RESEARCH AGENDA FOR THE CONSTRUCTION INDUSTRY IN MALAWI (2021 – 2026)

"A SUSTAINABLE AND INTERNATIONALLY COMPETITIVE CONSTRUCTION INDUSTRY"

Foreword

The construction industry plays a very significant role in the economic development of countries and more especially developing nations like Malawi. The industry produces, maintains, and adapts large percent of fixed capital investment such as buildings, roads and water supply schemes which other economic activities depend on for their operations. As such, the construction industry is one of the most important pillars to the economy of this country. Further to this, the people of Malawi expect that the industry should produce quality infrastructure which is accessible and comfortable for all, durably enjoyable, efficient and adaptable to changing demands, and available and affordable. As a result of these demands, the construction industry is the focus of the society and it is being criticized for underperforming and inefficiencies while being challenged to produce infrastructure that responds and satisfies demands of the nation.

The Government of Malawi recognizes the importance of providing sustainable infrastructure to its citizenry. This has been emphasized in the launching of Malawi 2063 which encapsulates the national aspiration of the need for globally competitive economic infrastructure that is sustainable. This is a call to the Construction Industry to identify technologies and methodologies that will effectively respond to the needs and demands of the nation and effectively deliver quality infrastructure.

The National Construction Industry Council was established with the mandate to regulate, develop and promote the construction industry. To promote research and innovation, the Council established a research function which has developed this research agenda to guide research within the industry to ensure identification and implementation of locally found sustainable and innovative solutions to respond to the demands of the nation. It is hoped that stakeholders will take this opportunity to contribute to a well-developed and competitive industry.

Let's help build a New Malawi.

Eng. Gerald Khonje

Chief Executive Officer

Executive Summary

The Research Agenda for the construction industry is coming in against a background of growing concerns over the overreliance on imported materials; and the unsustainable use of the natural resources for construction purposes with adverse consequences on the livelihoods of the present and future generations. In addition, the rate of various technological advances that the international market players have developed and are in practice seemingly disadvantages most local players who are utmost using old technologies. In view of this the National Construction Industry Council of Malawi (NCIC) through its Training and Research Department (TRD) decided to identify research priority areas and develop a Research Agenda that will guide research activities. This will ensure proper solutions are identified and adopted by the industry.

Research Agenda development process was conducted in a participatory manner involving key stakeholders participating in construction activities across all sectors, including NGOs, academia, private sector (contractors and consultants) and government entities. There was close liaison with the Council when designing, planning and implementing the study to ensure that it meets the expectations of the Council and the Industry. The information generated during stakeholder consultation has been collated and triangulated with information from the desk review. The challenges and research gaps identified in the construction industry were used to develop this Research Agenda.

Research themes have been reasonably presented in a broader sense with a view of allowing a researcher to have discretionary opportunity and flexibility to design specific research studies that address a particular identified topical area of priority research. The research themes have been grouped together with their corresponding priority research areas. The research themes that have been developed for the Research Agenda are: construction Materials, Technology and Innovation in construction, manpower and organisational development, Construction Economics and Cost Control, Management methodologies, estimating and tendering, Governance, legal and institutional framework, Green construction technology (Sustainability), transportation system and Health and Safety in the construction industry.

Successful adoption and implementation of the research agenda will require financing and implementation strategies. It is important that all stakeholders (government, R&D institutions, private sector, NGOs and all interested parties) be actively involved in order for the Research Agenda to be effectively implemented. Financing of research in the identified priority areas is critical for the realization of the goal and objectives of this Research Agenda. Some of the expected mechanisms of financing the Research Agenda include funding from the Council and development partners, research grant schemes and public and private partnerships.

The effectiveness of this Research Agenda is five years. Informed by emerging issues in the construction industry, there shall be a need to conduct a midterm evaluation followed by a final review of the Agenda after five years.

Acknowledgement

The study was made possible through the invaluable information provided by Regulatory, Statutory and Professional bodies, Non-Governmental Organizations, Funding Agents, Contractors and Consultants that participated in the development of the Research Agenda. Special gratitude is extended to the Research Assistants for their hard work during the data collection especially considering the COVID 19 limitations.

The Management of National Construction Industry Council (NCIC) acknowledge the Agricultural Engineering Department of the Lilongwe University of Agriculture and Natural Resources (LUANAR) for drafting the Research Agenda under the guidance of the Steering Committee Members, Mrs Nema Kadaluka (Training Director), George Chapotera (Planning and Evaluation Manager), Daniel Kampondeni (Senior Treasury Management Accountant), Wellington Mandowa (Training and Research Officer), Harrison Banda (Training and Research Officer) and Aubrey Kondowe (Procurement Officer).

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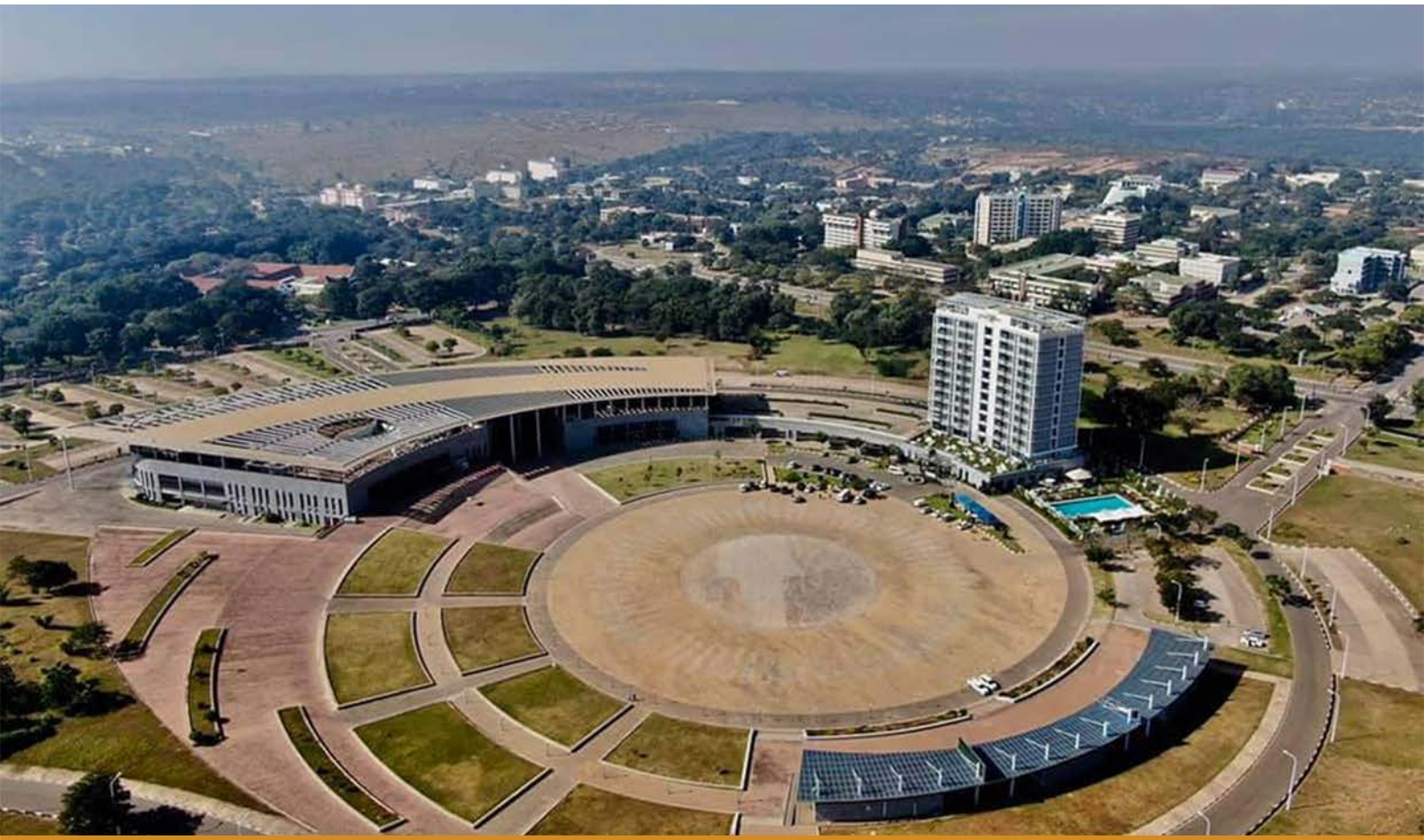
DARS	Department of Agriculture Research Services
LUANAR	Lilongwe University of Agriculture and Natural Resources
MBS	Malawi Bureau of Standards
MUST	Malawi University of Scienece and Technology
MW2063	The Malawi Vision 2063
MZUNI	Mzuzu University
NCIC	National Construction Industry Council
NCST	National Commission of Science and Technology
NRAEIE	National Research Agenda in Energy, Industry and Engineering
NGO	Non-Governmental Organisation
NSTP	National Science and Technology Policy
NWRA	National Water Resources Authority
R&D	Research and Development
S&T	Science and Technology Act
SADC	Southern Africa Development Community
UNIMA	University of Malawi



1 Introduction

The National Construction Industry Council of Malawi (NCIC) was established by an Act of Parliament of 1996 (No. 19 of 1996) under laws of Malawi CAP 53:05 to Regulate, Promote and Develop the local construction industry. Its vision is “A sustainable and internationally competitive construction industry” through increased participation of the local industry in the regional as well as the international market to foster economic growth and improvements in key aspects of the construction industry through research outcomes. Section 11 of the NCI Act outlines the functions which have to be executed by the council in order to fulfil its mandate and specific to this Research Agenda is 11 (a) “to promote research, development and use of competitive local materials”. The Training and Research Department was established with the aim of coordinating and promoting research in the construction industry. The Council through the Training and Research Department will develop policies, regulations, best practices among others that will promote sustainable construction technological advances.

1.1 Background of NCIC research function

The Research Agenda for the construction industry is coming in against a background of growing concerns over the overreliance on imported materials; and the unsustainable use of the natural resources for construction purposes with adverse consequences on the livelihoods of the present and future generations. In addition, the rate of various technological advances that the international market players have developed and are in practice seemingly disadvantages most local players who are utmost using old technologies. In view of this the National Construction Industry Council of Malawi (NCIC) through its Training and Research Department (TRD) decided to identify research priority areas and develop a Research Agenda that will guide research activities. This will ensure that proper solutions are identified and adopted by the industry.

Through identification of priority areas for research and subsequent development of the Research Agenda, the research function aims to contribute towards broad development of the construction industry through:

a) Developing and promotion of appropriate technologies and innovations for construction industry activities;

b) Identifying and supporting the development of strategic-decision making options for effective natural resource management;

c) Strengthening and coordinating the research system relevant to the construction industry;

d) Facilitating and meeting the demand for construction industry knowledge.

1.2 Current trends in construction related Research and Development (R&D)

The Construction Industry is one of the largest and oldest industries in the world. The construction industry is recognized as a leading driver of the world economy, yet it is an industry noticeably missing training in higher education and research that characterize most industries[1]. Research is widely acknowledged as a key factor in the advancement of technology and knowledge in an area of study. However, in developing countries, due to many of the unique challenges in the construction industry, research is not widely supported as compared with developed industries[2]. Contracting in construction industry is oriented towards achieving an immediate return on investment. The low profit margin realized by construction firms discourages the use of funds for research purposes[3]. The competitive environment of the construction industry also prevents the sharing of research results. Construction companies treat any research results as proprietary and do not allow the results to be published[4].

Across the globe the majority of research being conducted in the construction industry is done at the university level or public institutions[5] and similar trends have been observed in Malawi. In Malawi, the majority of research is conducted by public universities or public institutions which are mainly funded by government. These institutions include University of Malawi (UNIMA), Mzuzu University (MZUNI), Lilongwe University of Agriculture and Natural Resources (LUANAR), Malawi University of Science and Technology (MUST), Malawi Bureau of Standards (MBS) and Department of Agriculture Research Services (DARS). However, coordination, collaboration and partnerships between research institutions is very limited. This has resulted in low output and uptake of research findings.

[1]Tucker, R. L. Sep 2007. Construction Industry Institute. Journal of Construction Engineering and Management 133, no. 9: 640-644
[2]Oglesby, C. H. 1990. Dilemmas facing construction education and research in 1990s. Journal of Construction Engineering and Management 116: 4(14).
[3]Harris, R. B. (Univ. of Michigan). 1992. Challenge for research. Journal of Construction Engineering and Management 118, no. 3: 422-434.
[4]Gerwick B. C. 1990. Implementing construction research. Journal of Construction Engineering and Management 116: 556(8).
[5]Warszawski, A. R. Becker, and R. Navon. 2007. Strategic planning for building research-a process oriented methodology. Journal of Construction Engineering and Management 133, no. 9: 11

In an effort to enhance collaboration and partnership among researchers the National Commission for Science and Technology (NCST) together with Technology Fund was established under the Science and Technology (S&T) Act No. 16 of 2003. The S&T Act mandates the National Commission for Science and Technology (NCST) to appraise, review, monitor and evaluate priority research and development programmes, plans and projects of Research and Development (R&D) institutions. It is for this reason that the NCST developed National Research Agenda in Energy, Industry and Engineering (NRAEIE) as a policy document that will guide R&D activities in the identified priorities areas in energy, industry and engineering during the period from 2017 to 2022. The NRAEIE covers the construction industry as well as other players in the engineering profession. R&D institutions are expected to align their Research Agenda against the NRAEIE. NRAEIE requires R&D institutions to register research activities with NCST thereby taping research funds through NCST research grants. The policy document also promotes formulation of R&D teams comprising researchers from different institutions for specific priority areas and different areas of expertise to enhance collaboration and knowledge sharing. It is therefore necessary for the construction industry Research Agenda to concur with the requirements of NRAEIE. Under NCST policy document NCIC will be one of the R&D institution translating construction industry research findings into policy. This is an opportunity for NCIC since there is no speceialised research initution for the contsruction industry as opposed to agricultural sector which is supported by DARS.

Similar organizations like National Commission for Science and Technology have been established in various countries within the region such as South Africa (1945), Zimbabwe (1993), Tanzania (1979), and Kenya (1979) to promote research. In the above listed countries, the R&D organisations were established by acts of parliament and they are all responsible for conducting and leading multi-disciplinary research and technological innovation. Currently, the Council for Scientific and Industrial Research (CSIR) of South Africa is the largest research and development (R&D) organization in Africa and accounts for about 10% of the entire African R&D budget.

2 Policy, regulatory, and institutional framework

This Research Agenda has been developed after a careful analysis of the national policies and laws of the Republic of Malawi. The identified research priority areas in this Research Agenda are those that are aligned to the following policy, regulatory and institutional framework;

a) National Construction Industry Act

b) Acts governing public institutions (LUANAR, UNIMA, MUST, MZUNI and MBS).

c) Malawi Forestry Act, 1997

d) Local Government (Amendment) Act, 2016

e) Physical Planning Act, 2016

f) National Construction Industry Policy

g) The Malawi 2063 Vision

h) Malawi Growth and Development Strategy (2017 to 2022)

2.1 National Construction Industry Act

The National Construction Industry Council (NCIC) was established by an Act of Parliament in 1996 (No. 19 of 1996) with the mandate to Regulate, Develop and Promote the Construction Industry in Malawi. NCIC's role therefore is to create an enabling environment that will not only facilitate the fulfilment of its mandate, but one that will provide the drive and the organizational structure to raise quality levels across the industry among local and foreign players; thereby enhancing wider appreciation of the interests of the construction industry by all stakeholders.

The mandate of the NCIC according to the National Construction Industry Act, 1996 is;

a) to promote and develop the construction industry in Malawi by giving priority to Malawian firms;

b) to facilitate Malawian firms to have access to resources for the development of their operations;

c) to promote, in liason with other bodies, both within Malawi and elsewhere, proper developmental issues relating to the Construction industry;

d) to promote research, development and use of competitive local materials;

e) to promote and facilitate, where possible, the construction of affordable low-cost and medium-destiny housing;

f) to promote safety standards in the construction industry;

g) to prescribe and vary the categories for the registration of persons engaged in the construction industry;

h) to recommend to the Minister conditions under which a foreign firm may register and operate in Malawi;

i) to keep and maintain a register for each category of persons engaged in the construction industry;

j) to conduct training, within Malawi and co-ordinate the training conducted by others, of persons engaged in the construction industry;

k) to make available, from time to time, to persons engaged in the construction industry published information, advice and assistance in relation to the construction industry;

l) to publish, from time to time, such technical and commercial information as it deems necessary or expedient for the benefit of persons engaged in the construction industry;

m) to review, from time to time, the process of awarding contracts;

n) to monitor and evaluate, from time to time, the capacity and progress of persons engaged in the construction industry;

o) to encourage competition in the professions or trades of persons engaged in the construction industry.

p) to regulate the activities of the construction industry in Malawi through the concerned Boards and Association;

q) to co-ordinate construction industry councils within or outside the region;

r) to standardize quality control, contract documentation, codes of practice, procurement processes, legal contractual procedures in liaison with other organizations;

s) to exercise disciplinary control over the conduct of any person engaged in the construction industry and practicing in Malawi; and

t) generally, to perform such other functions as the council deems necessary or expedient to achieve the objects of this Act.

The NCI Act recognises the role of research and development in the construction industry. R&D will enable NCIC to standardize quality control, contract documentation, codes of practice, procurement processes, legal contractual procedures, to exercise disciplinary control over the conduct of any person engaged in the construction industry and practicing in Malawi and to regulate the activities of the construction industry in Malawi. One of the main reasons behind the

under performance of the industry is recognised as insufficient research and development (R&D) activities and innovation. The construction industry faces various challenges due to the changing market needs of the customers, health and safety issues, growing concern on sustainable work practices, government regulations etc. In order to face these challenges while raising the profile of the construction industry, it is essential to invent new ways through research to deliver the construction output in an economically, socially, and environmentally acceptable manner. The Act also recognises the need for collaboration with other players in the construction industry and it is through this mandate that the council will be able to work with other R&D institutions.

2.2 The Science and Technology Act (2003)

The Science and Technology Act No. 16 of 2003 provides for the advancement of science and technology; the establishment of the National Commission for Science and Technology (NCST) and the establishment of the Science and Technology Fund amongst others. The S&T Act mandates the National Commission for Science and Technology to:

a) Advise Government and other stakeholders on all science and technology matters in order to achieve a science and technology-led development

b) Chart out national direction and establish national priorities in science and technology development in relation to socio-economic development needs

c) Appraise, review, monitor and evaluate priority research and development programmes, plans and projects of R&D institutions and undertake independently or in collaboration with appropriate person, body or institution surveys and research investigations considered necessary.

The S&T Act creates a conducive environment for the Council to thrive as an R&D institution. Under the S&T Act the council will be able to collaborate with other R&D institution and translate construction research results into policy for the industry. The Council will also be able to apply for research grants under the Science and Technology Fund once operationalised.

2.3 National Science and Technology Policy

It is obvious that developed countries maintain their leadership positions in socio-economic development mainly due to their strength in scientific and technological capabilities. Developing countries on the other hand are poor mainly due to low productivity caused largely by the low scientific and technological capabilities. The National Science and Technology Policy (NSTP) underscores the important role Malawi attaches to the development and application of science and technology in socio- economic development of the country. The Policy is consistent with other sectoral policies in advocating for the advancement of Science and technology for the socio-economic development of the country by promoting the efficient utilisation and management of natural resources in the context of sustainable development as well as promoting and developing the construction industry through research.

2.4 Acts Governing Public Institutions (LUANAR, UNIMA, MUST, MZUNI and MBS).

The objectives of the acts governing the four public universities in Malawi are similar in nature. The Acts recognizes the need for advancement, dissemination and commercialization of research to respond to the needs of the country and the region. The acts also promote establishment of research and innovation centres with the principle aim of promoting industrial growth.

2.5 Malawi Forestry Act, 1997

The Act recognizes the need to promote forestry conservation and management of trees within the country. Thus, it authorizes the District offices to protect, guide, plan, coordinate and facilitate sustainable management and utilization of forest resources in the District. The demand for timber and burnt bricks for construction has escalated deforestation within the country. It is therefore necessary to promote the use of environmentally friendly materials such as cement blocks, wherever possible, for the construction works thereby minimizing deforestation. Research efforts in the construction industry should focus on the use of environmentally friendly materials.

2.6 Local Government (Amendment) Act, 2016

The Act provides legal mandate for local councils in the planning, administration and implementation of various issues and development programmes in their respective geographical areas. One main function of the councils is that of local environmental planning and management. Some of the construction related management functions provided in section 2 of the second schedule of functions outlined in the Act include town planning, building control, local afforestation programmes, control of soil erosion, and appropriate management of solid and liquid wastes. The proposed research areas in the Research Agenda to be developed based on the needs assessment report will therefore promote compliance with the Act.

2.7 Physical Planning Act, 2016

The Physical Planning Act, 2016 regulates land use planning and physical developments in Malawi. The act seeks to promote orderly spatial physical planning in order to optimize use of land and services infrastructure; and protect and conserve fragile ecosystems in space. This is achieved by guiding physical developments through provision of planning permission following appropriate scrutiny by local planning committees or the Commissioner for Physical Planning. Section 46 of the Act requires any developer to submit plans to the local physical planning authority for approval before implementation. R & D efforts in the construction industry should therefore focus on sustainable construction bearing in mind the orderly spatial physical planning requirements of this Act.

2.8 National Construction Industry Policy

This Policy aims at guiding the Construction Industry in ensuring an enabling environment for the development of a vibrant, efficient and sustainable local construction industry in line with the Vision 2020 now Malawi 2063 Vision. The Policy, therefore, provides a platform for the local construction industry to overcome challenges and embrace opportunities. The Policy recognises that the construction industry is a sector of the economy that transforms various resources into physical, economic and social infrastructure necessary for the socioeconomic development of the country. It includes processes and stakeholders involved in the planning, designing, procurement, construction/ production, alteration, repairing, maintenance and demolition of various physical infrastructures. The infrastructures include:

a) New or existing commercial, industrial or domestic buildings or structures;

b) Any preliminary site preparation work (including pile driving) for the construction or erection of such building or structure;

c) Transportation systems and facilities such as airports, harbours, highways, subways, bridges, railroads, transit systems, pipelines and transmission and power lines;

d) Energy generation and transmission structures;

e) Structures for containing, controlling and distributing fluids, such as water treatment and distribution, sewage collection and treatment distribution systems, sedimentation lagoons, dams, and irrigation and canal systems;

f) Underground structures, such as tunnels and mines; and

g) Electrical or metal work associated with other engineering projects.

The Construction Industry Policy was developed to guide the industry in terms of:

a) Strengthening institutional arrangements to enhance the capacity and performance of the construction industry;

b) Improving participation of local firms- where the capacity of local firms is developed and enhanced in order to be able to improve productivity and compete effectively

c) Enhancing standards enforcement and monitoring;

d) Advancing research and technology that sustainably supports knowledge generation and retention;

e) Synchronization of different industry related acts and policies to enhance coordination.

The policy recognises the role that research and technology plays to support sustainable knowledge generation that result into significant contribution of the construction industry to the Gross Domestic Product of Malawi. The policy places emphasis on research through the Capacity Development for the Construction Industry with a commitment to promote Research and Development (R & D), ensure youth participation in research and development and establish strategic partnerships, forums, and industry-wide database that gives research and development information.

2.9 The Malawi 2063 Vision

The Malawi 2063 (MW2063) aims to transform Malawi into a wealthy and self-reliant industrialized 'upper middle- income country' by the year 2063. Already, projections indicate that if the economy grows at an annual average rate of six percent, Malawi will attain the low middle-income status by 2030. The MW2063 outlines collective aspirations and goals towards the year 2063. It is anchored on the three pillars of Agricultural Productivity and Commercialization; Industrialization; and Urbanization. The vision is anchored to the global Sustainable Development Goals (SDGs) including their variants moving forward; the continental Agenda 2063 that defines the Africa we want; and the strategies of the Regional Economic Communities to which we belong.

The attainment of Vision 2063 three pillars will be catalyzed by seven enablers, namely: Mindset Change; Effective Governance System; Public Sector Performance; Private Sector Dynamism; Human Capital Development; Economic Infrastructure; and Environmental Sustainability. Pillar 2 of the Malawi 2063 recognises the role research, science, technology and innovation in promoting industrialisation. The industrialization shall be driven by research, science and technology development in order to become and remain productive, innovative and highly competitive at regional and global levels.

The role of the construction sector is vital in attainment of Pillar 3 (Urbanisation). The construction guided by research and innovation in the construction industry will be key to the creation of urban centers, Regulated and Controlled Infrastructure Development Planning, secondary cities and tourism centers. The construction industry is a huge enabler for creation of irrigation infrastructure, road, rail, air and water transport and energy infrastructure. Sustainable involvement of the Construction Industry in Malawi 2063 Vision will be guided research within the construction sector.

2.10 Malawi Growth and Development Strategy (2017 to 2022)

The Malawi Growth and Development Strategy III (MGDS III) is the current overarching development strategy for Malawi. The strategy covers a period of five years from 2017 to 2022. The MGDS III objective aims at building a productive, competitive and resilient nation by consolidating achievements of the earlier strategies. Attainment of the MGDS II strategy depends on sustainable agriculture and economic growth, energy, industrial and infrastructural development while addressing water, climate change, environmental management and population challenges.

The MGDS II is aligned to Malawi's international, continental and regional obligations such as the 2030 Agenda on sustainable Development Goals (SDG's), the African Union Agenda 2063, the Instanbul Programme of Action (IPoA), the Vienna Programme of Action (VPoA), the Southern African Development Community Regional Indicative Strategic Development plan (SADC RISDP) and the Common Market for Eastern and Southern Africa (COMESA) treaty.

The strategy has five key Priority Areas (i) Agriculture, water development and climate change management; (ii) Education and Skills Development; (iii) Transport and ICT infrastructure; (iv) Energy, Industry and Tourism Development and (v) Health and Population. The role of the construction industry is critical to the positive outcomes of the key result areas as it is a critical sector to the industrialization and structural transformation of the economy to maintain long-term national economic growth.

3 Objectives of the Research Agenda

The Research Agenda will guide the Council in directing and coordinating the implementation of research and development activities for the sustainable and internationally competitive construction industry. It will also integrate the analysis of constraints and opportunities linked to policy, markets, and trade options as well as capacity strengthening.

The overall goal of the Research Agenda is to supplement the effort by NCST to guide researchers, technologists, policy makers, program implementers, academic institutions, development partners, investors, and other stakeholders on research priority areas for Malawi's construction industry. The specific objectives of this Research Agenda are to:

a) Promote the conduct of research in Construction Industry that is responsive to the socio-economic development of the country;

b) Promote multi-disciplinary and collaborative research among industry players;

c) Facilitate the mobilization of resources for the conduct of research that is relevant to local requirements or needs;

d) Facilitate the coordination of research in Construction Industry conducted by various stakeholders and;

e) Facilitate the translation of research findings into policy and practice in the construction industry.

4 Research Agenda Development Process

Research Agenda development process was conducted in a participatory manner involving key stakeholders participating in construction activities across all sectors, including Funding Agents, NGOs, academia, private sector. There was close liaison with the Council when designing, planning and implementing the study to ensure that it meets the expectations of the Council.

Documents relating to research from various organisation playing a role or benefiting from the construction industry were reviewed. In addition, the practice and trends on similar activities in the SADC region were also reviewed in order to identify the best practice and mark the way forward for the process.

In additional to the information gathered from document review, more detailed information was gathered during stakeholder consultation. The information generated during stakeholder consultation session has been collated and triangulated with information from the desk review. It is through this process that research gaps in the construction industry have been identified. This has informed decision in determining research needs and agenda to address the gaps. The proposed research areas have been highlighted in Section 5.

5 Research Areas

This section presents the key research priorities which were identified as key research areas for Malawi based on the challenges and research gaps in the industry as articulated by stakeholders in the Research Needs Assessment (RNA) Report. The top five challenges facing the construction industry in Malawi are: despite the existence of quality materials on the market there is also an influx of substandard materials which has created room for their use, scarcity of experienced and qualified professional personnel on the job market, non-properly trained or skilled tradesmen flooding the construction industry market, lack of access to credit facilities by local firms and lack of coordination between regulators and NCIC in regulating the industry. The RNA report also outlines research gaps which included construction economics, globalization, construction management, construction materials, health and safety, sustainable construction, technology and innovation, human resources, governance, transportation system, legal frameworks and compliance. The findings of RNA demonstrate the need to develop Research Agenda as a policy document to guide research activities in the construction industry.

Table 5.1 is a summary of the priority research themes and priority research areas. Research themes have been drawn from the research gaps and proposed themes while background issues have been drawn from the challenges in the construction industry. Themes have been ranked inorder of priority based on the recommendations from RNA report. Research themes have been reasonably presented in a broader sense with a view of allowing a researcher to have discretionary opportunity and flexibility to design specific research studies that address a particular identified topical area of priority research.

Table 5.1 Research themes and priority areas

	Theme	Background issues	Research Areas
1	Construction Materials	a) Despite the existence of quality materials on the market, there is also an influx of substandard materials which has created room for their use These substandard construction materials range from local and imported materials. b) The construction sector faces several challenges such as reliance on imported and/ or expensive construction materials and use of environmentally unsustainable building materials.	a) Mapping of indigenous materials in the country. b) Develop guidelines on standardization and utilization of locally available construction materials vis-à-vis imported ones. c) Develop long-term strategies on promotions of the use of indigenous construction materials & technologies d) Improvement of strength of construction material using local stabilizers e) Recycling of construction material f) Use of hybrid material like grass and fly ash over neat material g) Alternative construction materials (to replace cement; burnt bricks; corrugated iron; wood; etc) and practices that are sustainable and affordable without compromising on quality, durability and safety. h) Improving analytical and quality assurance techniques for construction materials i) Awareness of good construction materails

	Theme	Background issues	Research Areas
2	Technology and Innovation in construction	New innovative technologies and materials have since been introduced into the industry. Some old technologies have also become obsolete.	a) Application of standardization, prefabrication, and automation in construction b) Development and implementation of new technology and construction methods for the industry c) Human and organizational factors in encouraging innovation d) Identify/ suggest tools for which technology transfer programs could be successfully implemented.
3	Management methodologies, estimating and tendering	a) Lack of harmonized fee structure among consultants for delivering consulting services leads to undercutting in charging professional fees. b) Limited usage of artificial intelligence techniques to offer advice or make decisions	a) Judging the cost of a project and securing the work through the competitive process of bidding. b) Bidding models, estimating techniques and pricing construction projects. c) Improving analytical and administrative tools for costing engineering, planning and scheduling, materials procurement, and estimating d) Effective utilization of computer-based information systems in procurement and project management. e) Software tools suitable for Malawian environment and modelling in construction.

	Theme	Background issues	Research Areas
			f) Practices or strategies for minimizing risk on construction projects or in companies. g) Performance evaluation of the various contracting entities or individuals in managing construction contracts.
4	Governance, legal and institutional framework	a) The construction industry is danted with corruption and political interference in the award of contracts from government entities. b) Lack of coordination between regulators and NCIC in enforcing the public to embrace the construction industry. This is compounded with the fact that there is no clear support from NCIC in regulating private/ individual clients.	a) Principles of accountability and transparency in the construction industry b) Harmonization of construction related policies and legislation. c) Contract formulation - Studies that involve contracts, change orders, or other legal issues impacting the construction industry. d) Simple standard contract documents for small construction projects such as individual residential houses. e) Bringing the construction industry to the community – modeling and analyzing the interaction between the public and various construction industry players f) Identify contractual issues that come into play in construction projects more especially international tenders.

	Theme	Background issues	Research Areas
		c) The industry is open to the general public without considering qualification such that too many substandard or unskilled construction contractors have registered with NCIC compounding the problem of quality and durability of built facilities. d) Currently there are no standard contracts documents for consultancy services and works for developers in the private sectors especially individual clients. e) Private/Individual investors do not follow normal procedures when embarking construction activities. Private/individiual investors prefer to use unlicenced firms	

	Theme	Background issues	Research Areas
5	Construction Economics and Cost Control	The industry is open to international competitors who use economies of scale to outcompete local firms. At the same time local firm's lack of access to credit facilities to support the industry. This is coupled with stringent requirements for obtaining bonds/guarantees from money lending institutions.	a) Factors that influence the financial aspects of construction projects, and the industry as a whole. b) Innovative financing mechanisms of construction projects, sustainability and resilience. c) Operations and influence of international firms on the construction industry to create a comparative advantage over local firms d) Participation of Malawian firms on the international market
6	Green construction technology (Sustainability)	Sustainable construction generally refers to the application of the principles of sustainable development in the construction industry. There is growing concern on the unsustainable use of natural resources in the construction sector.	a) Research on sustainability techniques, waste and reduction methods, environmental impacts and application of green technology principles in the construction industry. b) Research on recycling of construction materials, low cost and low energy intensity and low greenhouse gas emission processes for production of building materials and construction technologies.

	Theme	Background issues	Research Areas
7	Manpower and Organizational Development	a) There is growning concern on the scarcity of experienced and qualified professional personnel on the job market. Most graduates in the construction sector are not willing to take up professional training in their respective fields (continuous professional development). b) Graduate architects, engineers not completing their professional training to become architects/ engineers such that most of them have opted to open their firms and practicing as architects/engineers illegally. c) Non-properly trained or skilled tradesmen have flooded the construction industry market. Some of the tradesmen are practicing as contractors illegally.	a) The balance between human rights and professional ethics in construction industry b) Job skills and motivation techniques among construction personnel c) Relevance of training, development and evaluation of skilled technical and managerial talent for construction. d) Understanding and improvement of organizational structures and team building for construction projects

	Theme	Background issues	Research Areas
		d) There is brain drain within the construction industry where by highly trained and experienced professional staff area leaving Malawi for Southern African Countries such as South Africa, Namibia and Botswana in search of greener pastures. There is also brain drain within the country as a result of Engineers opting for other professions.	
8	Transportation systems	The country has poor, inefficient and unsustainable transportation system. A reliable transportation system reduces cost of production and marketing of goods and services.	a) Improvement, optimization and management of transport systems (rail, road, water and air) to reduce transportation costs and improve efficiency

	Theme	Background issues	Research Areas
9	Health and Safety in the construction industry	Technology development to advance construction techniques should also come along with advanced techniques in construction health and safety	a) Survey the construction industry for the current compliance levels of occupational health and safety. b) Identify or suggest strategies needed to improve occupational health and safety standards on construction projects in line with current trends and technology.

6 Implementation Strategies

It is important that all stakeholders (government, R&D institutions, private sector, NGOs and all interested parties) be actively involved in order for the Research Agenda to be effectively implemented. Some of the strategies suggested for the effective implementation of the Research Agenda are:

a) R&D institutions to register construction related research with the Council for onward forwarding to NCST. This will ensure harmonization of research activities to avoid duplication of efforts.
b) NCIC shall develop an inventory of all research activities conducted by R&D institutions concerning the construction sector
c) R&D institutions to incorporate the identified R&D priority areas of the Research Agenda in their R&D programmes;
d) Funding priority to be given to R&D projects in the identified R&D priority areas;
e) NCIC should enhence collaboration among R&D institution (i.e those engaged in engineering reseach and development) by formulating R&D teams for specific priority areas comprising researchers from different institutions and different areas of expertise to enhance knowledge sharing.
f) NCIC shall be responsible and shall ensure that R&D results are communicated to a wider audience beyond the research community. Reporting of research and its results may be delegated to every researcher and the research institution.
g) NCIC shall be responsible in translating research findings into construction related policy or regulation.
h) The registered firms with NCIC, where applicable, to provide space for researchers to conducte research.
i) NCIC to enter into Memorandums of Understandings with public institutions such as MBS, Central Materials Laboratory and academic institutions to allow researchers use research facilities at the respective institutions e.g laboratories.

7 Financing of the Construction Research Agenda

Financing of research in the identified priority areas is critical for the realization of the goal and objectives of this Research Agenda. Stakeholders are, therefore, implored to support the financing of research geared towards addressing priorities outlined in this Agenda. The section outlines some of the expected mechanisms of financing this Agenda.

7.1 Funding from the Council and development partners

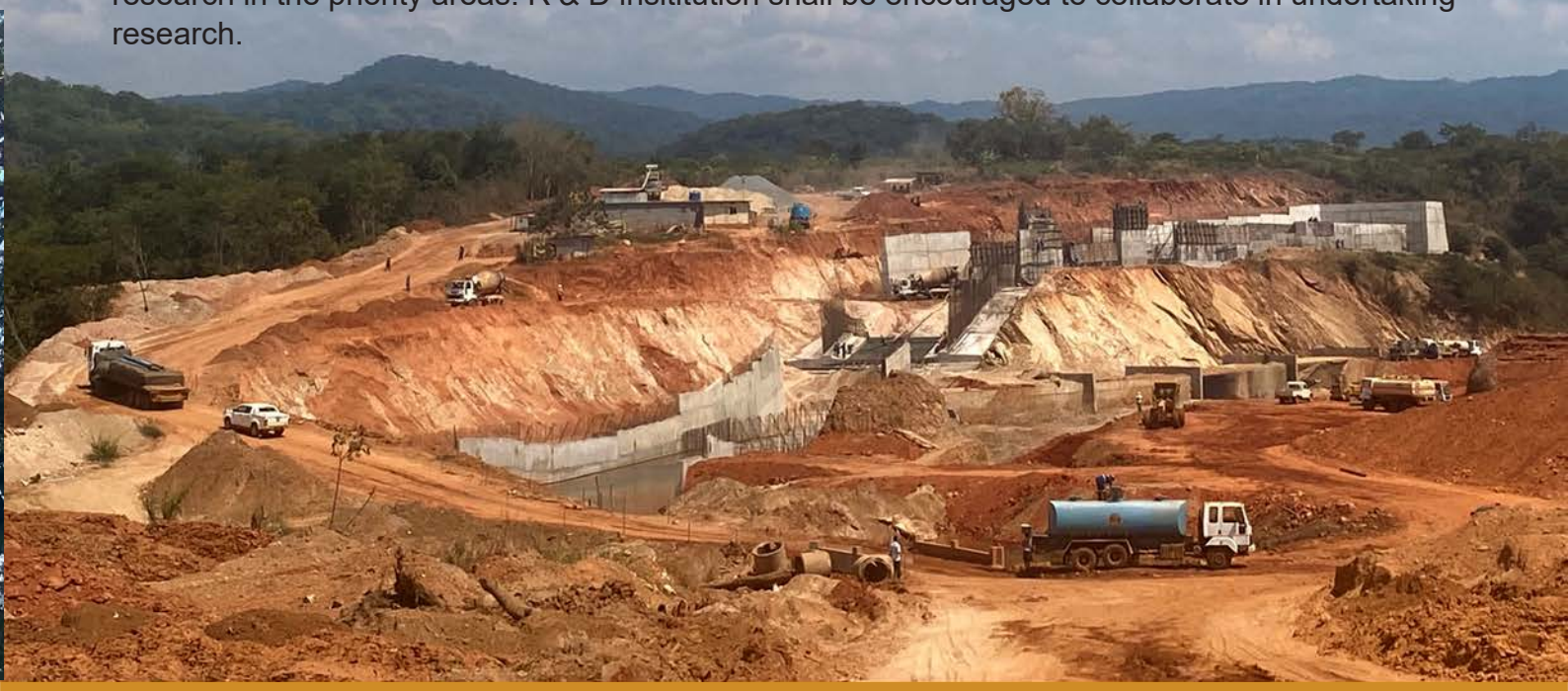
The Council and development partners should commit resources to support the undertaking of research in the identified priorities. Borrowing from best practice experiences from other countries, the Council should establish a National Construction Research Fund (NCRF). The Council should commit a portion of the construction levy towards this fund. The NCRF should comprise a pool of resources from the Council, development partners and other sponsors. This will be a basket funding for research activities in the identified priorities. The Fund shall be managed by the Council with clear guidelines. A key advantage of the NCRF is to ensure sustainability of funding for research in the construction industry.

7.2 Research Grant Scheme

Researchers and all other stakeholders wishing to undertake research in the identified priority areas shall be encouraged to take advantage of the existing national and international research grant schemes in construction research. R & D insititutions shall register research grants with the Council to ensure harmozation of research funding and activities to avoid duplication of efforts.

7.3 Public and Private Partnerships

Public and private partnerships shall be an important vehicle for nurturing resource mobilization for research in the priority areas. R & D insititution shall be encouraged to collaborate in undertaking research.



8 Monitoring and Evaluation

To track and review the implementation of the Research Agenda, monitoring and evaluation techniques will have to be used.

8.1 Tools for Tracking Adherence to the Agenda

8.1.1 Checklist for Submission of Review of Research Protocols

A checklist for submission of proposal for research in the construction industry shall be submitted to NCIC for review. The checklist should contain an element of whether the study is addressing any of the priority areas and is in line with the research agenda. A scoring system will be incorporated in the checklist for alignment of the research proposal to the key priority areas and the research themes.

8.1.2 Monitoring and Evaluation (M&E) Reports

During implementation of the research, NCIC shall work with relevant stakeholders to undertake periodical M&E visits to areas where the approved studies are being conducted.

8.1.3 Progress and Final Reports

Progress and final reports shall be submitted to the research committee. The progress report will provide an explanation in detail on how far the researchers have gone towards the completion of a project. The report will outline the activities carried out, the tasks completed, and the milestones reached against the project plan. The final report will describe the activities that have been carried out and the results achieved over the entire project period. It will also state whether the project has achieved the results set out in the research proposal.

8.1.4 Database and Directory of Research Studies

Final reports of studies shall be compiled in a database and directories of approved research studies.

8.2 Dissemination of Research Results

The findings from the research conducted following the Research Agenda developed for the construction industry will only be significant if shared with relevant stakeholders in the construction industry. The research findings will have to be integrated by stakeholders in their construction related activities. Various dissemination options exist including but not limited to local and international conferences on construction, NCST Annual Symposium, the Malawi Engineering Institution Annual Conference. However, NCIC can also have its own knowledge sharing workshop or conference where the findings from various research can be disseminated to the stakeholders.

8.3 Review of the Research Agenda

The Research Agenda has been developed for a life span of five years. Informed by emerging issues in the construction industry, there shall be a need to conduct a midterm evaluation followed by a final review of the Agenda after five years. The review will assess progress and in cooperation with emerging issues to the research themes that have been developed.

9 Summary

Research themes in this Research Agenda have been reasonably presented in a broader sense with a view of allowing a researcher to have discretionary opportunity and flexibility to design specific research studies that address a particular identified topical area of priority research. The research themes have been grouped together with their corresponding priority research areas. The research themes that have been developed for the Research Agenda are construction Materials, Technology and Innovation in construction, manpower and organisational development, Construction Economics and Cost Control, Management methododologies, estimating and tendering, Governance, legal and institutional framework, Green construction technology (Sustainability), transportation system and Health and Safety in the construction industry.

Successful adoption and implementaion of the research agenda will require financing and implementaion strategies. It is important that all stakeholders (government, R&D institutions, private sector, NGOs and all interested parties) be actively involved in order for the Research Agenda to be effectively implemented. NCIC shall develop an inventory of all research activities conducted by R&D institutions concerning the construction sector while R&D institutions shall incorporate the identified R&D priority areas of the Research Agenda in their R&D programmes.

Financing of research in the identified priority areas is critical for the realization of the goal and objectives of this Research Agenda. Some of the expected mechanisms of financing the Research Agenda include funding from the Council and development partners, research grant scheme and public and private partnerships. Stakeholders are, therefore, implored to support the financing of research geared towards addressing priorities outlined in this Agenda.

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