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Rehabilitation of
The Mycetoma Research Center Plan

Executive Summary

The Mycetoma Research Center (MRC), University of Khartoum in Sudan, is a vital institution at the forefront of global health innovation, especially in combating mycetoma and other neglected tropical diseases (NTDs). Sudan's recent conflicts have caused extensive damage to its infrastructure, threatening its capacity to conduct groundbreaking scientific research, deliver high-quality patient care, and maintain essential community awareness initiatives. This rehabilitation plan presents a comprehensive strategic roadmap to restore and modernise the MRC, ensuring it re-emerges as a resilient, world-class facility that promotes health equity, scientific research excellence, and health resilience.

Revitalising the MRC addresses both immediate structural needs and the broader, long-term challenges posed by NTDs, which predominantly impact vulnerable populations in underserved communities. The approach is holistic, combining physical restoration with human capacity development and active community engagement. Successful implementation will safeguard the center's role in fostering international collaborations, advancing research breakthroughs, and improving health outcomes for millions. In doing so, it will contribute significantly to global efforts targeting diseases that are often neglected by mainstream health agendas.

The overarching goal is to transform the MRC into a resilient, state-of-the-art institution capable of supporting advanced research, providing comprehensive patient care, and enhancing community awareness. To accomplish this, an extensive assessment of the damage caused by recent conflicts was conducted, categorising affected areas into high, medium, and low severity

zones to guide targeted repairs and upgrades. The phased approach prioritises critical repairs such as restoring structural integrity, modernising laboratories with advanced diagnostic and research equipment, and installing reliable power backups and sanitation systems to meet international standards.

Modernisation efforts will focus on upgrading laboratory and medical infrastructure with state-of-the-art diagnostic tools, and laboratory information management systems that support both clinical and research functions.

Human capacity building is a key component, emphasising staff training, recruitment of specialists, and the development of contingency plans to enhance the institution's resilience and sustainability. Equally important is re-establishing community outreach programmes aimed at raising awareness about mycetoma, facilitating early diagnosis, and reducing stigma through targeted campaigns involving local communities, schools, and health workers.

The initial phase of rehabilitation is estimated to require a total of $537,145 USD, allocated with $287,145 USD dedicated to structural repairs and infrastructure upgrades and $250,000 USD earmarked for equipment and consumables. An additional $250,000 USD post-rehabilitation budget will support ongoing patient treatment, staff training, community outreach, and operational sustainability.

Funding will be pursued through an international collaboration between health organisations, NGOs, the Sudan government, and global donors via grants, donations, and strategic partnerships, emphasising collaboration to ensure successful implementation and long-term impact.

Background

Founded in 1991 at the University of Khartoum, the Mycetoma Research Center (MRC) is the only institution of its kind worldwide and the sole WHO Collaborating Center for Mycetoma and skin NTDs. It stands as a critical cornerstone in the fight against mycetoma and other neglected tropical diseases that predominantly affect underserved populations in Sudan and the wider region. As a leading institution dedicated to patients care, scientific research, and community engagement initiatives, the MRC has played an instrumental role in advancing understanding of

mycetoma, developing effective treatment protocols, and raising awareness about this devastating disease (www.mycetoma,edu.sd).

The MRC provides care to over 12,000 mycetoma patients from Sudan and abroad and mentors 50 postgraduate students whose research has yielded an extensive body of publications. It also hosts the Mycetoma Vocational and Entrepreneurship Training Centre (SAA'ID), which equips individuals living with permanent mycetoma and other skin NTDs–related disabilities with skills and support to overcome social stigma. Moreover, the MRC runs two satellite clinics in endemic villages, offering local treatment and spearheading a variety of community initiatives.

However, during the recent conflict in Sudan, the center sustained substantial structural and infrastructural damage, compromising its ability to operate effectively. These damages threaten not only the ongoing scientific research and clinical services but also the center's long-term mission to reduce the burden of mycetoma and related diseases in vulnerable communities. Restoring the MRC to its full operational capacity is therefore imperative, not only to reinstate its vital functions but also to strengthen regional health resilience against neglected tropical diseases.

This plan presents a comprehensive and strategic plan aimed at rehabilitating and modernising the Mycetoma Research Center. The plan focuses on restoring the physical infrastructure, upgrading laboratory and clinical facilities with state-of-the-art technology, and ensuring the safety and sustainability of the premises. It also emphasises capacity building for staff, re-establishing community outreach programmes, and fostering collaborations with national and international scientific research communities and health agencies to amplify the center's impact.

By revitalising the MRC, we aim to restore its status as a sign of hope, scientific innovation, and health equity in Sudan and beyond. A fully operational and modernised facility will enable the center to continue its critical work in research, diagnosis, and treatment, ultimately improving health outcomes for thousands of patients affected by mycetoma and other neglected tropical diseases.

The successful realisation of this project depends heavily on the support and collaboration of governmental agencies, international partners, health organisations, and donors. Together, we can rebuild a resilient center capable of addressing current challenges and future health

emergencies, ensuring that this vital institution continues to serve as a leader in tropical disease research and care for generations to come.

Objectives

- Restore the structural integrity of the premises.
- Re-establish state-of-the-art laboratories and clinical facilities.
- Upgrade infrastructure to meet modern standards.
- Enhance the capacity for scientific research and patients care.
- Ensure the safety and sustainability of the facility.
- Promote community engagement and awareness.

The Rehabilitation Plan

The rehabilitation plan consists of the following components

1. **Damage Assessment**
2. **Structural Restoration**
3. **Upgrade Laboratory Facilities with Advanced Equipment**
4. **Human Resources and Capacity Building**
5. **Community Engagement and Outreach Activities Restoration**

1. Damage Assessments

A thorough and comprehensive inspection and assessment process was carried out by licensed structural engineers to evaluate the structural integrity of existing buildings. These assessments included detailed visual inspections, structural analyses, and the use of specialised diagnostic tools to identify any signs of deterioration, stress, or potential failure points within the structures. (Fig. 1)

Following these evaluations, comprehensive reports that documented the extent and nature of damage across the premises were prepared. The damage was systematically classified into three distinct zones based on severity :

1. **High-Damage Zone:**
   This area exhibited critical structural issues that pose immediate safety risks. Buildings or sections within this zone require urgent repair and reinforcement to

prevent potential collapse or further deterioration. Emergency intervention is necessary to ensure the safety of occupants and to stabilise the structures.

2. **Medium-Damage Zone:**
   Structures in this zone have sustained moderate damage that, while not immediately hazardous, necessitates prompt intervention. These repairs are essential to prevent escalation of damage and to restore the structural integrity to safe levels. Urgent but non-emergency repairs are recommended for this zone.

3. **Low-Damage Zone:**
   The damage in this zone is minor and does not compromise the overall stability of the structures. Repairs in these areas can be scheduled for a later stage without immediate safety concerns. Routine maintenance and minor repairs are sufficient to restore these sections to optimal condition.

The classification of zones facilitates prioritised planning for repair work, resource allocation, and scheduling, ensuring that the most critical areas are addressed promptly to safeguard lives and property.

Fig. 1: Damage Assessment Map

2. Structural Restoration

A. Repair or Rebuild Damaged Walls, Roofs, and Floors

- To remove and replace compromised materials, ensuring compatibility with original structures.
- To use durable, high-quality materials suited to withstand environmental stresses and future wear.
- To implement temporary safety measures during repair phases to protect staff, patients, and visitors.

B. Reinforce Structures Against Future Conflicts or Natural Calamities

- Integrate seismic retrofitting techniques to improve damage resilience.
- Strengthen foundations and load-bearing elements to resist rainfall, potential blast or conflict-related impacts.
- Install protective barriers and doors and windows where necessary.
- Ensure building codes and standards specific to the region's risks are strictly followed.

C. Facility and Infrastructure Upgrades

Modernise Electrical and Plumbing Systems

- Replace wiring with modern, fire-safe electrical systems compliant with current standards.
- Install energy-efficient lighting and smart building automation systems for better resource management.
- Upgrade plumbing infrastructure to prevent leaks, improve water pressure, and ensure sanitation standards.
- Incorporate water-saving fixtures and sustainable water management practices.

D. Install Backup Power Solutions (Generators, Solar Panels)

- Deploy high-capacity, reliable generators to ensure uninterrupted power supply during outages.
- Integrate renewable energy sources such as solar panels to reduce reliance on grid power and enhance sustainability.
- Establish automatic transfer switches for seamless power transition.

E. Improve Patient Waiting and Consultation Areas

- Redesign spaces to maximise comfort, privacy, and accessibility.

- Incorporate ergonomic furniture, adequate lighting, and climate control to enhance patient experience.
- Introduce digital check-in systems to streamline patient flow.
- Ensure compliance with universal design standards for accessibility to persons with disabilities.

3. Upgrade Laboratory Facilities with Advanced Equipment

- Design specialised laboratory spaces with proper ventilation, safety features, and containment measures.
- Procure and install state-of-the-art diagnostic and testing machines to improve accuracy and turnaround times.
- Implement digital data management systems for efficient record-keeping and result dissemination.

4. Human Resources and Capacity Building

A. Train Staff on New Equipment and Safety Protocols

- Conduct comprehensive training workshops led by equipment manufacturers or certified trainers to ensure staff proficiency.
- Develop standardised operating procedures (SOPs) for all new equipment and technologies.
- Include modules on safety protocols, infection control, and emergency response to ensure staff are well-prepared.
- Schedule refresher courses periodically to maintain high competency levels and keep staff updated on new practices.

B. Recruit Additional Personnel as Needed

- Assess current staffing levels and identify gaps in expertise, especially in specialised areas like laboratory diagnostics, clinical care, and maintenance.
- Initiate targeted recruitment campaigns to attract qualified professionals, including clinicians, laboratory technicians, support staff, and administrative personnel.
- Consider partnering with medical training institutions or offering internship programmes to build a pipeline of future staff.
- Ensure recruitment processes adhere to fair hiring practices and include background checks and credential verifications.

C. Develop Contingency Plans for Future Emergencies

- Create detailed emergency preparedness and response plans covering scenarios such as war, conflict, disease outbreaks, natural disasters, or security threats.
- Regular drills and simulations should be conducted to test readiness and identify areas for improvement.
- Train staff on crisis management, communication protocols, and resource mobilisation during emergencies.
- Establish a stockpile of essential supplies, including PPE, medicines, and backup power sources, to ensure rapid response.
- Coordinate with local authorities and community partners to streamline emergency response efforts.

5. Community Engagement and Outreach

A. Re-establish Community Awareness Programmes

- Launch targeted awareness campaigns using local media, community meetings, and informational materials to educate the public about mycetoma and other health issues.
- Develop culturally sensitive messages to dispel myths, reduce stigma, and promote early diagnosis and treatment.
- Involve community leaders, traditional healers, and volunteers as health ambassadors to foster trust and participation.
- Organise outreach events such as health fairs, screening camps, and educational workshops to increase community engagement.

B. Collaborate with Local Health Authorities and NGOs

- Establish formal partnerships with government health departments, NGOs, and international agencies to coordinate efforts and share resources.
- Align rehabilitation and outreach activities with national health strategies and programmes.
- Seek technical assistance, funding, and logistical support to enhance service delivery.
- Participate in joint planning, monitoring, and evaluation to ensure programme effectiveness.
- Promote scientific research and education on mycetoma prevention

- Support research initiatives aimed at understanding risk factors, transmission, and effective prevention strategies.
- Develop educational materials and curricula for schools, community groups, and healthcare providers to increase awareness.
- Encourage community-based participatory research to incorporate local knowledge and address specific needs.
- Advocate for policy development and resource allocation dedicated to mycetoma prevention and control.
- Facilitate training of community health workers to serve as frontline educators and early detection agents.

The expected outcome and impact

- The successful implementation of this rehabilitation plan is expected to yield significant outcomes and positive impacts both locally and globally. The immediate outcome will be the restoration of the Mycetoma Research Center's structural integrity and operational capacity, enabling it to resume and expand its critical functions in scientific research, patient care, and community outreach.

- The upgraded infrastructure and state-of-the-art laboratory facilities will facilitate more accurate diagnostics, advanced research, and effective treatment protocols, ultimately leading to improved health outcomes for patients suffering from mycetoma and other neglected tropical diseases.

- Enhanced staff capacity and the development of contingency plans will ensure the center's resilience against future crises, maintaining continuous service delivery and scientific activity.

- On a broader scale, this plan will strengthen regional health systems by establishing a resilient, modern institution capable of serving as a regional hub for research and treatment of NTDs.

- The increased community engagement and awareness programmes will promote early diagnosis, reduce disease stigma, and encourage community participation in health initiatives, fostering a culture of health literacy and proactive disease management.

- The center's ability to foster international collaborations and research breakthroughs will contribute to global knowledge and strategies aimed at controlling and eliminating mycetoma and similar diseases.

- The long-term impact of this plan extends beyond immediate health benefits. It will contribute to reducing health disparities among vulnerable populations, promote health equity, and support Sustainable Development Goals related to good health and well-being.

- By positioning the MRC as a leading research and healthcare institution, the plan will attract further funding, partnerships, and expertise, creating a sustainable model for ongoing innovation and capacity building.

- Ultimately, this initiative will not only improve disease outcomes but also strengthen regional health resilience, empower communities, and elevate Sudan's role in global health efforts against neglected tropical diseases.

Urgent Budget Estimate

Item	Estimated Cost (USD)
Structural repairs	287,145
Equipment, furniture and consumables procurement	250,000
Total	537,145

Less urgent Budget after the rehabilitation

Item	Estimated Cost (USD)
Patients treatment	100,000
Staff training and capacity building	100,000
Community outreach programs	50,000
Total	250,000

Implementation Timeline

Phase	Duration	Timeline
Assessment and Planning	1 month	Done
Structural Repairs	3-4 months	
Infrastructure Upgrades	2-3 months	
Equipment Procurement & Installation	2 months	
Staff Training & Community Outreach	Ongoing	

Funding and Partnerships

- Seek funding from international health organisations (DNDi, WHO, WHO-EMRO, NGOs).
- Collaborate with local government and health authorities.
- Explore grants and donations from global health donors.

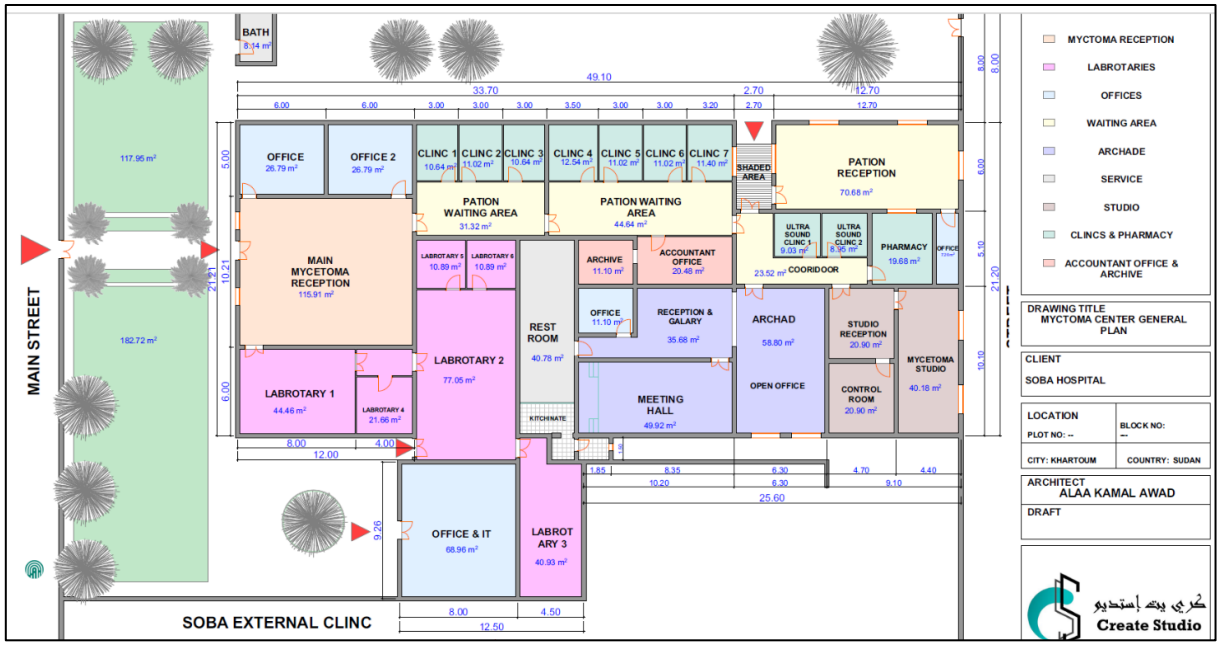

Fig. 2: The Mycetoma Research Center Master Plan

Fig. 3 The Mycetoma Research Center Google Map

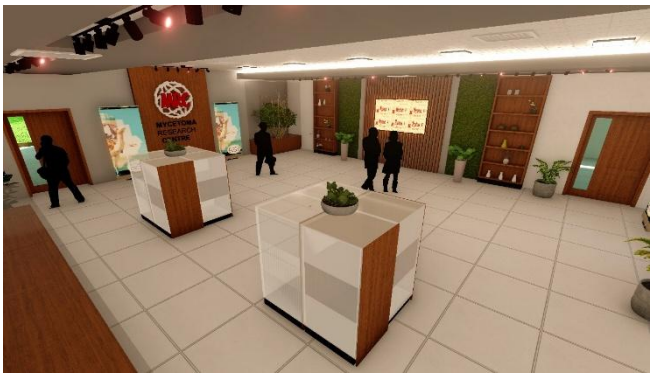

Fig 4: Design of the new reception