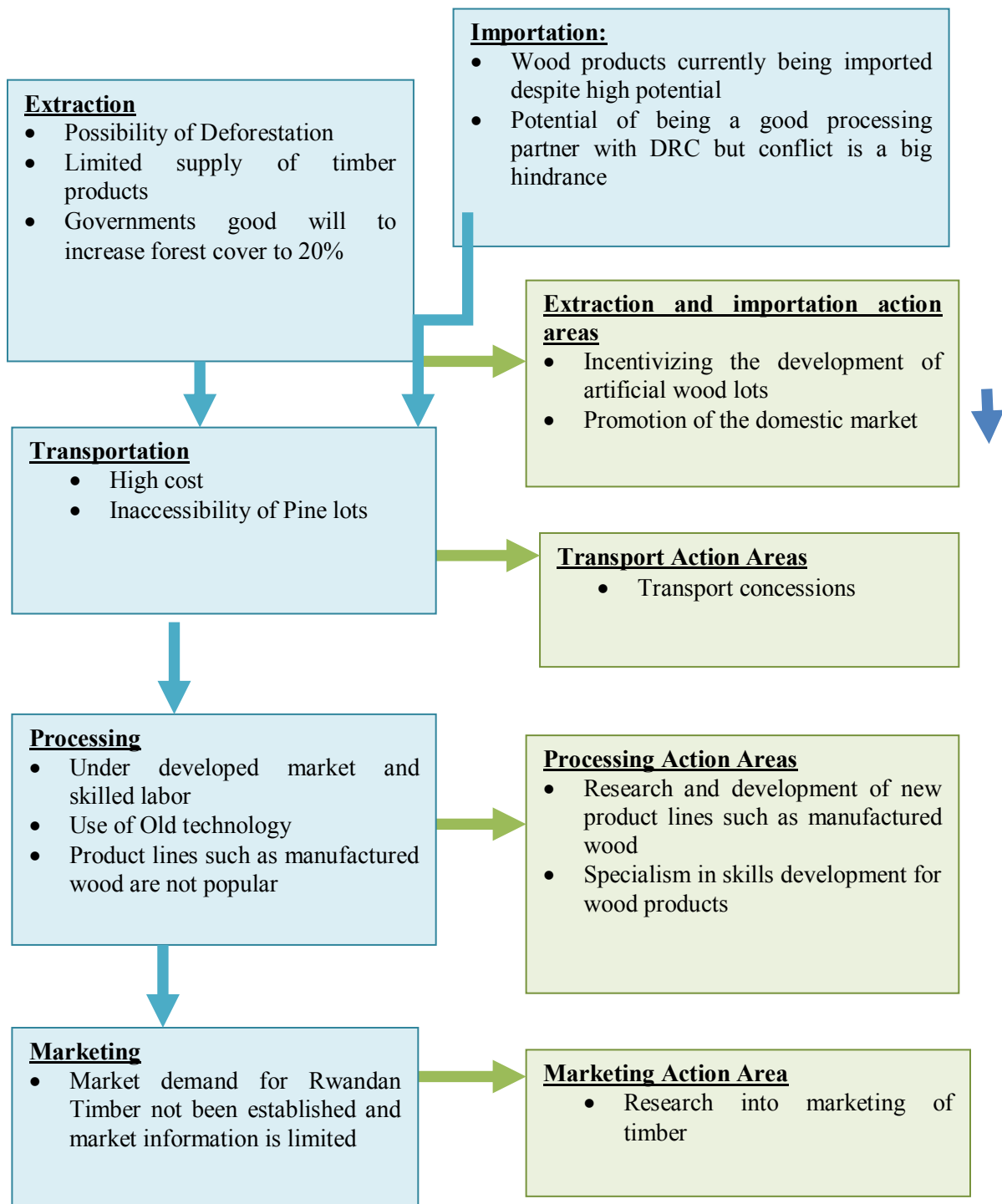


Figure 23: Timber Products Diversification

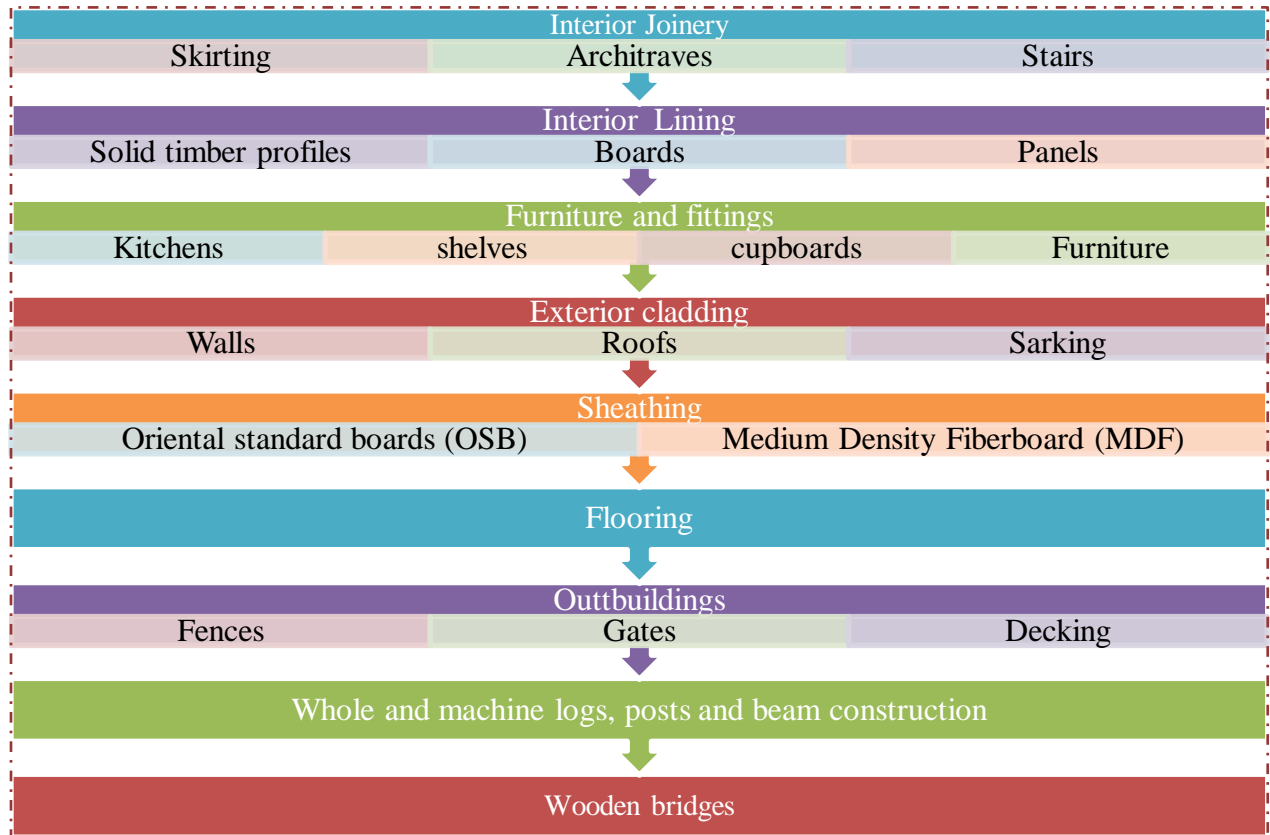
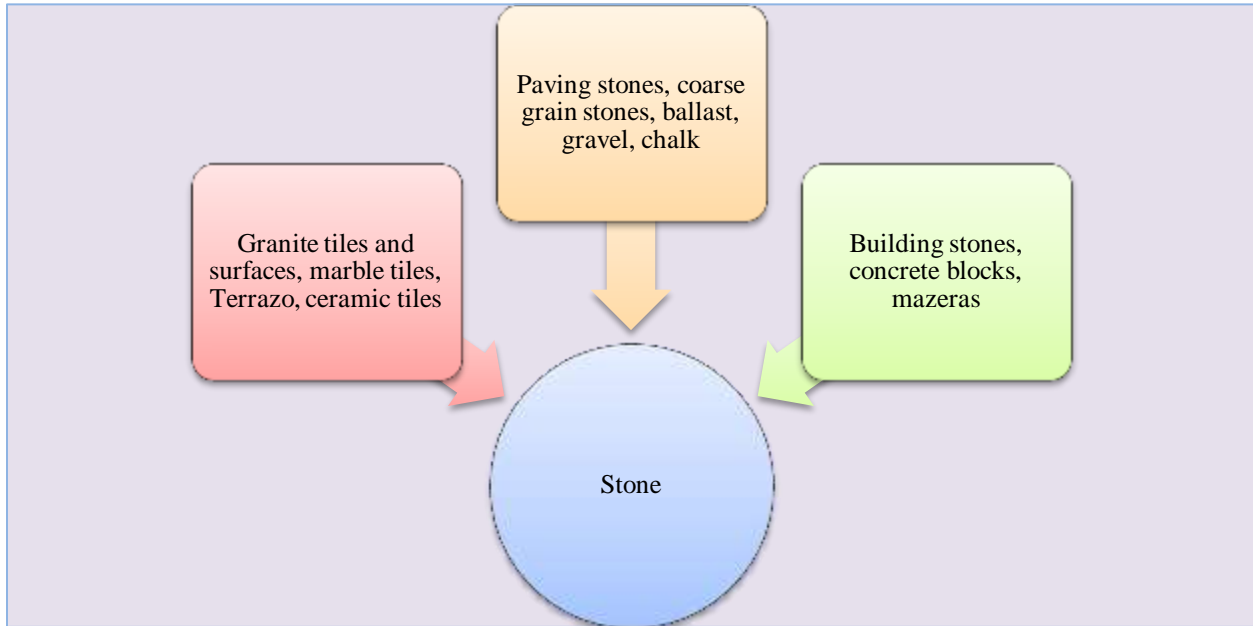


Fig: Examples of wood products



c). Stone Products:

Figure 24: Stone Products Diversification



Paving Blocks

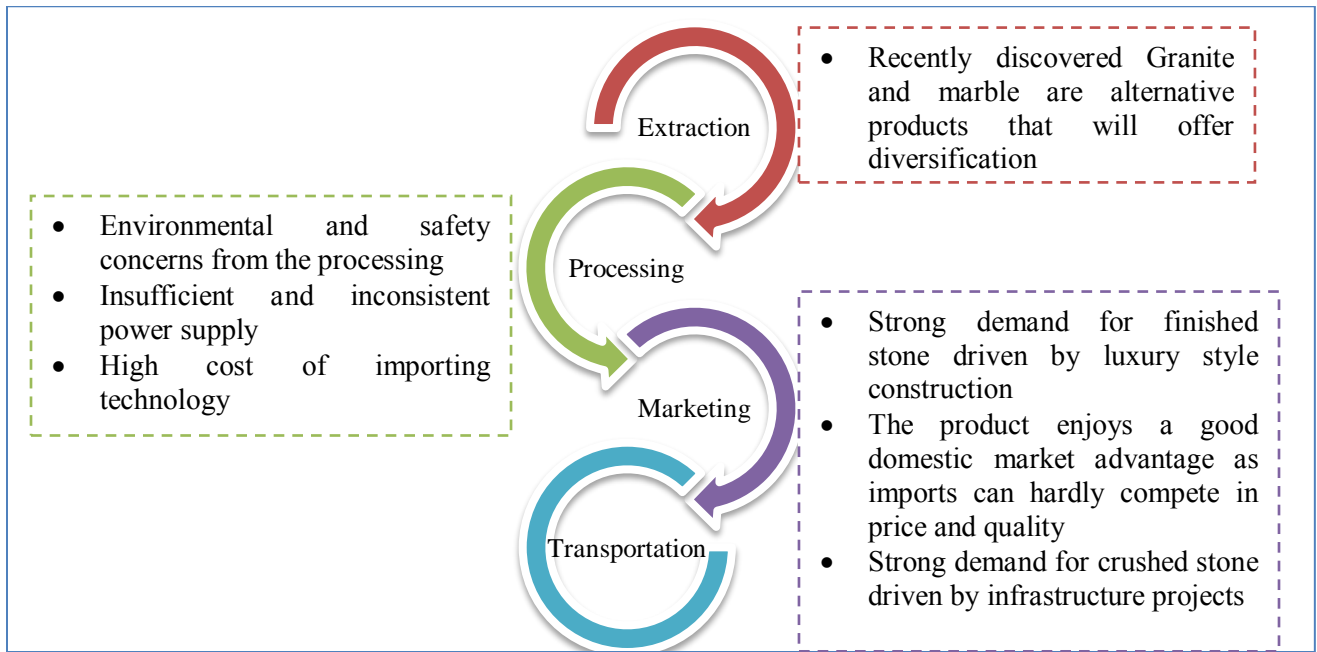


Mazeras stone



Granite Surface

Figure 25: Stone Value-Chain Issues and Proposed Product Actions



d). Sand

Figure 26: Sand Value-Chain Issues and Proposed Product Actions

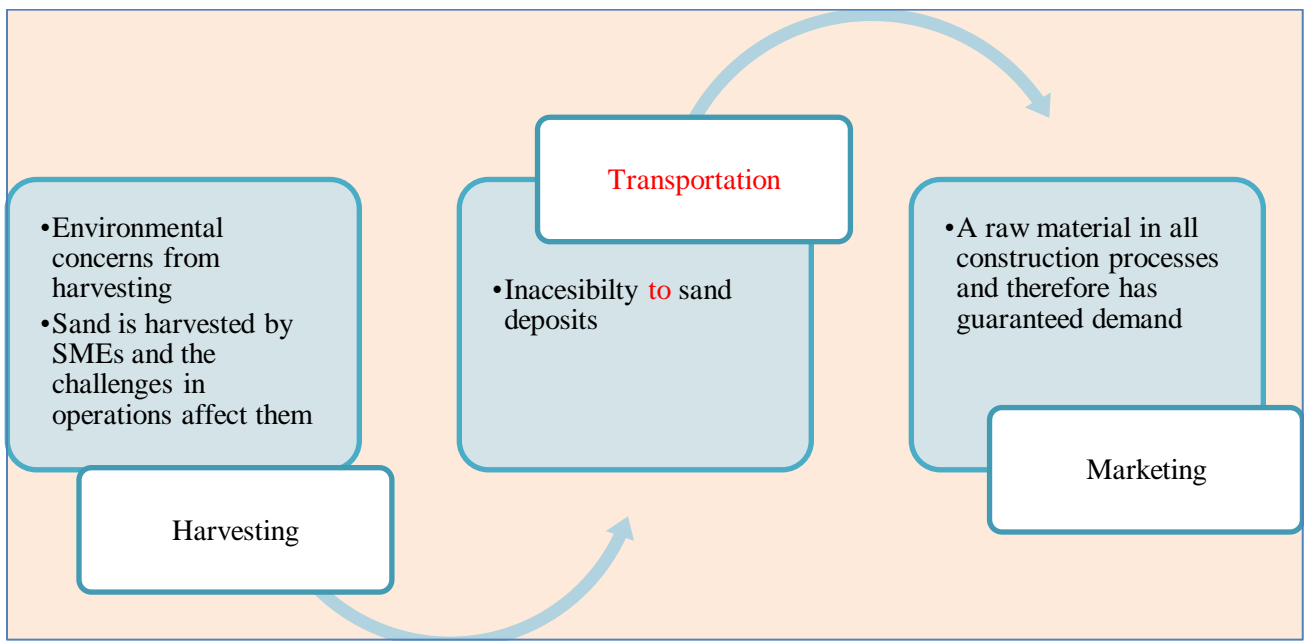
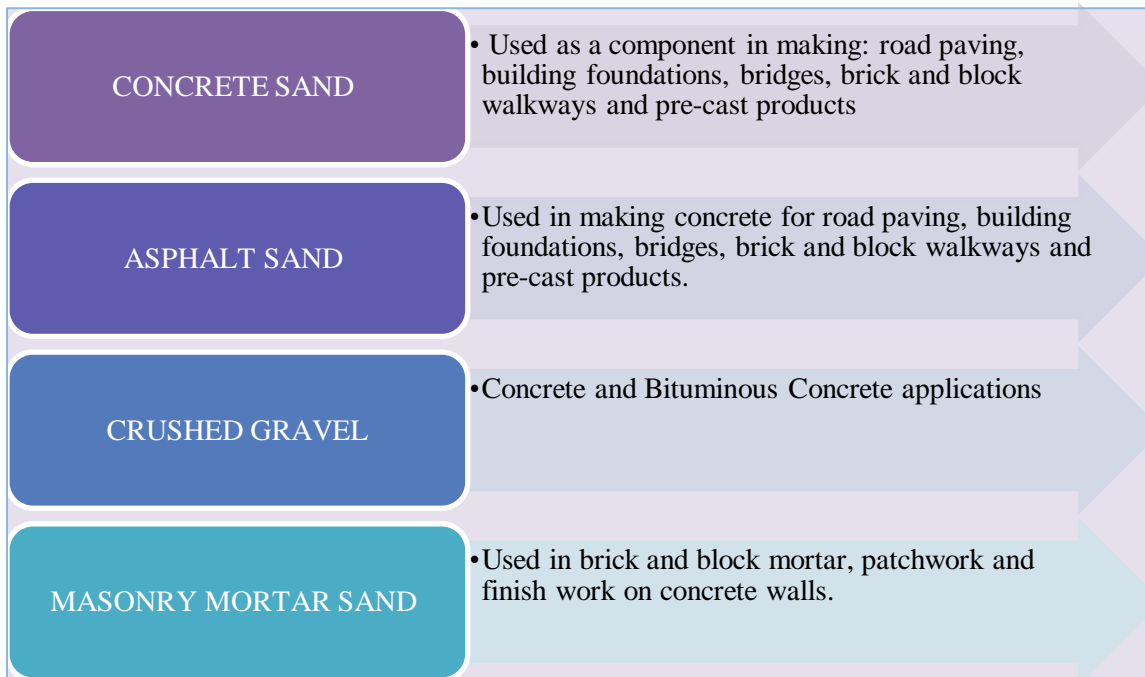


Figure 27: Diversification Sand Products



Industry Value-Chain Development Strategies:

Strategy/ Action:	Sub-action:	Output:	Timelines:			Actors:
			Short-Term:	Medium-Term:	Long-Term:	
BUSINESS START-UP STAGE:						
To improve business start-up environment	1. Creation of an online one-stop shop for special licensing of natural resource extractors.	-Integrated e-licensing framework				MINICOM, RDB, REMA, RRNA
	2. Creation of awareness on improved or upgraded systems to industry operators/prospective investors.	-Aware public				MINICOM, RDB
	3. Fast track the implementation of the SME policy	- Increased SME's in construction materials industry				MINICOM, RDB
EXTRACTION STAGE:						
To upgrade the raw material extraction process	1. Development of an up-to-date database on quantities of naturally occurring construction materials	-Initiate detailed studies to confirm quantities of clay, stone and sand. -Digitize and make this information available online for prospective investors.				REMA, RRNA
	2. Promote innovation through research and development	-Innovative construction products -Alternative construction technology -Cleaner and safer environmental extraction practices				University of Rwanda, WDA

	3. Fast track the implementation of the Skills Policy					WDA, MINEDUC, University of Rwanda, Technical & Vocational Institutions
TRANSPORTATION STAGE:						
To reduce transportation costs and duration	1. Movement consolidation	Reduced cost of transportation				MININFRA, MINICOM
	2. Imposing transport concessions to reduce the cost of transportation	Reduced cost of transportation				MININFRA, MINICOM
PRODUCTION STAGE:						
To develop enhanced production systems through modernized technology	1. Improvement of production technologies	-Continuous R & D -Increased production output -Cleaner and safer production systems				MINICOM, PSF, WDA, MINEDUC, University of Rwanda, Technical & Vocational Institutions
	2. Skills development/ fast tracking implementation of skills policy					WDA, MINEDUC, University of Rwanda, Technical & Vocational Institutions
	3. Provision of reliable and efficient energy					EWASA, MININFRA
PRODUCTS:						
To develop an appropriate standardization system	1. Harmonization of construction materials standards with those with the EAC.	- Harmonized construction materials standards				RBS
	2. Translate the construction materials standards into Kinyarwanda and French	- Construction materials standards in Kinyarwanda and French				RBS
	3. Increase public awareness on standards	- Aware public - Decrease in sub-standard				RBS

		products				
To increase product variability	1. Diversification of finished products	-Innovation through Research and development -Alternative products				WDA, MINEDUC, University of Rwanda, Technical & Vocational Institutions, MINICOM, RDB
MARKETING STAGE:						
To improve competitiveness of construction materials and industry	1. Change local preference for imported products.					MINICOM, RDB, PSF
	2. Leverage industry to benefit from regional integration/globalization					MINICOM, RDB, PSF
	3. Provide support for SMEs					MINICOM, RDB, PSF
	4. Promote industrial associations					MINICOM, RDB, PSF
WASTE PRODUCTION STAGE:						
To develop proper waste production systems (Green production systems)	1. Compliance with environmental standards on industrial waste disposal					REMA, MINICOM
	2. Research and development on environmentally friendly use of industrial waste					REMA, MINICOM, WDA, MINEDUC, University of Rwanda, Technical & Vocational Institutions

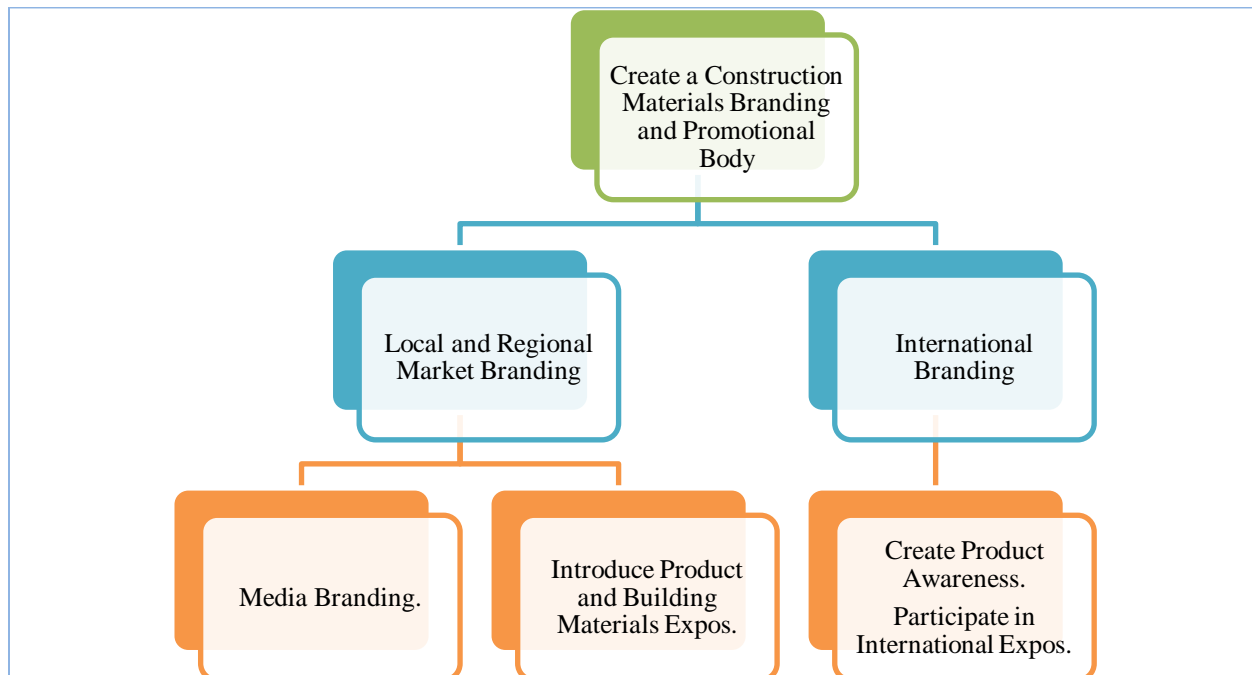
5.3 Branding Strategy:

To increase uptake of locally made Rwandese building materials by the local market, regionally and eventually international market, the concept of branding should be adopted as a strategy. The perception by the local market that imported building materials are of better quality than locally manufactured ones should be overridden by branding and creating awareness that locally manufactured materials are of equally great quality and buying Rwandan is promoting Rwandan.

Aims of Branding Rwandan Construction Materials

1. Promoting recognition of Rwandan products
2. Setting Rwandan Products apart from the competition

3. Create direct communication with the intended markets



Construction Material Branding and Promotional Body:

The body will be tasked with the responsibility of identifying and refining the key features of Rwandan Construction materials that contribute positively to the image and reputation of the Sub-sector so as to enhance these characteristics and create an authentic, credible brand for the sector that establishes the uniqueness in the local, regional and international market.

Proposed Functions of the Body:

- Establish a brand for Rwandan Construction materials, which positions the products optimally in terms of Reliability, high quality and standards as well as cost.
- Bring on board all the stakeholders in the industry and provide them with information about the sector that will help them in promoting locally manufactured construction materials.
- Establish an integrated approach within government and private sector towards marketing of Rwandan Construction Materials; locally, regionally and internationally
- Organize for expos in the construction sector that gives local manufacturers a platform to exhibit their products
- Encourage commitment to quality and innovation among local manufacturers and service providers in the Construction Materials Sub-sector;
- Assist different towns and cities in the country to improve their image; and
- Undertake measures aimed at improving the image of Rwandan Construction materials locally, regionally and internationally.

The success of the Sub sector will be highly dependent on the fast tracking of the branding approach by the body. This will assist in changing the local perception of the products locally, regionally and internationally, which eventually will increase the markets for the products. The ripple effect will lead to increased production and employment creation within the clay subsector.

Proposed Actions:

STATEGY	ACTION	ACTOR	TIMELINE
Come Up With A Branding Body	Institute a Construction material Branding and promotional Body	MINICOM&RDB	1 month
Branding Campaign	Have an intense branding and publicity campaign locally through all media platforms to sensitize the market on Rwandan Clay construction materials	Branding body	3 months
Rwandan Construction Materials Expo	Have a platform for locally manufactured Rwandan construction materials to be exhibited in themed Expos	Branding Body RDB, MINICOM Manufacturers and other stakeholders	3 months (Three times a year)
Participate in major international building and construction expos	Ensure Rwandan Clay Construction materials products are displayed in international expos in a bid to enter regional and international markets	Branding Body RDB, MINICOM Manufacturers and other stakeholders	

5.4 EHS and Green Economy Strategy

The goal of this strategy is to have an industry is operating in sustainable and safe manner at all levels

Key Objectives:

- To have an industry that is producing internationally accepted sustainable products.
- To have production systems that are respecting the global norms of environmentally sound productions.
- To have an industry that supports the green growth agenda of Rwanda.

Proposed Actions:

Strategy	Actions	Actors	MONITORING AND EVALUATION				
			Outcomes	Indicators	Short Term	Medium Term	Long Term
Production of sustainable material leading to eco friendly production building	<ul style="list-style-type: none"> • Adoption of New Techniques And Technology of production at all levels. • Improve on R and D. • Adoption of Resource Efficiency And Cleaner Production Tools In Production And 	RBS and Private sector (PSF), REMA, MINICOM, MINIRENA, RRCEP	Production of sustainable products. Increased use of renewable energy technologies	New Products of Sustainable products in the market. 20 % Use of renewable energy			

material	<p>Construction Activities.</p> <ul style="list-style-type: none"> Capacity building enhancement in the areas of energy efficiency, good water management practices, general management practices. 		Increased skills in RECP in the building materials sector.	technologies in the sector. Training of personnel in the sector on RECP			
To implement and adopt the use of internationally accepted environmental standards in the sector	<ul style="list-style-type: none"> Expanded the Environmental quality monitoring surveillance programs and environmental auditing systems in the sector. Encouragement of the players to have in place a well developed Environmental Management Systems (EMS). Use Of Life Cycle Assessment (LCA) Approach (systems thinking approach). 	RBS and Private sector (PSF), REMA, MINICOM, MINIRENA. RRCEP	Have systems thinking approach adopted	Adoption of the LCA tools in the sector. Have 5 of the key industries certified with EMS 14000			
Implementation Of Robust Health And Safety System In The Industry	<ul style="list-style-type: none"> Adopt basic safety techniques in the sector though the development of sector specific safety guidelines. Effective management of Occupational health, and safety at all levels of production. Have awareness, education and training, Enhance enforcement and legislation of the Current OHS regulations. 	MIFOTRA, PSF, MINIRENA	Have functional OHS systems in the organizational	Have a OHS personal in every industry in the sector. Conduct training in OHS in the sector.			
To introduce Green Public Procurement (GPP)	<ul style="list-style-type: none"> Develop GPP National Action Plan. Have a deliberate green procurement policy for all the public procurement for services and works 	REMA, RPPA, RBS	National Green Procurement Plan for the building materials sub sector developed.				
Introduce Green Rating	<ul style="list-style-type: none"> Adopt and introduce a voluntary approach to environmental performance 	Architectural and engineering associations, PSF,	Have a national green rating	An Annual green building			

System For Buildings	<ul style="list-style-type: none"> certification for buildings. Introduce, Develop and adopt Green rating Incentive Schemes to encourage the industry to build green friendly buildings. 	RBS, REMA, MINICOM	standard for building.	award scheme instituted			
Introduce Sustainable Financing mechanisms.	<ul style="list-style-type: none"> Work with FONERWA and the industry to support of their innovative ideas, which can be turned into 'marketable', green products and services. 	REMA, PSF, MINICOM	Have financed project in the areas of Energy saving measures, Increased use of renewable energy technologies, Development of an environmentally superior product	Have building sector project financed under FONERWA .			

5.5 SME Support, Entrepreneurship Development & Private Sector Mobilization Strategy

Classification System Of Industries:

Construction industries are defined differently between countries and within sectors. Definitions differ in the break points they employ, and also in the underlying basis used for classification (Ayyagari, Beck and Demirguc-Kunt 2003:4). Some of these definitions are based on quantitative measures such as staffing levels and turnover or assets, while others employ a qualitative approach (Meredith 1994:44).

The first common criterion is based on the number of employees. The second criterion defines an industry per the degree of legal formality, and has been used to distinguish between the formal and informal sectors.

Here, Micro, small and medium enterprises (MSMEs) are considered as enterprises which are not registered and do not comply with the legal obligations concerning safety, taxes and labor laws. The third criterion is based on the amounts of capital and skills per worker.

Classification criteria are summarized below:

- No of Employees/People
- Annual Turnover Limit
- Investment in Plant and Machinery +Registered Capital
- Equipment Investment + Registered Capital
- Legality and registration of the Entity

Table 10: Classification System for Industries

Entity	No of Employees/People	Annual Turnover Limit (Million RwF)	Investment in Plant and Machinery +Registered Capital
Small	<30	<12	<15
Medium	31-100	12-50	15-75
Large	>100	>50	>75

Source: SME Policy, 2010.

Proposed Actions:

Strategy:	Action Area/ Programme/ Activity:	Actors:	Monitoring and Evaluation:				
			Expected Outcomes	Indicators	Short Term	Medium Term	Long Term
Setting up of natural construction materials villages per district	- Stakeholder participation per district to select locations and products for natural construction materials villages to be set up (for cottage industries). - Development of the SME	District Councils, Local community, MINICOM	SME villages per district	Increase in construction materials SMEs per district			

	Villages per district.						
International investor summits highlighting investment potential	<ul style="list-style-type: none"> - Taking lessons from Gujarati, India on international investor summits - Target international investor summits to showcase Rwandese construction materials e.g. Kenya National construction materials expo. 	<p>MINICOM</p> <p>RDB</p> <p>NGOs</p>	Increase in export business	Participation in regional and global business expos			
To mobilize the private sector to engage in the industry	<ul style="list-style-type: none"> - A strong PR campaign about investing in the Industry featuring successful entrepreneurs in the industry. - Putting in place a strong enabling environment with affordable costs of production, protection from unnecessary and unfair competition etc. - Using public funds to support early entry projects at the country level that will be of sufficient scale to help transform markets. - Catalyzing private capital with innovative tools that will attract the private sector as an investor at scale. 	<p>MINICOM</p> <p>RDB</p> <p>NGOs</p>	Improved Private sector investment in the industry	<p>Improved knowledge about investment options in the industry</p> <p>Ease of information access about starting a business in the industry</p>			
Leveraging on the benefits of creating investor associations within the construction	<ul style="list-style-type: none"> - They have proved useful in disseminating information, conducting training, monitoring implementation of programmes, marketing, technology transfer and 	<p>NGOs</p> <p>MINICOM</p> <p>RDB</p> <p>NGOs</p>	Improved association within the industry	<p>Improved information flow</p> <p>Increased ease in communication</p>			

industry	uptake etc. - Capacity building on the creation and management of Associations.						
Provision of Business Development services	- Incentivize private sector to engage in Construction materials industry BDS and knowledge promotion -Leveraging the recommendation of the ICT policy to promote business management and practices through a website, SMS services	MINICOM RDB NGOs	Improved entrepreneurship skills “soft skills”	Increase in the number of the people investing in private BDS			
Investing in business incubation centers	- Incentivize the setting up of business incubation centers in institutions and by the private sector.	MINICOM RDB NGOs	Successful start ups	Ease in opening and running SMEs and businesses within the industry			
Innovative approaches to business financing	- Promoting the SACCO movement to encourage savings and access to cheaper financing - Credit guarantee schemes from the National Bank of Rwanda - Innovative banking solutions	NBR MINICOM RDB NGOs All commercial banks	Access to finance	Improved domestic savings			
Offering operational and capacity support to SMEs through	- Leasing for equipment - Private Equity - Venture Capital - Real Estate Investment Trusts through Rwanda Stock exchange	NBR MINICOM RDB NGOs All commercial	Access to finance	Increase in the number of SME’s within the industry			

	- UMURENGE SACCO - Participate in Hanga Umurimo Business Plan Competition for eventual financing - JICA One Village One Product Competition	banks					
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5.6 Human Resource Development (Capacity Building) Strategy

Strategy	Actions	Actors	MONITORING AND EVALUATION				
			Outcomes	Indicators	Short Term	Medium Term	Long Term
To reduce high reliance on foreigners as technical and artisanal	To fast track the implementation of the existing policy on Skills development to achieve: <ul style="list-style-type: none"> Invest in education programmes that will promote local talent through: Program and curricular development that is customized towards the needs of the industry To improve the capacity of university polytechnics and colleges to train adequate numbers for the needs of the industry To establish programs on training of specialized construction industry professionals To establish training on soft skills enhancement like communication, management, team building. Organize workshops that address specific needs of workers in the industry Increase the number of lectures and reduce lengthy recruitment process Publication for workers 	Ministry of Education TVET (Technical Vocational Education and Training) All Professional societies Ministry of Trade and Industry IPRC (Integrated Polytechnic Regional Center) VTC (Vocational Training Centers) TSS (Technical Secondary Schools) KIST (Kigali	Increased employment of local personnel as technicians and managers	- Skilled employees along the value chain. - Increased investment in local construction industry programmes. - Education institutions with improved capacity. - Improved soft skills			

	and instructors on topic related to the construction materials industry <ul style="list-style-type: none"> • Provide grant to help improve skills and prepare the industry for growth. 	Institute of Science and Technology)				
To promote gender inclusiveness in construction materials industry	<ol style="list-style-type: none"> 1. Sensitize and promote gender inclusion in the industry through mass media 2. Preferential allocation of certain jobs for women in the industry 	NCHE (National Council for Higher Education) Private Investors	Improved gender balance to at least 60%	Increased employment opportunities in the construction industry		
Development of skills for the future; “Skills for the future initiatives”	<ol style="list-style-type: none"> 1. Integration of the construction industry syllabus within school curricular activities 2. Piloting a youth apprentice scheme among youth to promote career 3. Construction industry ambassadors 		Increased youth in the construction industry	Increased uptake and enrollment of construction related courses by youth		
Development of skills through the private sector	<ol style="list-style-type: none"> 1. Incentivize private institutions of higher learning to offer courses in construction industry through tax exemptions etc 2. Raising profile of the construction industry through exemplary business awards as outlined in the SME policy 		Improved private sector excitement & involvement in construction industry	Increased private sector investment in the industry		

5.7 ICT Integration

In 2001 a National information and communications infrastructure plan was launched so as to leverage socio-economic development on ICT. The 8 pillars and sub-plans consist of timelines and specific actions. However, the plan does not have a pillar exclusively on construction industry.

Information and communication technology (ICT) has a significant role to play in transforming the project visions and ideas into physical reality, from facilitating the creation and modification of building plans to expedite the review and approval process. As a strategic thrust for the construction industry, it brings significant improvements to the industry, enhance its efficiency in several areas such as knowledge sharing, not to mention improve the industry's image.

The construction industry needs a single point of access to all information relevant to the industry. A construction industry portal has to meet the knowledge requirements of all the stakeholders in the industry

- contractors, suppliers, clients/developers, regulatory authorities, professionals, academia, students, financiers and the general public.

Construction Industry Drivers for Adopting ICT

Driving force	Description
Productivity	<ul style="list-style-type: none"> Increasing the level of productivity in construction processes
Globalization	<ul style="list-style-type: none"> The necessity of overcoming the fierce competition due to the pervasive globalization trend
Idiosyncrasies/Uniqueness of construction industry	<ul style="list-style-type: none"> Material testing and standardization Tight Scheduling necessity High dependency on Information and communication Visualization necessity Necessity to gather multi-disciplinary skills

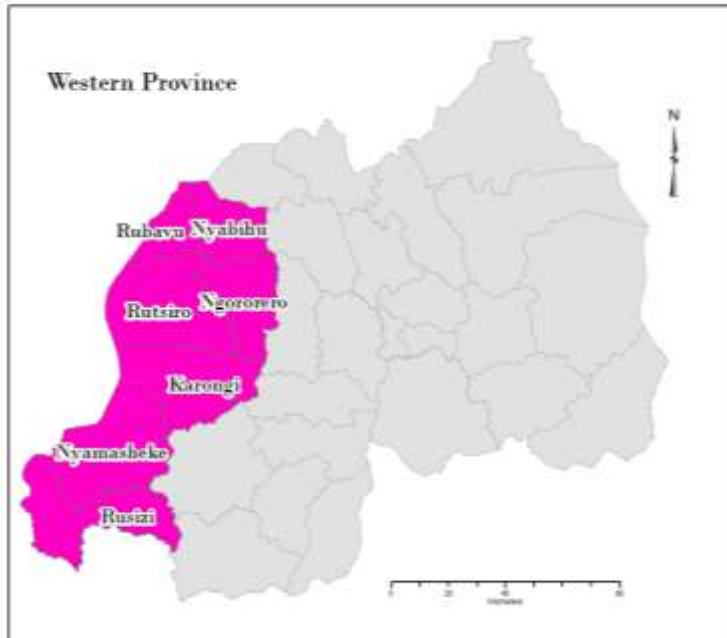
ICT Strategies in the Construction Materials Industry

Strategy	Actions	Actors	Timeline
Online portal for the construction industry (E-Construction)	<ul style="list-style-type: none"> Business registration and online-Licensing Approving plans Tender information Recent projects awarded Registered contractors Market information Laws and technical issues Land and soil information Training programs, etc. 	MINIFRA MINIRENA MINICIT	3- 6 months

Type of Costs

Capital Costs	Operation Costs	Indirect Costs
<ul style="list-style-type: none"> Hardware Software Acquisition 	<ul style="list-style-type: none"> Personnel Consultants Communication Administration Evaluation and education Security 	Support (Network, data, administration) etc

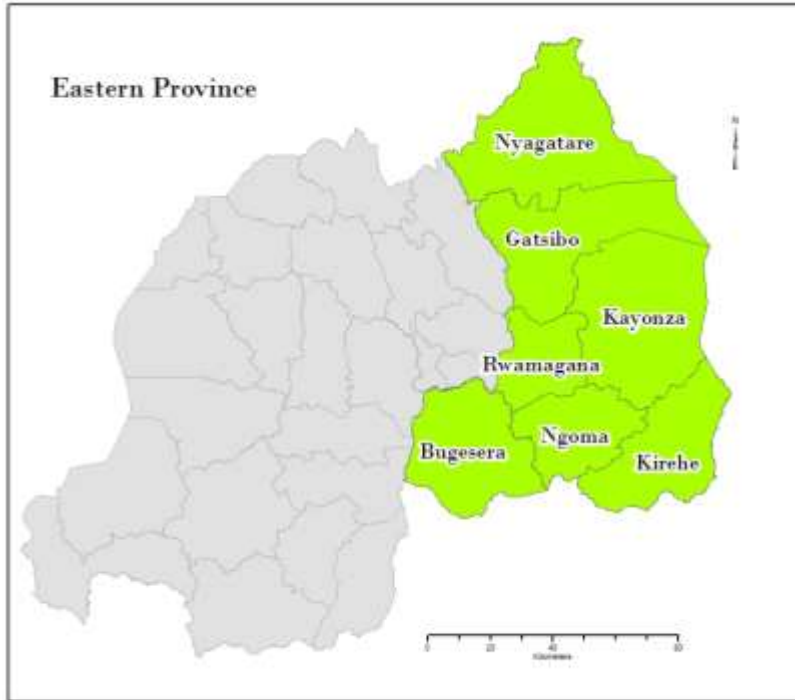
5.8 Industrial Zoning (Per Province)



WESTERN PROVINCE
 DISTRICTS: Rubavu, Nyabihu,
 Rutsiro, Ngororero, Karongi,
 Nyamasheke, Rusizi

TOP CONSTRUCTION RAW MATERIALS

Rubavu	<ul style="list-style-type: none"> •Clay •Sand •Dimension Stones(Building Stones) •Wood(Plantations)
Nyabihu	<ul style="list-style-type: none"> •Clay •Sand •Dimension stones(Limestone) •Wood(Plantations)
Rutsiro	<ul style="list-style-type: none"> •Clay •Dimension Stones (Building Stone) •Wood(Plantations)
Ngororero	<ul style="list-style-type: none"> •Clay •Sand •Wood(Plantations)
Karongi	<ul style="list-style-type: none"> •Clay •Sand •Dimension Stones(Limestone/Building Stone) •Wood(Plantations)
Nyamasheke	<ul style="list-style-type: none"> •Clay •Sand (730,000m3 Glass Sand) •Dimension Stone (Building Stone/Kariba Rock, Granite) •Wood(Commercial logging)
Rusizi	<ul style="list-style-type: none"> •Clay •Dimension Stones(Limestone, Logging)



EASTERN PROVINCE
 DISTRICTS: Nyagatare, Gatsibo, Kayonza, Rwamagana, Bugesera, Ngoma, Kirehe

TOP CONSTRUCTION RAW MATERIALS

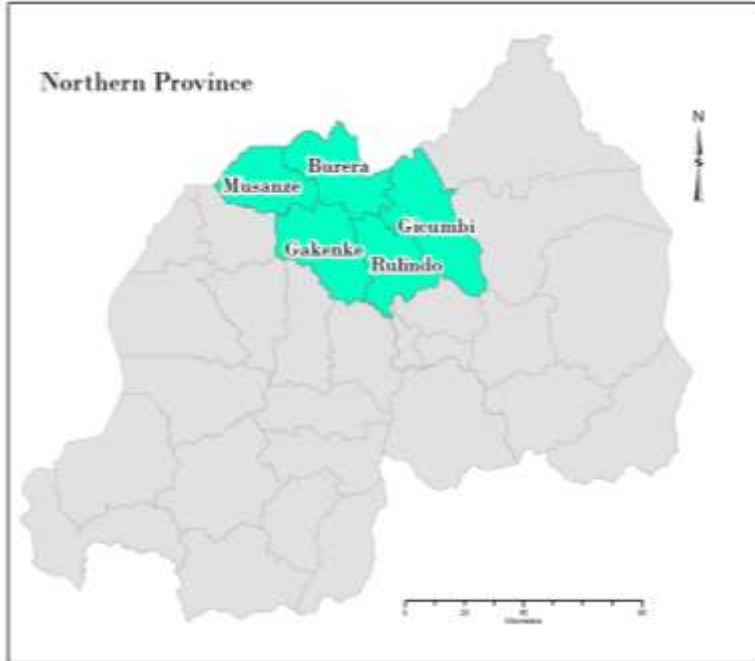
Nyagatare	<ul style="list-style-type: none"> •Clay(•Dimension Stones(granite,Building Stones) •Wood(Plantations)
Gatsibo	<ul style="list-style-type: none"> •Clay •Sand •Dimension stones(Granite, Building Stones) •Wood(Plantations)
Kayonza	<ul style="list-style-type: none"> •Clay •Wood(Plantations)
Rwamagana	<ul style="list-style-type: none"> •Clay(30,000m3) •Dimension Stones(Building stone) •Wood(Plantations)
Ngoma	<ul style="list-style-type: none"> •Clay •Wood(Plantations)
Kirehe	<ul style="list-style-type: none"> •Clay •Dimension Stones(Black Sand stones) •Wood(Plantations)
Bugesera	<ul style="list-style-type: none"> •Clay •Dimension Stones(Building Stones) •Wood(Plantations)



KIGALI CITY
 DISTRICTS: Gasabo,
 Nyarugenge, Kicukiro

TOP CONSTRUCTION RAW
 MATERIALS

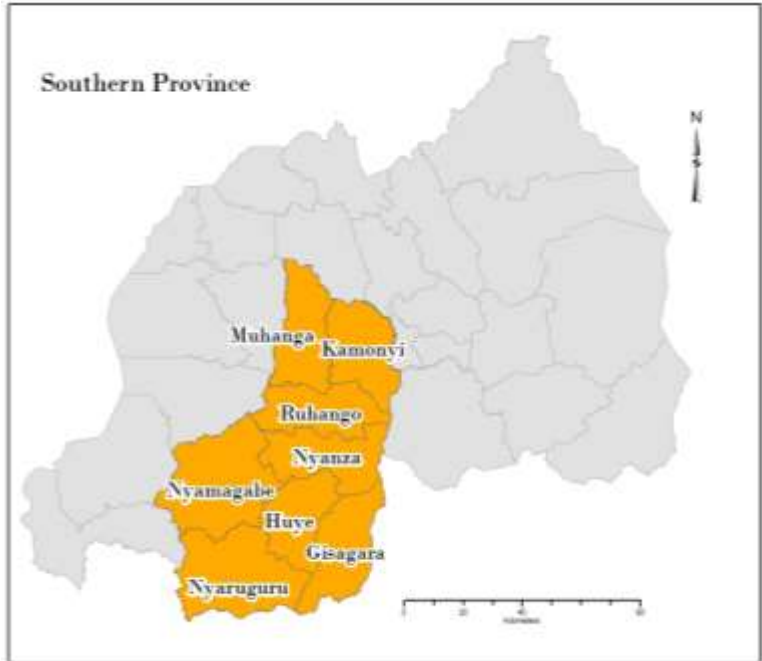
Nyarugenge	<ul style="list-style-type: none"> •Clay(700,000m •Dimension Stones(Limestone)
Gasabo	<ul style="list-style-type: none"> •Clay (400,000m³) •Dimension stones(Granite)
Kicukiro	<ul style="list-style-type: none"> •Dimension Stones (Building Stone)



NORTHERN PROVINCE
DISTRICTS: Musanze, Burera, Gakenke, Rulindo, Gichumbi

TOP CONSTRUCTION RAW MATERIALS

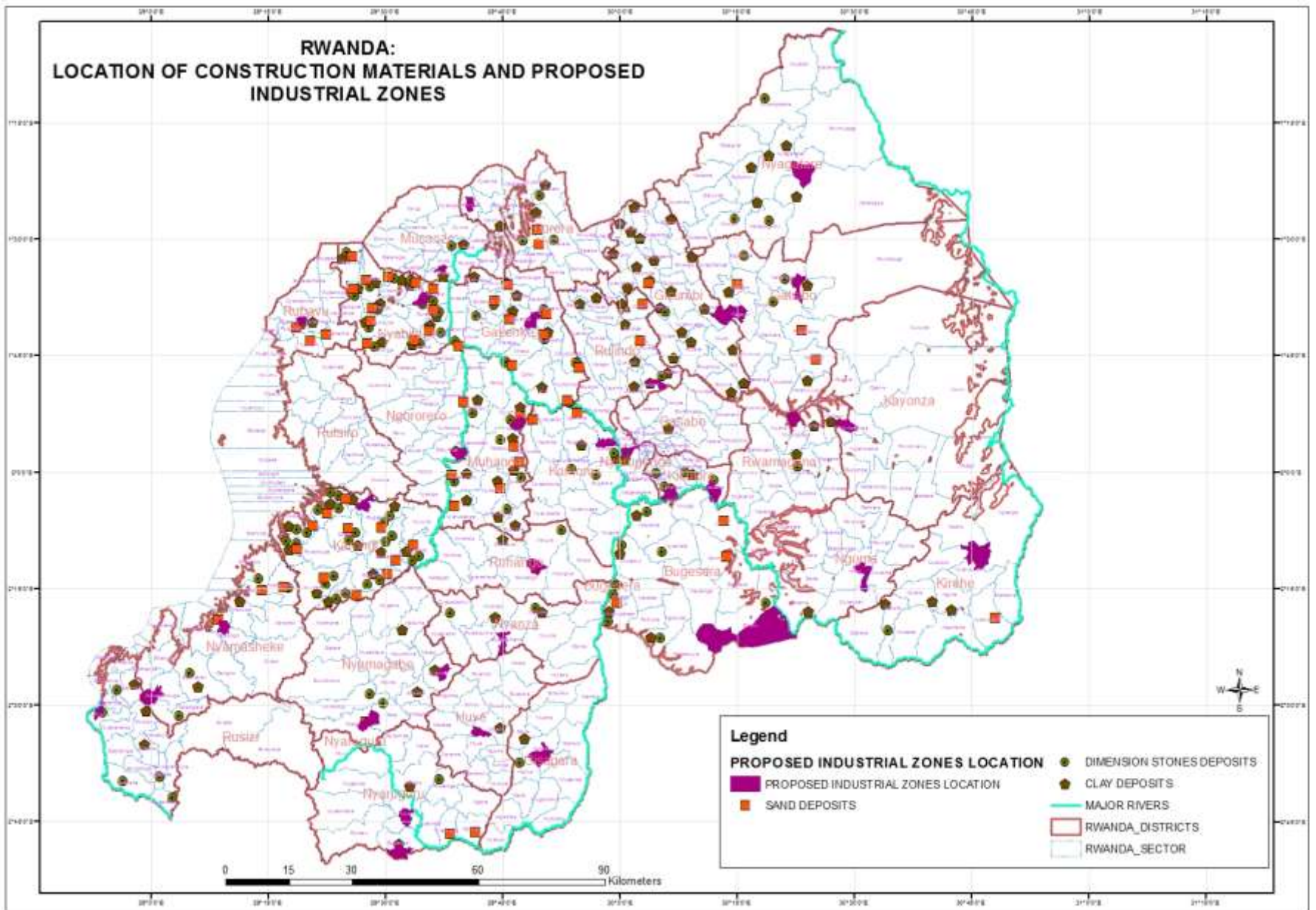
Musanze	<ul style="list-style-type: none"> •Clay(500,000m3, PEAT Clay) •Sand •Dimension Stones(Travertins) •Wood(Plantations)
Rulindo	<ul style="list-style-type: none"> •Clay (576,000m3 PEAT Clay) •Sand •Dimension stones(Granite) •Wood(Plantations)
Gakenke	<ul style="list-style-type: none"> •Clay •Sand(1,000,000m3 Glass Sand) •Dimension Stones (Building Stone) •Wood(Plantations)
Gichumbi	<ul style="list-style-type: none"> •Clay •Sand •Dimension Stones(Building stone/Ugarika Rock) •Wood(Plantations)
Burera	<ul style="list-style-type: none"> •Clay •Sand •Dimension Stones(Kariba Rock) •Wood(Plantations)



SOUTHERN PROVINCE
 DISTRICTS: Muhanga, Kamonyi, Ruhango, Nyanza, Nyamagabe, Huye, Gisagara, Nyaruguru

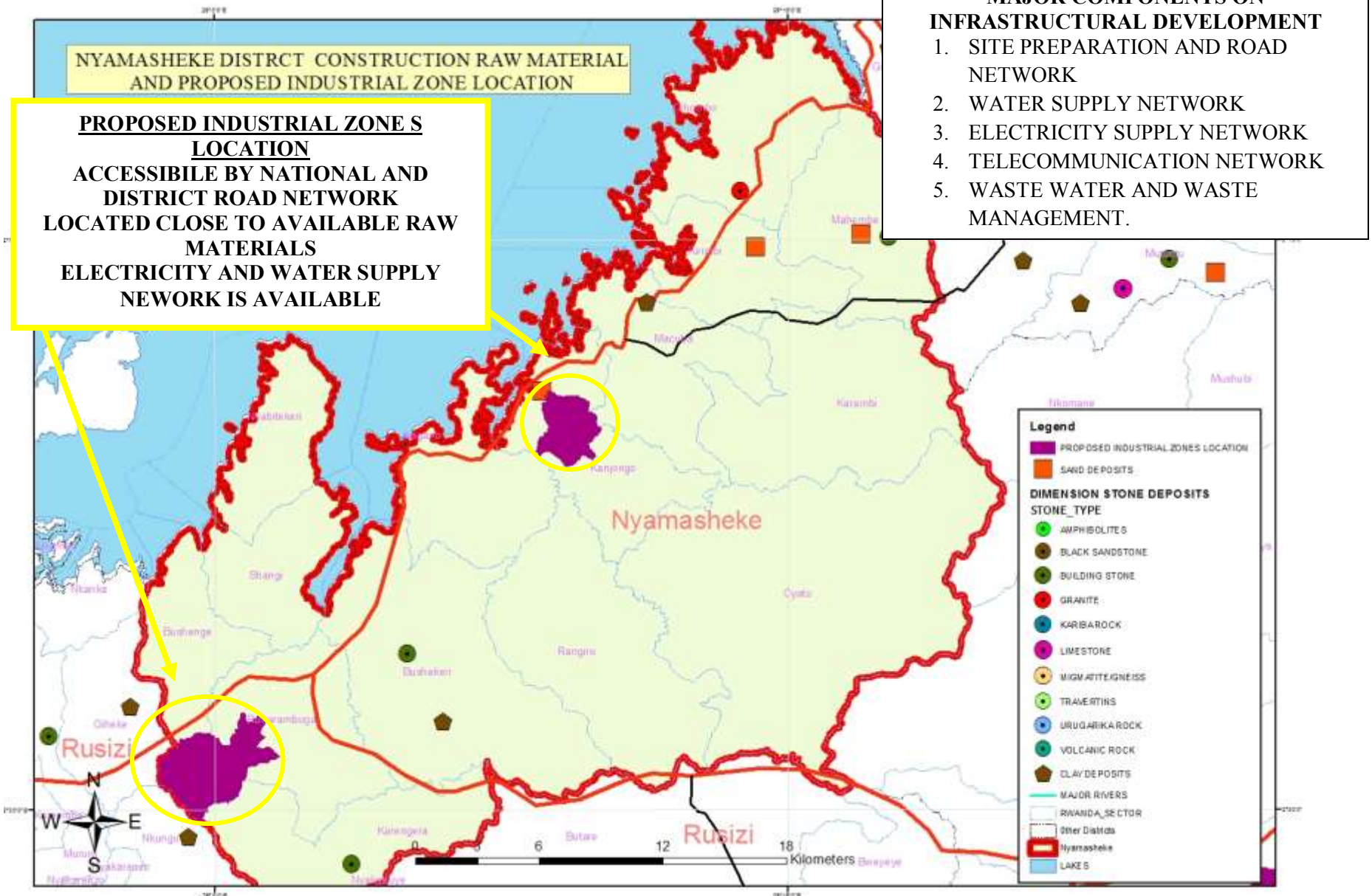
TOP CONSTRUCTION RAW MATERIALS

Muhanga	<ul style="list-style-type: none"> •Clay(310,000m) •Sand •Dimension Stones(Building Stones) •Wood(Plantations)
Kamonyi	<ul style="list-style-type: none"> •Clay (576,000m³ PEAT Clay) •Dimension stones(Building Stone) •Wood(Plantations)
Ruhango	<ul style="list-style-type: none"> •Clay •Dimension Stones (Building Stone) •Wood(Plantations)
Nyanza	<ul style="list-style-type: none"> •Clay(80,000m³) •Dimension Stones(Building stone/Granite) •Wood(Plantations)
Nyamagabe	<ul style="list-style-type: none"> •Clay •Sand •Dimension Stones(Kariba Rock) •Wood(PCommercial Logging)
Huye	<ul style="list-style-type: none"> •Clay(600,000m³) •Wood(Plantations)
Gisagara	<ul style="list-style-type: none"> •Clay (1000,000m³) •Dimension Stones(Building Stones) •Wood(Plantations)
Nyaruguru	<ul style="list-style-type: none"> •ClaySand •Dimension Stones(Migmatite/gneiss) •Wood(Plantations)



5.9 Infrastructure Development Plan

Example: NYAMASHEKE DISTRICT (PROPOSED INDUSTRIAL INFRASTRUCTURE PLANNING REQUIREMENTS FOR PROPOSED INDUSTRIAL ZONES)



SITE SPECIFIC INFRASTRUCTURAL REQUIREMENTS

SITE PREPARATION

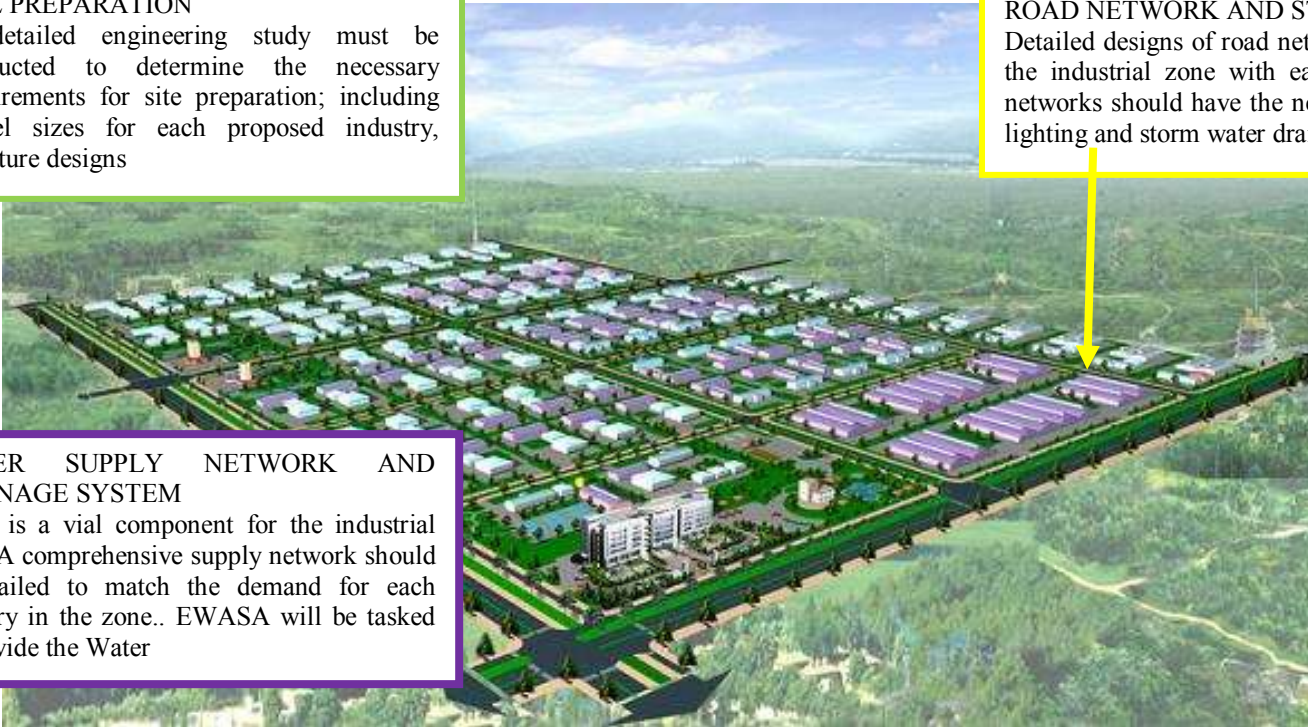
A detailed engineering study must be conducted to determine the necessary requirements for site preparation; including parcel sizes for each proposed industry, structure designs

ROAD NETWORK AND STREET LIGHTING

Detailed designs of road networks to create transit spines within the industrial zone with ease should be developed. The road networks should have the necessary infrastructure such as street lighting and storm water drains.

WATER SUPPLY NETWORK AND DRAINAGE SYSTEM

Water is a vital component for the industrial zone. A comprehensive supply network should be available to match the demand for each industry in the zone.. EWASA will be tasked to provide the Water



1. ELECTRICITY NETWORK

Electricity is the vital component in the production process. Having a steady and reliable supply of electricity is important especially from EWASA. The industrial zones should have a well-laid electricity network for main supply grid. An independent source of electricity should also be in place in case the main supply is not reliable or inadequate.

2. WASTE WATER AND MANAGEMENT

The industrial zone is expected to emit certain levels of waste and products. It's important to have in place mechanisms for treatment as well as management of this waste in cases where the authorities have not put in place such systems. Each industrial zone should have its own on sight treatment plant.

3. TELECOMMUNICATION NETWORK

A comprehensive modern phone, internet and cellular communication network must be designed and installed in the zone.

NB:

The above model is applicable to all sites for proposed industrial zones. However, proposed industrial zones have different characteristics that make them unique therefore need to be treated differently.

The conceptual ideal zone is subject to further analysis to enable the assertion of the applicability in infrastructure development. These studies include:

- Comprehensive baseline survey to determine the most ideal location of the zone
- Detailed topographical survey to determine slope analysis among others.
- Detailed environmental studies to determine environmental conformity of the industrial zone to existing land uses and land cover
- Detailed socio economic survey to determine the socio economic impact of the zone to the local community and the whole district in general.

5.10 Resource Mobilization Strategy

Funding Mechanisms

Financing of the proposed projects will be sourced from different agencies as outlined in the table below:

Table 11: Financing Mechanisms

Mechanism:	Activities:	Source/ Actors:
National Funding	<ul style="list-style-type: none">• Industrial zoning• Providing infrastructure such as road, water, energy• Branding	<ul style="list-style-type: none">○ Rwanda National Treasury
<ul style="list-style-type: none">• PPP (Public Private Partnership)• Build Operate Transfer (BOT/BOOT)• Build Lease Transfer (BLT)• Design Build Finance Operate (DBFO)• Design Build Operate Transfer (DBOT)• Design Construct Manage Finance (DCMF)	<ul style="list-style-type: none">• Setting up of factories/industries• ICT installation• Enhancing entrepreneurship among locals• Training of locals on related industrial production• SME support such as setting up of SME villages• Spearheading green economy in construction industry	<ul style="list-style-type: none">○ Rwandan Government (RBS, RDB, MINIRENA)○ World Bank○ African Development Bank○ United Nation (UNIDO, UNEP)
Donor funding	<ul style="list-style-type: none">• Investment promotions• Value chain development of construction material products• Training of locals on related industrial production	<ul style="list-style-type: none">○ NGO's○ International Monetary Fund

	<ul style="list-style-type: none"> • Spearheading green economy in construction industry 	
Loans	<ul style="list-style-type: none"> • Developing industrial zones • Constructing infrastructure • ICT integration 	<ul style="list-style-type: none"> ○ World Bank ○ African Development Bank
Subsidies	Such as tax subsidy, production subsidy	○ Rwanda National Government
Inter-company partnerships	Investment promotion	○ Construction-related companies

Figure 28: Inter-Company Partnerships In Investment Promotion

Within an overarching strategy for improving the investment environment, investment promotion and facilitation can help to increase both domestic and foreign investment and to enhance their contribution to national economic development.

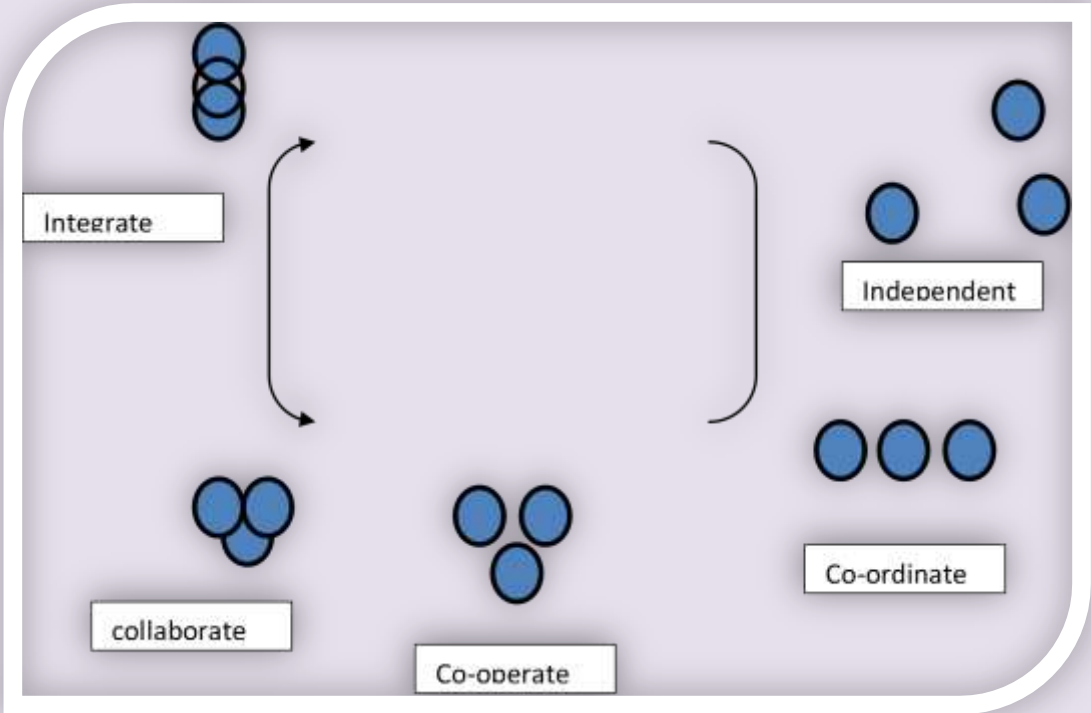
Why Partner?

Organizations may partner to:

- + Increase services
- + Reduce duplication
- + Overhead or leverage shared resources

Strategies may range from information sharing to joint ventures or mergers.

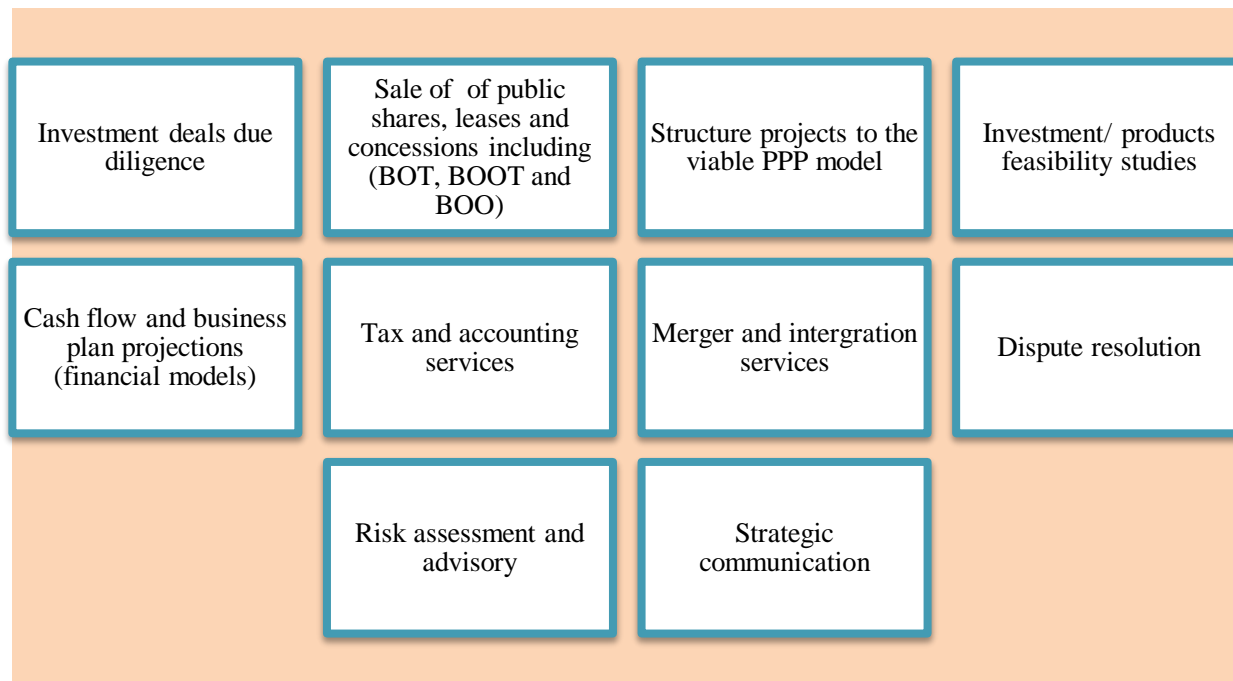
A Working Together Continuum



Transaction Advisory Service

It involves advising current and future businesses prospects of a client, with the aim of advancing their business or company. It involves examining the legal, tax, finance, and market and risks factors involved to start up a business or making new changes to the business.

Figure 29: Business Advisory Services Applicable to the Rwanda Construction Materials Industry



These services can be categorized as follows:

- a) **Buyer Services-** Involves comprehensive due diligence, including quality of earnings, synergy analysis and evaluation of projections. They assess key value drivers and risk factors and counsel clients on the most advantageous tax and accounting structures and oversee the contract and valuation processes.
- b) **Seller Services-** These are meant to enable sellers to manage the sales process, increase the probability of a successful sale and realize maximum value at the time of the transaction. By: Providing vendor due diligence to reduce risk and make the sale process more efficient, Evaluating businesses or entities for sale, including quality of earnings, balance sheet and working capital requirements, Negotiating with buyers on the client's behalf and Managing the due diligence process
- c) **Lender Services-** They are meant to advise clients on all aspects of the lending decision-making process, for both domestic and foreign-based opportunities. The services provided include:
 - Reviewing and sensitizing cash flow and business plan projections
 - Performing due diligence, analyzing collateral and monitoring portfolios
 - Assisting in credit-crisis situations and suggesting troubled-credit restructuring alternatives
 - Supporting securitizations and providing backup management services
- d) **Valuation-** They should allow for opening balance sheet valuations, perform impairment analyses and assist with enterprise valuation. They also help private equity general partners with

valuation of their holdings, including capital adequacy used to facilitate dividend recapitalizations, solvency and fairness opinions.

- e) **Purchase Price Dispute Services-** They should assess whether generally accepted accounting principles have been consistently applied and determine the accuracy of financial statements
- f) **Merger Integration Services-** They are meant to realize the full value of mergers by assessing the feasibility of integration project plans, benchmarks and timetables. These services keep the integration on schedule and evaluating the functions of both entities to determine best practices.
- g) **Tax Services-** The tax service develops strategic solutions to clients' tax issues arising from acquisitions, sales and restructurings and advises on all matters of compliance. This helps clients realize the maximum tax advantages from their transactions.

Policy Recommendations to Achieve Transaction Advisory Services

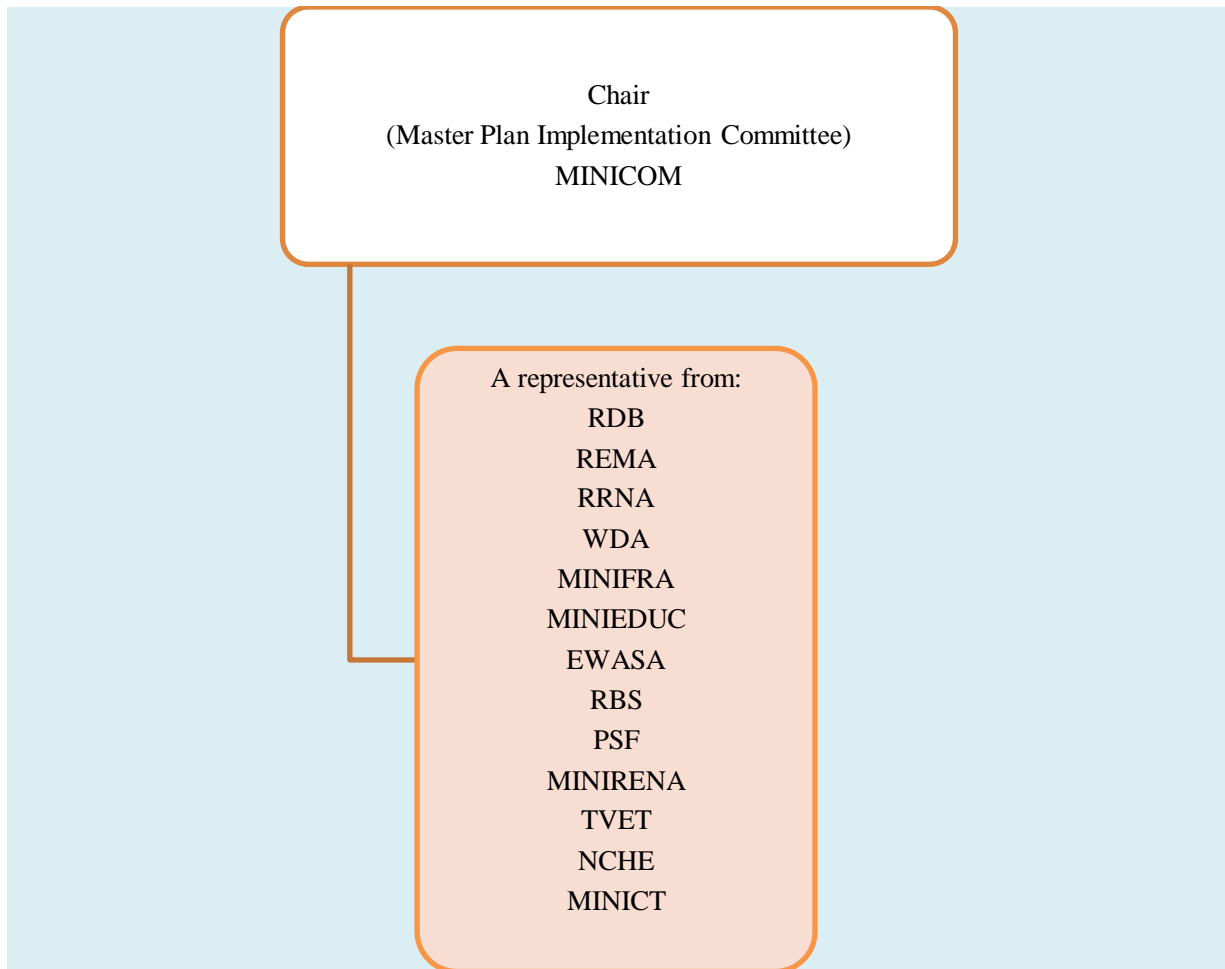
Policy Recommendation:	Policy Action Areas:	Actors:	Expected Outcome:
Expanding RDB Investment and Promotions Department to include transaction advisory services	Include the following function: 1. Construction materials industry's product feasibility studies to better help showcase Rwanda as an investment destination.	RDB MINICOM	1. Readily available information of the products investors can profitably invest in the construction materials industry in Rwanda.
Creation of an enabling environment for the private sector to engage in private sector lead business advisory services		MINICOM RDB	1. Increased number of private sector players in Transaction advisory 2. Increased private sector participation in construction materials industry 3. Increases the speed, value for money and transparency in transactions

5.11 Institutional Framework For Implementation Of The Master Plan

The strategies suggested herein require a complex system of interrelation between the various institutions. In order to achieve this master plan, the consultant suggests that the lead institution (MINICOM) comes up with an implementation committee constituting a representative from each of the mentioned Actors. The tasks of the representatives are dual faced:

- To ensure the proposals are implemented by the responsible agency.
- Avoid duplication of roles by the institutions and those suggested herein.

The composition of the proposed committee is as proposed in the following diagram:



CHAPTER 6: PRODUCT NICHE

6.1 Existing Products and Gaps Identification

The chapter focuses on the construction material niches that Rwanda can focus on to achieve the greatest benefits and satisfy local demand. Rwanda has abundant resources that are sufficient for the establishment of a viable ceramics and engineered lumber industry. The current emphasis is based on traditional technologies, which are not efficient to satisfy local demand and offset material imports. For the purpose of value addition and therefore substitute for some imports, this chapter aims at creation of ceramic and engineered lumber production units.

6.1.1 Existing Products

Within Rwanda today, the existing products profile is as described below:

Table 12: Current Construction Product Profile

Product:	Clay Based Products:	Stone-Based Products:	Cement Products:	Wood Products:	Sand Products:
	<u>Structural Products</u> <ul style="list-style-type: none"> • Wall Bricks • Roofing Tiles • Paving Bricks • Masonary and foundation blocks • Ventilators <u>Fine Ceramics/ White-ware</u> <ul style="list-style-type: none"> • Wall tiles • Floor tiles • Sanitary wares • Tableware 	<ul style="list-style-type: none"> • Building Blocks • Cobblestones • Washed gravel • Crushed aggregates 	<ul style="list-style-type: none"> • Cement • Construction Bricks 	<ul style="list-style-type: none"> • Lumber mill (rough cut and kiln dried) • Manufactured wood (plywood, particle boards and OSB) • Wood doors and windows 	<ul style="list-style-type: none"> • Concrete poles • Glass • Pavers • Building Blocks • Washed gravel • Asphalt • Crushed aggregates
Companies:	AMEGERWA, BEMS S.A.R.L, etc.	EAST AFRICA GRANITE, INTERNATIONAL MARBLE, STATION DE CONCASSEGE etc.	KIGALI CEMENT, CIMERWA and GREAT LAKES CEMENT FACTORY	NEW FORESTS COMPANY, Small Lumber mills etc.	-

Source: Fieldwork 2014

6.1.2 Alternative Products/Gaps

a). Clay Products:



The product gaps identified in the clay sector include:

1. **Electrical and special ceramics:** Electro-porcelain used for electrical insulators and modern ceramic materials.
2. **Refractories:** Steel and glass plants refractories.
3. **Structural products:** Clay pipes

Clay pipes are sustainable products and last longer than other materials; they have a negative carbon footprint as compared to PVC. The pipes are used in drainage solutions.

b). Wood Products:

There is a market opportunity for modified timber in Rwanda since much of the timber is raw. The number of manufacturers of modified wood is negligible.

c). Engineered Lumber:



Shiplap House.

There is a market opportunity for modified timber in Rwanda since much of the timber is raw. The number of manufacturers of modified wood is negligible.

- Plywood,
- Oriented strand board (OSB)
- Laminated veneer lumber: - Laminated Veneer Lumber is a high-strength engineered wood product made from veneers bonded together under heat and pressure. It is used for permanent structural applications including beams and rafters.
- I-joists and wood I-beams
- Shiplaps: Where wood is pre shaped with joints and you are only required to slide the woods together to form a house (examples of shiplap houses are pre-fabricated houses).

6.2 Proposed Product Niches

6.2.1 ENGINEERED WOOD

Why Engineered Wood?



Engineered wood has been selected as a possible product niche for the following reasons:

A). Abundance Of The Resource- Timber as a natural resource is abundant in Rwanda as illustrated in the table below:

Table 13: Forest Coverage in Rwanda

	1990	2000	2010
Forest area (sq. km) in Rwanda	3180.0	3440.0	4350.0
Forest area (% of land area) in Rwanda	12.9	13.9	17.6

Source: World Bank 2011

NB: Forest area is land under natural or planted stands of trees of at least 5 meters in situ, whether productive or not, and excludes tree stands in agricultural production systems (for example, in fruit plantations and agroforestry systems) and trees in urban parks and gardens.



While these vast forest reserves exist, there is a limit on how much of this resource can be harvested annually (Annual Allowable Cut) depending on annual average increment of forest cover and government restrictions. In Rwanda therefore, the Annual Allowable Cut has been estimated as follows:

Table 14: Annual Allowable Cut (2010)

Forest Plantation/ Management Unit	Area (Ha, Rounded)	Average Increment (m ³ /ha/yr)	Annual Allowable Cut (m ³)	Available Annual Allowable Cut (m ³)
Eucalyptus plantations	63 600	6.2	394 000	236 400
Young plantations and coppice (mainly <i>Eucalyptus spp.</i> and <i>Acacia spp.</i>)	62 700	10.3	645 800	387 600
Pine plantation (<i>Pinus spp.</i> , <i>Cupressus spp.</i> and <i>Callitris spp.</i>)	12 100	8.6	104 100	62 300
Woodlots and tree resources outside forests (<i>Eucalyptus spp.</i> , <i>Grevillea spp.</i> , <i>Pinus spp.</i> , <i>Cupressus spp.</i> ; <i>Callitris spp.</i> , <i>Acacia spp.</i> , <i>Alnus spp.</i> , <i>Casuarina spp.</i>)	162 800	10.8	1 758 200	1 319 000
Grand Total	301 200	-	2 902 000	2 005 000

Source: African Forest Forum Working Paper Series, 2011

B). Growing Demand for Wood Products- The demand for wood products has been on the rise in Rwanda as illustrated below:

Table 15: Wood Demand (2010)

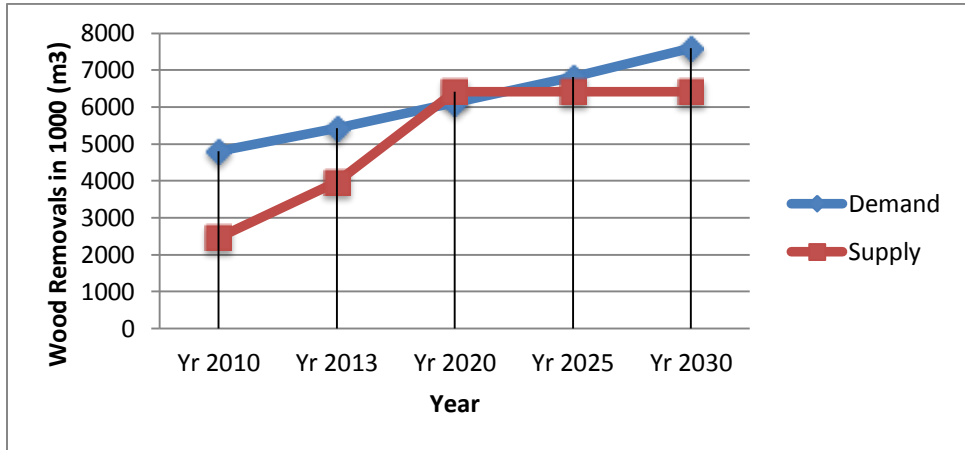
Forest Product:	2010:	2013:	2020:	2025:	2030:
Wood-fuel (firewood and charcoal) (1000 m ³)	4 071	4 583	5 160	5 753	6 414
Industrial round wood (1000 m ³)	434	513	578	644	719
Sawn wood (1000 m ³)	120	135	152	170	189
Domestic poles (construction material) (1000 m ³)	178	200	226	252	281
Total	4 802	5 432	6 116	6819	7 603

Source: Various Reports On Wood Consumption, Survey 2011 And FAO (2010)

The type of wood product with the highest demand is industrial round wood/-engineered lumber.

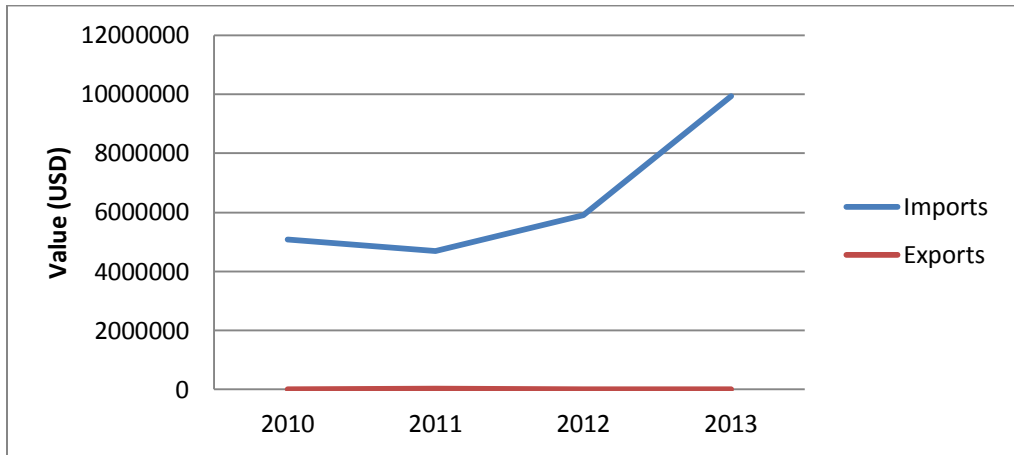
C. Supply Deficit for Wood Products- As previously illustrated, demand for engineered wood is on the rise. In Rwanda today, the highest suppliers of construction wood are woodlots as opposed to forest plantations. There however exists a mismatch between demand and supply as illustrated in the chart below:

Chart 24: Demand Versus Supply of Engineered Wood



D. High Trade Deficit of Engineered Wood- Imports have been on an upward trend to satisfy the local demand over the years, while exports have been stagnant as illustrated below:

Chart 25: Imports Versus Exports of Engineered Wood



Skills and Technology Needed:

The international wood industry has become more complex due to globalization, production assortment and the development of technologies. Environmental protection also plays a major role to the development of this sector (processed materials, nature preservation, etc.).

In many companies, the production process consists of the assembly and gluing of particleboard, which is coated with a decorative covering such as a veneer. The level of skills involved is not as sophisticated as in craftwork. Nevertheless, the skills are important particularly in respect of the operation and maintenance of computer numerically controlled machines, finishing techniques and in the case of soft furniture, the sewing, cutting and pattern making. The increasing complexity of the industry means that it requires a cadre of university-qualified professionals to provide many of the technical, supervisory and management functions. Design and marketing have become the twin pillars on which any successful development strategy for this industry must be based.

Figure 30: Pyramid of Skill Needs in Wood Sector



Growth Scenario For Timber

Table 16: Estimated Size of the Industry

Narrative	Clarification	Quantity
Total forest cover in Rwanda in 2010 (Ha)	4350sq km	435000
Add artificial wood lots (plantations with 0.5 ha or more)(Ha)		301200
Total available wood Cover (Ha)		736200
Total allowable cut annually (Africa Forest Forum)	40% with consistent reforestation	
Available wood for exploitation (Ha)		294480
Available wood in acres	1 ha= 2.47Acres	727365.6
Capacity annually (1 acre = 30,000 bd ft in 20 years) (American Standards)	1 acre = 150 bd ft annually	
Capacity of Rwandese forests annually (bd ft)		109,104,840
Average size of plywood (bd ft)	One 8/4 board 7 inch wide 10 feet long = 11.67bd ft	
Quantity of plywood available (Number)		9,349,172.237
Cost of 1 plywood (world bank agricultural statistics)	5.35 USD per plywood	
Potential income from Rwandese engineered wood (USD)	Capacity of Rwandan Market	50,018,071.47
Size of domestic demand (USD)	Equivalent to import	9,940,837
Available for export (USD)		40,077,234.47

Key Assumptions:

1. It is estimated that within the time span of twenty to fifty years, the average acre of timber contains roughly 3,000 bd ft, and has a stumpage value (landowner's share) of approximately \$600.00.
2. It is assumed that there will be continuous reforestation
3. Industries will produce engineering wood at least at 95% productivity.
4. Recommendations for a conducive environment will be efficiently implemented.
5. Labor is available and sourced locally

Expected Outcomes:

- Save foreign exchange, in excess of USD 10 billion annually
- Finished products can be exported
- Gain employment and skills on the workers
- Self-dependence
- National economic growth

6.2.2 CLAY CERAMICS

Why Clay Ceramics?

Clay Ceramics can be a niche in Rwanda because of the following reasons:

a). Abundance of the Resource- Clay is readily available in Rwanda. These include clay that results from alteration of (a) granite rocks (b) volcanic rocks and (c) argillaceous rocks. Where the clay deposits exist, they are of good quality, but generally contain limonite. Some studies on quality and quantity of clay deposits were done through Swiss Cooperation with Rwanda Geological Survey. A summary of the quantity of some key clay deposits and their locations are presented below:

Table 17: Clay Deposits

Province	District	Sector	Deposits	Reserves
South	Huye	Mbazi	Gihindamuyaga	600.000 m ³
	Gisagara	Save	Rwasave	1.000.000 m ³
	Gisagara	Save	Kigoma	80.000 m ³
	Muhanga	Shyogwe	Rugeramigozi	310.000 m ³
	Muhanga	Shyogwe	Ruli	310.000 m ³
East	Ngoma	Rurenge	Kanyirangoli	Low
	Rukira	Murama	Kibaya	Low
	Rwamagana	Mwulire	Kariko	30.000 m ³
Kigali-Town	Nyarugenge	Kigali	Ruliba	700.000 m ³
	Gasabo	Kinyinya	Kinyinya	400.000 m ³
	Gasabo	Kacyiru	Gacuriro	10.000 m ³
North	Rulindo	Rukoza	Rukoza	540.000 m ³
	Rulindo	Buyoga	Muyanza	36.000 m ³
	Musanze	Nkotsi	Ndali	500.000 m ³
	Gakenke	Rwaza	Mukinga	Low
West	Karongi		Munzanga	Low
	Karongi		Rukoko	Low

Source: EGAR, 1988

Clays rich in **kaolin** can be used for refractory products or thin ceramics (dishes, sanitary ware, tiles etc.). Kaolin is perfect for Sanitary Ceramics. Rwanda is rich in kaolin deposits as presented below:

Table 18: Kaolin Clay Deposits

Deposit	Region	Kaolin (%)	Reserves
Bahimba	Gatumba	90%	600.000 t
Mbuye	Kibungo	92%	50.000 t
Ntungwa	Rwamagana	85%	30.000 m ³
Nsinda	Rwamagana	85%	100.000 m ³
Mulindi	Byumba	-	-
Muyanza	Rutongo	-	-
Ruyenzi	Gitarama	85%	-
Busoro	Gatumba	-	-
Ruhanga	Gatumba	88%	2.000 m ³

Nyamase	Gatumba		5.000 m ³
Nyamisa	Gatumba		60.000 m ³
Gitaba	Gatumba		50.000 m ³
Nyungwe	Nyungwe		
Mpatsi	Kibuye		2.000.000 t

Source: (BRGM, 1987; Sebisogo and Sluiter, 1978)

Sebisogo and Sluiter (1978) estimated that the kaolin deposit at Nyamisa is the most recommended for exploitation. Nsinda and Ntungwa were considered as attractive kaolin deposits.

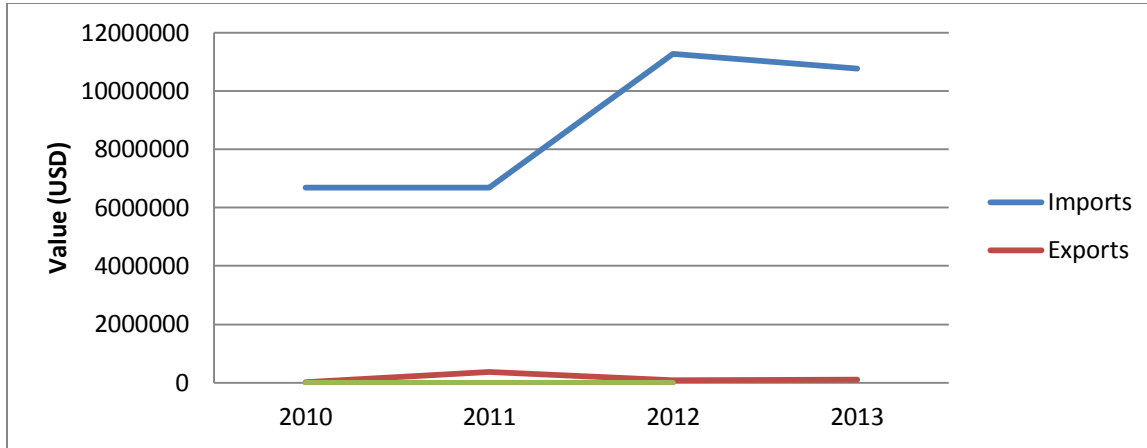


b). High Demand for Clay Products- Rwanda's construction sector has grown steadily over the years despite the high cost of raw materials. GoR envisions that by 2020 approximately 30% of the population will live in urban areas. To date, only about 5% of residents in Kigali own modern-style houses. In Kigali alone, there is fast growing population (3% 5 year average) combined with urban growth currently at more than 4% per annum. The demand for housing is 8,000 - 10,000 units per annum. The combined demand for housing countrywide is estimated to be >25,000 units per annum. With clay construction already representing a large part of housing construction, its demand can only rise.

c). Low Supply of Clay Products- Supply of clay construction products is restricted to few industries despite the high demand. Local production is estimated to be around **50,000 T** annually for clay bricks and tiles (Rwanda Mining Policy, 2009), which is barely enough to meet demand.

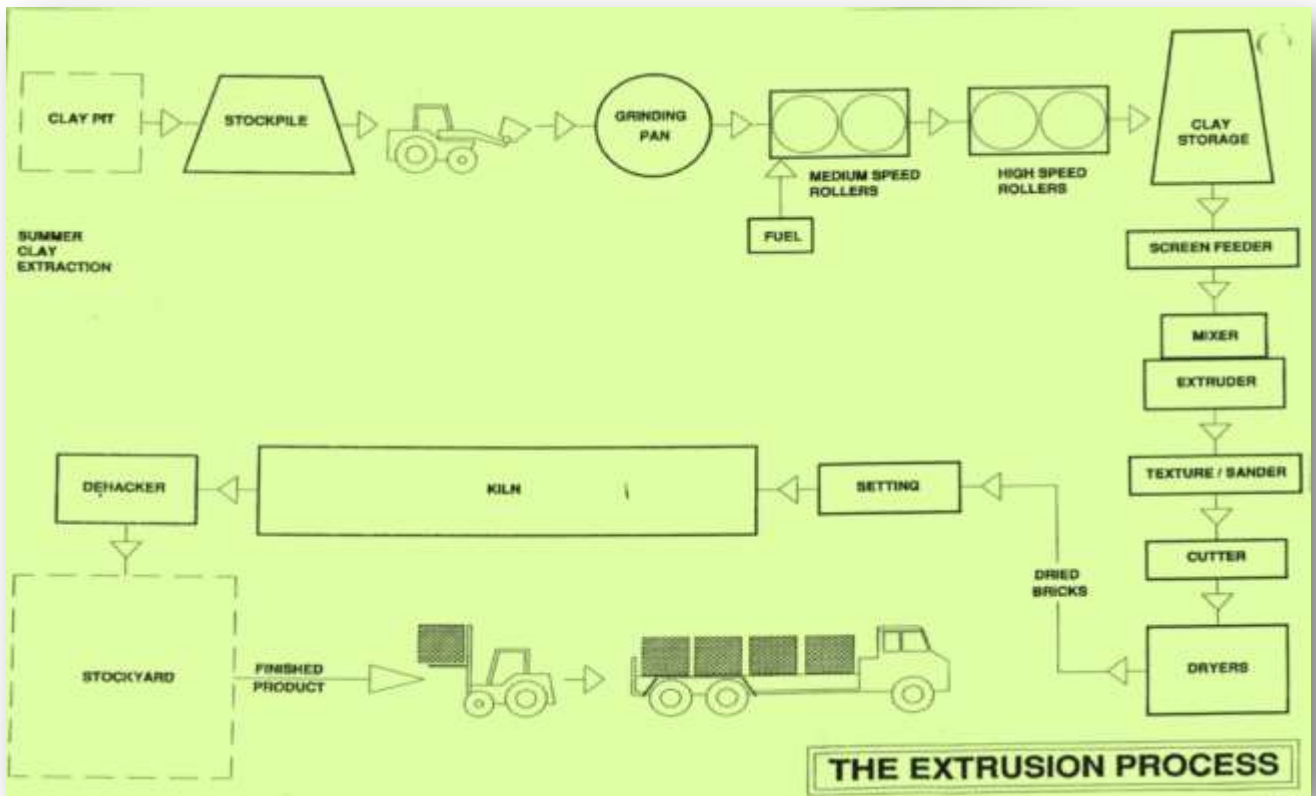
d). High Trade Deficit of Clay Ceramics- Imports have been on an upward trend to satisfy the local demand over the years, while exports are negligible as illustrated below:

Chart 26: Imports Versus Exports of Clay Ceramics



Process, Skills and Technology Needed:

Figure 31: The Ceramics Manufacturing Process



There are several kilns used in the firing process, the most commonly used are:

Technology:	Features:	Approx. Capital Cost* (US \$):	Production Capacity (Million bricks/year):	Typical simple payback period under normal conditions:
FCBTK	Chimney height 27 to 30 m; kiln circuit capacity 0.5 to 1 million bricks.	40,000 - 60,000	4-8	< 2 years
Zig-Zag	Natural draft kiln with a chimney height of 30 m.	40,000 - 60,000	4-6	< 2 years
	Kiln of 24-36 chambers; induced draft fan operated by a 15-20 hp motor; valve system in the flue ducts	60,000 - 80,000	4-6	< 2 years
VSBK	• Two-shaft Indian VSBK with a conveyor system for lifting the brick.	60,000	1.0 -1.5	2-3 years
	• Four-shaft Vietnamese VSBK: higher height; electrical lift; extruder for making internal fuel bricks; drying shade; hydraulic jack and fork-lift truck for unloading bricks	400,000	3.5-4.5	3-4 years
Tunnel	Vietnamese tunnel kiln plant; daily production capacity: 40,000 to 50,000 bricks per day; tunnel kiln, tunnel dryer, drying shed, extruder for firing bricks	1-2 million	15-20	> 3 years

Note: * excluding the cost of land; simple payback assuming 100% capacity utilization.

Zig-zag kilns appear to be the logical, because of low capital investment and environmental friendliness. The zig-zag kiln performance strongly depends on the kiln operation practices; These aspects need further study before finalizing recommendations and formulating a large-scale dissemination programme for zig-zag kilns.

At least 2.5 ha of land is required to set up a brick-making factory. With peat energy in abundant supply in Rwanda, Fuel to power the kilns should not be a problem

Growth Scenario for Ceramics:

The optimal rate for exploiting non-renewable resources is, in theory, determined by the required rate of return (Hotelling 1931).

Table 19: Growth Scenario for Clay Ceramics

Item	Description	Cost
Total available clay deposits	MT	6000000
Total available kaolin deposits	MT	3000000
Total deposits		9,000,000

Total reserves available for consumption annually (MT)	Assuming they were to exhaust reserves in 100 years	90,000
Reserves in tons	1MT=1.1023 tons	99,206.35
Total annual domestic demand	Tons/year	45,000
Current production	Tons/year	20,000
Deficient in production (for domestic demand)		25,000
Reserves available for export production	MT	54,206.35
Average weight of a tile	15 piece tile box is between 25-30kg	2
Number of tiles in a year		27,103,175
Cost per tile (Ruliba clay price+ inflation)	1square metre/4 tiles = 36,000 rwf	13
Income from tiles exports		352,341,275

Key Assumptions:

- Taking that Rwanda would like to exhaust the existing reserves in the next 100 years, it will have 90,000 MT to use annually.
- An 8" square tile should be at least one half inch thick.
- One piece of 12"x12" ceramic tile usually will weight 3.5 – 4 pounds or 1.6 – 1.8 kilograms.

6.3 Additional Product Specific Strategies

6.3.1 IRON ORE



Iron is an important material in construction industry today. Construction materials from iron includes:

1. Steel rods
2. Iron sheets

Steel, an alloy of iron and carbon, is widely used in construction and other applications because of its hardness and tensile strength.

Product Dynamics and Challenges

a) **Resource Availability-** A semblance of iron industry existed in Rwanda long time ago. This implies that iron deposits exist in the country.

Recent exploration works of iron ore deposits in Rwanda are summarized below:

1. Ngara : 65 % iron; Reserves : 500 000 tons
2. Kirwa – Cyasenge: 47 - 70 % iron: 11 000 000 tons.
3. Kabona, Mushongi and Nganzo: absence of a geological study

Other locations of iron deposits of Gihira and Butonda are mentioned in the “Plan Minéral du Rwanda”, a BRGM report (1987). The iron ore deposits of Rwanda can be said to be of good quality. The iron content of these deposits is almost the same as the iron ores, which are industrially workable. However, the known volumes are still small.

b) High Demand and Low Supply

Materials	Local production ('000's USD)	Market Size ('000's USD)	Imports
Metal Rolled sheets	35,775	69,269	33,494
Hollow Sections and profiles	8,751	21,184	12,433
Nails	1,510	1,513	3

c) High Imports and Low Exports

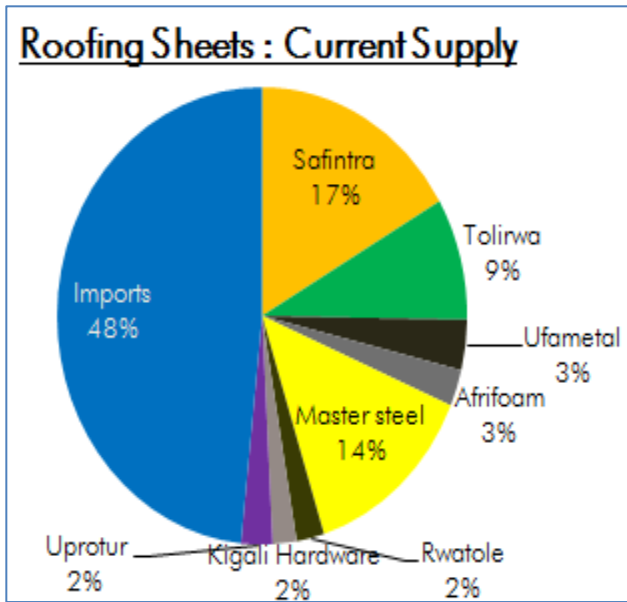
Imports of Metal products from 2010 to 2013 (USD)

Year	2010	2011	2012	2013
METAL	48,202,235	69,763,814	73,476,417	78,755,699

Exports of Metal products from 2010 to 2013 (USD)

Year	2010	2011	2012	2013
METAL	375,500	1,157,999	545,325	192,368

Nearly **50%** of all roofing sheets and tubes are imported from China, Uganda and other countries. There are currently **8 local manufacturers** supplying significant volumes and meeting quality standards



Export Potential

- Based upon imports currently sent to countries from Uganda and Kenya (EAC neighbors with higher transport costs)...
- Eastern D.R. Congo offers an incremental market for *hollow sections and profiles* of **40%**; Burundi offers an incremental market of **17%** of the current Rwandan market (import + domestic mfg.)
- Eastern D.R. Congo offers an incremental market for *roofing sheets* of **46%**; Burundi offers an incremental market of **29%** of the current Rwandan market (import + domestic mfg.)

d) Other Challenges

- The ferrous materials in Rwanda are widely distributed making production expensive
- The production of steel accounts for high CO2 emissions. This results to pressure from environmental protection agency
- Loss of landscape due to mining, processing and transporting the iron ore, coke and limestone.
- Energy costs are usually high

Product Specific Strategies

a) Research and development of technology

- Steel making requires skills and technology, which is a hindrance for expansion of this industry. Actions on this regard includes:
- Improvements in energy efficiency. Medium-term energy efficiency improvements are expected through technology transfer, or applying best-available technology to outdated steel plants
- Environmentally friendly Smelting Kilns to reduce greenhouse gas emissions

b) SME Support

- Actions includes:
 - Develop Recycling Small business to maximize steel output in the country
 - Stakeholder participation per district to select locations and products for natural construction materials villages to be set up (for cottage industries).
 - Development of the SME villages per district.

c) Green Options

The goal of this strategy is to have an industry is operating in sustainable and safe manner at all levels. Proposed Actions includes:

- Adoption of New Techniques and Technology of production at all levels.
- Improve on R and D.

- Adoption of Resource Efficiency and Cleaner Production Tools In Production And Construction Activities.
- Capacity building enhancement in the areas of energy efficiency, good water management practices, general management practices.
- Adopt basic safety techniques in the sector though the development of sector specific safety guidelines.
- Effective management of occupational health and safety at all levels of production.
- Have awareness, education and training, Enhance enforcement and legislation of the Current OHS regulations

Growth Scenario For Export Substitution In Metal

Table 20: Growth Scenario for export substitution in Metal

Item	Description	Cost (USD)
Total imports of metal rolling sheets	30,000 MT	33,494,000
Cost of importing one MT of rolling metal sheet	USD/MT	1082
Total exports of metal roofing sheets	261 MT	292,000
Cost of exporting 1MT of roofing sheet	USD/MT	1118
Total cost of importing hollow sections	10,302 MT	12,433,000
Cost of importing 1MT of hollow sections	USD/MT	1206
Total exports of hollow sections	7MT	10,000
Cost of exporting 1MT of hollow section	USD/MT	1428
Reserves in tons	1MT=1.1023 tons	10432731.56
Total reserves available for consumption annually (MT)	Assuming they were to exhaust reserves in 100 years	104,327
Total cost of domestic production	Annual reserves * cost per MT (assuming export value)	116,637,938.86
Possible Income from Iron Ore (USD)		116,637,939

6.3.2 BUILDING STONES



Construction materials from stones includes:

1. Construction stones (Dimension stones)
2. Decorative stones

Product Dynamics and Challenges

a) Resource Availability- The stones that exist in Rwanda which have been identified as very good dimension stones include: granites, amphibolites, migmatites, marbles and quartzophyllades

- **Quartzophyllades:** these are abundant in Rwanda and are largely used for construction, paving, etc
- **Amphibolites:** these are currently mainly used for road construction because of their mechanical resistance. A study made by MINIMART (1976) identified key deposits, as indicated in the table 1 below.

Amphibolite deposits and estimated reserves (BRGM, 1987)

Stone type	Deposit	Region	Reserves	Profile
Amphibolite	Runda	Runda	2000 m ³	Exploited
	Kinyambi	Runda	3000 m ³	Exploited
	Gitarama	West Gitarama	81000 m ³	-
	Gitinda	Gatsiko	200000 m ³	-
	Kigombe	Ruhengeri	Unconfirmed	-
	Mushubati	Gitarama	Unconfirmed	-
	Cyabingo	Ruhengeri	Unconfirmed	-
	Gitesi	Kibuye	Unconfirmed	-
	Rusumo	Kibungo	Unconfirmed	-

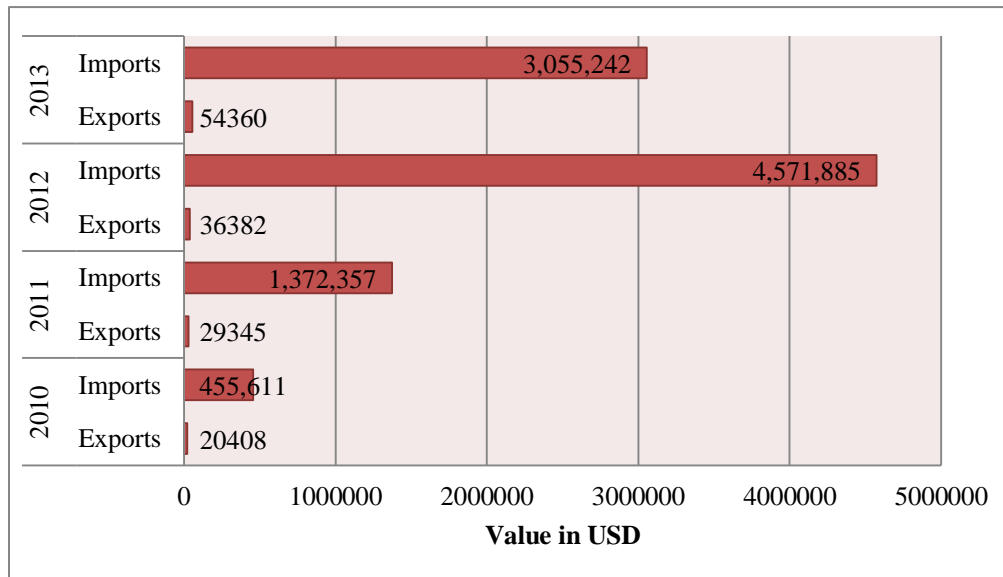
- **Marble:** Marble large outcrops have been identified on Mbabara Island, Kibuye and in Mururu, in areas bordering Rusizi River.
- **Granites:** Granite deposits are abundant. Those so far identified as good for dimension stores are Kigoma (Gitarama) and Ngarama (Mutara) granites.
- **Migmatites:** Migmatites identified to be good for dimension stones are found at Gishamvu (Butare).

b) High Demand and Low Supply

There are a total of just over 15,000km of paved roads in Rwanda, which represents about 20% of total roads in the country. There has been a steady increase in the allocation of resources to the transport sector both from internal and external sources of finance and consequently, demand for building materials will raise. Cost per km for gravelling is estimated at 22,000 dollars

c) High Imports Low Exports

Chart 27: Comparison of Imports and Exports of Stone Products from 2010 to 2013 (USD)



Product Specific Strategies

a) **SME Support-** Specific Actions includes:-

- Putting in place a strong enabling environment with affordable costs of production, protection from unnecessary and unfair competition etc.
- Using public funds to support early entry projects at the country level that will be of sufficient scale to help transform markets.
- Catalyzing private capital with innovative tools that will attract the private sector as an investor at scale
- They have proved useful in disseminating information, conducting training, monitoring implementation of programmes, marketing, technology transfer and uptake etc.
- Capacity building on the creation and management of Associations.

b) **Green Options**

Proposed actions includes:

- Adoption of New Techniques and Technology of production at all levels.
- Improve on R and D.
- Adoption of Resource Efficiency and Cleaner Production Tools In Production And Construction Activities.
- Capacity building enhancement in the areas of energy efficiency, good water management practices, general management practices.
- Adopt basic safety techniques in the sector though the development of sector specific safety guidelines.
- Effective management of Occupational health and safety at all levels of production.
- Have awareness, education and training, Enhance enforcement and legislation of the Current OHS regulations

Growth Scenario for Ambipholites

Table 21: Growth Scenario for Export of Ambipholites

Item:	Description:	Quantity:
Amount of reserves of ambipholites	m ³	286,000
Kms of road to be tarmarked in Rwanda (*Assuming 60% tarmarking of roads in Rwanda)	Kms	45,000
Amount of ambipholite required per km of road tarmarked	m ³	1800
Additional kms of road that can be tarmarked by local existing reserves	km	159
* Given the small percentage of road construction that Rwanda's local confirmed ambipholite reserves can support, this sector is not ideal for large-scale investment but rather for small-scale SME exploitation.		

6.3.3 SAND



Construction materials from sand include:

1. Glass
2. Construction sand

Product Dynamics and Challenges

a) Resource Availability


Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. It is used in glass industry, in water plants as filter and in construction

Materials required in glass production; those, which occur in Rwanda, are indicated:

Minerals	Source	Availability
Silica (SiO₂; 72%)	Sand	Rwanda
Na₂+K₂O; 14%	Alkali-minerals	To be imported (Na ₂ CO ₃ , Na ₂ SO ₄ from Uganda: Katwe Lake; KCl from East Africa + Ethiopia; KCO ₃ from East Africa + Ethiopia; NaB ₄ O ₇ from England)?
Lime (CaO; 10%)	Ca CO ₃	Rwanda
Alumina (Al₂O₃; 1,5%)	Feldspar	Rwanda
MgO; 1,3%	Dolomite	Rwanda

The 5,721,459 tones of glass products were imported in Rwanda for 2006, thus emphasizing the need for a glass manufacturing industry. Different types of glass can be manufactured for Rwanda as well as the Eastern & Central African markets. Since 1974, several studies carried out by the Geological Survey of Rwanda identified many types of sand deposits. Those identified include deposits that originate from; the quartzite of Sakinnyaga and from the alteration of Kigali and Butare granites. Other deposits occur along rivers all over the country. As indicated in table 1 the end product of glass normally contains the following composition: 72 % of SiO₂, 1.5 % of Al₂O₃, 14 % of Na₂O + K₂O, 10 % of CaO and 1.3 % of MgO. Some accessories represent the remaining 1.2 %: elements of the glass coloration or materials used during sand fusion. Two key deposits in the country, **Mukungwa-Masangano** and **Karundura** are potential for large-scale industrial production based on their good quality and significant reserves.

Table 22: Key Sand Deposits in Rwanda

Mukungwa-Masangano sand reserve:	sand	Estimated to be 1.600.000 m ³ (2.160.000 tons)	
Karundura-Kirimbi sand reserve:	sand	Estimated at 730.000 m ³ (985.000 tons)	

Geological Survey of Rwanda, 1974

Positive aspects about this location:

- Contains large reserves
- The sand is of a good quality
- The location is near Lake Kivu (easy transportation and possibility of use of methane gas as energy source)
- The presence in the area of another big sand deposit: Kirimbi, which is located at the mouth of Kirimbi River into Kivu Lake (12-15 km N.E of Karundura site). The Kirimbi sand should be easily transported to Karundura site (through the lake)
- It is close to Nyamasheke – Kirambo electric power line (MT: 30 KV).

Based on the above aspects Karundura and the nearby deposits present possibly the best site for the glass manufactory.

b) High Demand and Low Supply

Currently, Rwanda purchases all glass items from abroad and this costs so much money, which consumes a lot of foreign exchange. This project will help in substitute for a percentage of glass imports, transfer technology, add value to quarry products, and create jobs.

c) Low Exports and High Imports

Imports of Glass products from 2010 to 2013 (USD)

Year	2010	2011	2012	2013
	2,451,492	3,954,049	2,339,558	4,583,520

Exports of Glass products from 2010 to 2013 (USD)

Year	2010	2011	2012	2013
	0	285	266	10,396

NB:

- Rwanda imports most of its glass construction needs
- The potential market for bottles in the region is attractive. With good quality sand, Rwanda should consider the prospects of promoting glass production
- Much of the presentation centered chiefly on bottle production. This is because of high iron content in the described deposits. However, there are abundant outcrops of white quartzite, which should be investigated for building glass production in the country. And given the tremendous growth in the construction sector the construction glass should have a huge market in Rwanda and the region.

d) Other Challenges

- The sector requires high technology in glass production and advanced skills
- Environmental challenges in sand harvesting since most of high quality sand is found on river valleys
- Almost zero value addition. The sector is still in the primary level.

Product Specific Strategies

a). Research and Development for Technology in Glass making- Specific Actions includes:

- Production Efficiency goals:- include Improve operating, Improve optical quality, Eliminate all sources of surface damage and Extend furnace life
- Energy Efficiency goals:- development of more energy-efficient manufacturing technologies will achieve significant energy savings and help to strengthen the competitiveness of glass products both internationally and with other materials.
- Environmental Goals:- focusing on challenges and opportunities to reduce emissions and waste through leaner and cleaner production and processing as well as increased recycling.
- Innovative Uses Goal: Create innovative products which broaden the marketplace and beats competition

b). SME Support- Specific actions includes:

- Putting in place a strong enabling environment with affordable costs of production, protection from unnecessary and unfair competition etc.
- Using public funds to support early entry projects at the country level that will be of sufficient scale to help transform markets.

- Catalyzing private capital with innovative tools that will attract the private sector as an investor at scale. They have proved useful in disseminating information, conducting training, monitoring implementation of programmes, marketing, technology transfer and uptake etc.
- Capacity building on the creation and management of Associations.

c). Green Options- Specific actions include:

- Expanded the Environmental quality monitoring surveillance programs and environmental auditing systems in the sector.
- Encouragement of the players to have in place a well developed Environmental Management Systems (EMS).
- Adoption of Resource Efficiency And Cleaner Production Tools In Production And Construction Activities.
- Capacity building enhancement in the areas of energy efficiency, good water management practices, general management practices.

Estimates Of Investment Costs:

Type of activity	Cost in 1985*	Current cost 2007**
Field (site of industry implementation): 15.000 m²	750.000.000	4.125.000.000
Factory construction (10.000 m²)	100.000.000	550.000.000
Equipment	87.000.000	478.500.000
Initial store of spare parts	9.000.000	49.500.000
Cash funds (mining, energy costs, production, ...)	11.000.000	60.500.000
Total	957.750.000	5.263.500.000

* In 1985 1 \$=100 Rwf); in 2007 1\$=550 Rwf

** Current cost means cost in 1985*5.5

*** The estimates are based on the 1974 figures of the Ministry of Planning and Natural Resources planned for bottles manufacture.

The total investment cost is estimated to 8.772.500 \$.

Growth Scenario for Glass/Sand

Table 23: Growth Scenario for Sand Export

Item	Description	Amount
Estimated size of Rwanda Reserves (MT)	2,330,000M3 (1m3=1442kg)	3,359,860,000
Sand available for consumption annually (MT)	Taking 100 years to exhaust reserves	33598600
Amount of sand available for glass production	Estimating half of annul reserves	16799300
Size of domestic demand	Assuming the import values	4,961,537
Amount available for export (MT)	Less domestic demand	11,837,763
Cost of exporting 1MT of glass	Taking export figures	2.68283871
Income from exporting glass		31758808.81

6.3.4 LIMESTONE AND GYPSUM



The chief construction materials from limestone and gypsum are cement. Limestone is also used in steel production.

Product Dynamics and Challenges

a) **Resource Availability-** Sources of raw material are detailed below.

Raw materials	Source	Reserves (tonnes per annum)
Limestone	Nyakabuye, 3 km	573,080
Sandstone	Nyakabuye, 3 km	69,890
Clay	Muganza, 2 km	3 51,000
Gypsum	Kenya	24,000
Pozzolana	Nengo/ Rugeroro	180,000
Peat	Gishoma,	95,720

It is proposed to use peat (which is available from Gishoma bog, which is located close to the Rusizi-Bugarama road, 18 km south of Rusizi) as a fuel at the new cement plant in the future.

b) **Demand and Supply-** In 2012, cement demand in the East African market grew by an estimated 7% to 8.5 million tonnes compared to a 9% growth in 2011. On average over the past decade, East African cement consumption has been growing at a CAGR close to 14% and it is expected to continue growing in the near future at around 8% per annum. As a result, regional and international cement companies have embarked on ambitious investment and expansion drives in East Africa with capacities expected to reach 14.4 m tonnes by 2017.

A 700,000 ton per annum cement plant is available in Rwanda to satisfy local demand for the building material which continues to be high, but its yet to reach this target, mainly driven by housing sector growth and infrastructure development.

c) **High Demand And Low Supply**

Cement Production. '000 tonnes							
Year	2006	2007	2008	2009	2010	2011	
Rwanda	103	103	103	92	99	94	
EAC	4,789	5,353	5,882	6,516	7,468	8,164	

Cement Consumption. '000 tonnes

Year	2006	2007	2008	2009	2010	2011
Rwanda	170	195	269	257	308	363
EAC	4,609	5,194	5,724	6,786	7,729	8,225

Current demand for cement in Rwanda is estimated at 350,000 ton per annum. Based on Rwandan and the surrounding region's positive economic outlook, regional cement demand is projected to increase to 1 million ton during the next decade.

d) Low Exports And High Imports

Cement Imports. '000 tonnes

Year	2006	2007	2008	2009	2010	2011
Rwanda	67	97	173	173	214	273

Cement Exports. '000 tonnes

Year	2006	2007	2008	2009	2010	2011
Rwanda	0	4	6	8	5	4

Investment banks estimates that Rwanda imports about 60 per cent of its Cement Consumption Mainly from Uganda and Kenya.

e) Other Challenges

- High production costs coupled with outdated machinery have been cited as the major challenges affecting local cement manufacturers and hurting the competitiveness of their products.
- Imported cement from Uganda, Kenya, Tanzania and the Far East is cheaper in the market compared with locally manufactured cement.
- Environmental pollution in the production process and mining of Limestone causes conflicts with environmental agencies
- High cost of power in the country. The Cement Company is contemplating peat as an alternative energy source.

Product Specific Strategies

With robust gross domestic product growth expectations, a large supply deficit in the cement market and challenging logistics for importing cement makes the country attractive for cement related investment although the following should be addressed:

a) Human Resource Development- Cement sector is a human resource intensive industry. Some actions to improve this includes:

- To fast track the implementation of the existing policy on Skills development to achieve:
- Invest in education programmes that will promote local talent through: Program and curricular development that is customized towards the needs of the industry
- To improve the capacity of university polytechnics and colleges to train adequate numbers for the needs of the industry
- To establish programs on training of specialized construction industry professionals
- To establish training on soft skills enhancement like communication, management, team building.
- Organize workshops that address specific needs of workers in the industry

- Increase the number of lectures and reduce lengthy recruitment process

b) Green Economy

Proposed Actions includes:

- Adoption of New Techniques and Technology of production at all levels.
- Improve on R and D.
- Adoption of Resource Efficiency and Cleaner Production Tools In Production And Construction Activities.
- Capacity building enhancement in the areas of energy efficiency, good water management practices, general management practices.
- Adopt basic safety techniques in the sector though the development of sector specific safety guidelines.
- Effective management of Occupational health and safety at all levels of production.
- Have awareness, education and training, Enhance enforcement and legislation of the Current OHS regulations

Growth Scenario for Cement

Item	Description	Amount
Estimated Size of Rwandan Reserves	Assumed to sustainably support production in 100 years	800,000 MT
Size od domestic Demand		370, 000 MT
Amount available for export (MT)		430000
Cost of Exporting cement from Rwanda (USD)	Taking export figures from 2013	7246.932969
Potential income from cement export (USD)		3116181177
Savings on importation (USD)	Taking imports of 2013 of 4,270,137	3,748,221

6.3.5 PAINTS



Paint is an important building material. Paint is composed of the following raw materials: pigments, solvents, resins, and various additives. The pigments give the paint its characteristic color; solvents make it easier to apply; resins aids dispersion; and additives serve as everything from fillers to anti fungicidal agents. Hundreds of different pigments, both natural and synthetic, exist.

Product Dynamics and Challenges

(Using the case of Ameki Color): Products include emulsion paints, water-based silk vinyl emulsion paints, acrylic emulsion paints, epoxy paints, wood and office glue, synthetic roofing paints and road marking paints. Current production is estimated at 60 tons per day and full capacity is 80 tons per day, which means that Ameki Color currently runs at an estimated capacity utilization rate of at least 75%.

a) Resource Availability- Most of the raw materials used in the manufacturing of paint are imported. Kaolin, an important ingredient in paint, is locally available with reserve estimates in excess of three million MT.¹⁹ Most of the raw material inputs are imported, such as resin.

b) High Demand and Low Supply- Local production is estimated at 10,000 MT per annum. In 2011, 4,265 MT (value of 9.8 Million USD) of paint was imported into Rwanda to fill the supply gap.

c) High Imports Low Exports

Imports of Paint products from 2010 to 2013 (USD)

Year	2010	2011	2012	2013
	12,194,269	14,948,809	16,006,276	16,371,018

Exports of Paint products from 2010 to 2013 (USD)

Year	2010	2011	2012	2013
	61,374	107,169	40,976	136154.8

d) Challenges in this Sector

- Skilled labor scarcity
- High cost of production (primarily, the cost of Imported raw materials, energy and transport)
- Costly importing of plant equipment and machinery

Product Specific Strategies

a) Human Resource Development- Some actions to improve this includes:

- To fast track the implementation of the existing policy on Skills development to achieve:
- Invest in education programmes that will promote local talent through: Program and curricular development that is customized towards the needs of the industry
- To improve the capacity of university polytechnics and colleges to train adequate numbers for the needs of the industry
- To establish programs on training of specialized construction industry professionals
- To establish training on soft skills enhancement like communication, management, team building.
- Organize workshops that address specific needs of workers in the industry
- Increase the number of lectures and reduce lengthy recruitment process

b) Green Options- Proposed Actions include:

- Adoption of New Techniques and Technology of production at all levels.
- Improve on R and D.

- Adoption of Resource Efficiency and Cleaner Production Tools In Production And Construction Activities.
- Capacity building enhancement in the areas of energy efficiency, good water management practices, general management practices.
- Adopt basic safety techniques in the sector though the development of sector specific safety guidelines.
- Effective management of Occupational health and safety at all levels of production.

Growth Scenario

Table 24: Growth Scenario for Paint Export

Item	Description	Amount
Domestic Production of Paint	14,285 MT (Assuming Ameki takes 70% of domestic production with a production of 10,000MT/yr)	32, 823,681 USD
Total Amount of paint imports	4,265 MT	9,800,000 USD
Size of domestic demand for paint (MT)	14,285 MT + 4,265MT =	18,550 MT
Size of domestic demand of paint (USD)	Local production + imports	42,623,681
Size of kaolin reserves	3,000,000 MT	
Total reserves available for consumption annually (MT)	Assuming they were to exhaust reserves in 100 years	30,000 MT
Size of paint available for production (MT)	Assuming 1MT of Kaolin reserve make 1MT of paint	30,000 MT
Amount Available for export (MT)	Less domestic demand	11,450
Cost of exporting 1MT of paint (USD)	Export figures of 63MT of paint at 87,000 USD	1380.952381
Income from paint export (USD)	Cost * amount for export	15811904.76

6.4 Proposed Future Studies

1. Detailed geological studies to a certain the quantity, quality and economic viability of the following reserves:

- Clay in Gisagera, Huye, Nyaregenge, Rulindo and Musanze Districts
- Sand in Gakenke and Nyamasheke Districts

2. Detailed master planning of zones per district

3. Detailed product feasibility studies of the following products: glass, timber and engineered wood, other possible products from clay.

4. Studies on potential regional and international markets for export of products and the prerequisite requirements for penetration into these markets.

APPENDICES

1. CONSTRUCTION INDUSTRY QUESTIONNAIRE

Type of Industry:

Location

Province:

District:

Sector:

Cell:

1. COMPANY START-UP:

Year of Start:	Type of Company (Sole Proprietorship/ Partnership/ Limited Company):	Start-up Challenges:	Possible Solutions:

2. RAW MATERIALS:

Raw Materials:	Quantity Used:	Source:	Challenges in Acquisition & Use of Material:	Possible Solutions:

3. FINANCING:

Source of Finance:	Challenges:	Solutions:

4. PRODUCTIVITY:

Product	Installed Capacity	Actual Output	Production Challenges:	Proposed Solutions:

5. DEMAND:

Does the output match demand for your Products?

YES/ NO	REASON:

6. TECHNOLOGY:

Type of Machine Used:	Source:	Challenges in Acquisition & Use:	Possible Solutions/ Current Best Practices):

7. ENERGY:

Energy Used:	Type	Source:	Challenges:	Possible Solutions:

8. SKILLS:

Skill	Number		Skill Training (on- Job/ Education):	Challenges	Solutions:
	Foreign	Domestic			
Managerial					

Technical					
Unskilled					

9. MARKETING:

Market:	Competitors:	Challenges:	Proposed Solution:

10. HEALTH AND SAFETY AND GREEN ECONOMY:

	Issue/ Challenges:	Proposed Solutions (Greener and Safer Approaches):
a). Health and Safety Issues at Extraction:		
b). Health and Safety Issues at Transportation:		
c). Health and Safety Issues at Production:		

11. RECOMMENDATIONS:

What interventions would help this industry grow?

Private Sector Interventions	Government Interventions

2. KEY INFORMANT QUESTIONNAIRE: DISTRICT

Name of Respondent:

District:

Designation:

RESOURCES/ INDUSTRY LOCATION

1. What are the naturally occurring major construction materials in this District and where are they located? (SECTOR/CELL/VILLAGE)

RESOURCE	LOCATION

2. Which industries process these resources into building materials?

RESOURCE	LOCATION (DISTRICT/SECTOR/CELL/VILLAGE)

3. Are there any the construction materials industries in this District not mentioned in the list above?

INDUSTRY	LOCATION

MANAGEMENT OF RESOURCES

4. In what ways does the district manage the named resources?
.....

5. What are the District's requirements for starting Industries to exploit the Resources
.....

6. What challenges have limited economic exploitation of these construction material Resources? (Give Reasons)
.....

7. How can the above challenges be addressed?
.....

SKILL TRAINING INSTITUTIONS

8. What key training institutions exist to train locals on construction industry skills in this District?

Key Training Institutions:	Challenges Faced by Institution:	Proposed Solution:

9. What local knowledge and skills exist in this District that can be tapped in the construction Industry?
.....

RECOMMENDATIONS:

10. What plans are in place to promote construction industries in this District?
.....

11. Which locations do you/the District propose as appropriate for an industrial Zone In this District?

Proposed Industrial Zone (Sector/Cell/Village):	Reasons:

3. KEY INFORMANT INTERVIEW GUIDE: MINICOM (RDB, PSF)

Name:

Designation:

PRIVATE SECTOR OVERVIEW

1. What is the growth trend of construction industry in Rwanda?
2. What is attributed to the current trend?
3. Which are the most profitable local construction industries in Rwanda?
4. What has MINICOM done to promote the Construction Industry Sub-sector in Rwanda?
5. What are the challenges to growth of the Construction Industry? (Give Reasons)
6. How can the above challenges be addressed?

INDUSTRY PROMOTION

7. What are the Ministry's requirements for starting construction Materials Industries in Rwanda?
8. How does the Ministry ensure promotion of exports of Locally Manufactured Construction Materials?
9. How does the government safeguard local product from competition from Imported Products?
10. As a Ministry, what steps have been put in place to ensure the prosperity of the industry?
11. What policy recommendations would you propose to boost the Construction Materials Industry in Rwanda?

4. KEY INFORMANT INTERVIEW GUIDE: RWANDA BUREAU OF STANDARDS (RBS)

Name:

Designation:

STANDARDS DEVELOPMENT

1. What standards exist for the construction materials industry?
2. How were these standards developed?

STANDARDS IMPLEMENTATION

3. How do you enforce compliance with these standards?
4. What challenges does RBS face in implementation of these standards?
5. In your opinion, are these standards an opportunity or hinderance to the construction materials industry?

RECOMMENDATIONS

6. What policy recommendations would you propose to boost the Construction Materials Industry in Rwanda?

5. KEY INFORMANT INTERVIEW GUIDE: MINIRENA (REMA)

Name:

Designation:

NATURAL CONSTRUCTION RAW MATERIALS

1. What natural construction materials resources has the Ministry identified in Rwanda?
2. What resources are mainly exploited for construction purposes?

ENVIRONMENTAL ISSUES

3. What environmental challenges affect the exploitation of these natural resources?(Give reasons)
4. How can the above challenges be addressed?
5. What steps has the Ministry put in place to ensure sustainability in exploitation of these resources?

6. LIST OF CONTACT PERSONS

	Institution	Contacted Person	Position	Number
1	Rwanda Bureau of Standards (RBS)	Sibomana Mathias	Building and Civil Engineering Standards Officer	788426319
2	Rwanda Natural Resources Authorities (RNRA)	Ngombwa Evode	Public Relations	727000290
3	Rwanda Environment Management Authority (REMA)	Kabera Juliet	Environmental Audit and Monitoring	788514577
4	Rwanda Development Board (RDB)	Kajangwe Adelin	Product Development Officer	adelinkome@yahoo.fr
5	Rwanda Housing Authority (RHA)	Bimenyimana Elaste	Director of Design and Construction	788439600
6	Ministry of Natural Resources (MINIRENA)	Nitiyimana Wensislas	Mines and Quarries product expert	788652084
7	Ministry of Trade and Industries (MINICOM)	Dukuzimana Jean Pierre	Professional in charge of Manufacturing Development	7886465517
8	Private Sector Federation (PSF)			
9.	Sam Construct Ltd	Muzatsinda Bonaventure	Managing Director	788301121
10.	Entreprise Usengimana (EUR)	Richard Usengimana Richard	Managing Director	788301709

SN	Name of the company	Location		
		Province	District	Phone no
1	BEMS	Kigali City	Gasabo	788522969/788307833
2	Briqueterie et Tuilerie (BTN)	Southern Province	Nyamagabe	788420466
3	International Marble	Kigali City	Gasabo	788847884/788514994/788308360
4	Ruliba Clays Ltd	Kigali City	Nyarugenge	788305242/788300751
5	SteelRwa Industries Ltd	Eastern Province	Rwamagana	
6	Kigali Cement Company	Kigali City	Nyarugenge	
7	East African Granite Industry	Eastern Province	Nyagatare	
8	ETS Amagerwa		Kicukiro	
9	Cimerwa	Western Province	Rusizi	
10	NPD Cotraco	Kigali City	Kicukiro	
11	Safintra	Kigali City	Kicukiro	
12	NFC	Southern Province	Nyamagabe	
13	Mironko Plastic Industry	Kigali City	Kicukiro	
14	Sigma Coats Industries	Kigali City	Kicukiro	

Key Informants Contacted Per District

	Districts	Name	Position	Phone no.
1	Bugesera	Uwase Sylvie	Environment Officer	788548377
2	Burera	Gasnamu Musana Innocent	Cooperatives and investment	726719816

			promotion officer	
3	Gakenke	<i>Ntawiniga Michel</i>	In charge of infrastructure	788521185
5	Gatsibo		Environment Officer	788596920 (V/M Economics)
8	Huye	<i>Munyanziza Jean Marie</i>	Land Management Officer	
9	Kamonyi	<i>Nsengiyumva Maurice</i>	Local economic engineer	788554693
10	Karongi	<i>Hakizimana Sebastien</i>	V/M FED	788358675
11	Kayonza	<i>Mudenge J. Paul</i>	Environment Officer	
13	Kirehe	<i>Bititi Fred</i>	Environment Officer	
14	Muhanga	<i>Uhagaze François</i>	V/M FED	788892058
15	Musanze	<i>Uwimana Beline</i>	Cooperatives and investment promotion officer	
16	Ngoma	<i>Mutabaruka Semutaho</i>	Environment Officer	
17	Ngororero	<i>Mazimpaka Emmanuel</i>	V/M in charge of economics and development	
18	Nyabihu	<i>Murenzi Jean Claude</i>		
19	Nyagatare	<i>Muvandimwe Albert</i>	Land Management Officer	
21	Nyamasheke	<i>Iyakaremye Evelyne</i>	Environment Officer	728915353
22	Nyanza	<i>Nkurunziza Francis</i>	V/M Economics	788303292
24	Nyaruguru	<i>Harelimana Anselme</i>	Environment Officer	788581830
25	Rubavu		V/M Economics	
26	Ruhango	<i>Ntaganda Henry</i>	Community settlement and urban Planner	788865691 (Mugeni Germaine)
27	Rulindo	<i>Ntambara Emile</i>	Land Management Officer	
28	Rusizi	<i>Nsabayezu Ferdinand</i>	Environment Officer	
30	Rwamagana	<i>Rwakayiganda Emmanuel</i>	Environment Officer	788454412