African Centers of Excellence II

Environment and Social Management Plan (ESMP)

MAKERERE  **UNIVERSITY**

African Center of Excellence in Materials, Product Development and Nano-Technology, MAPRONAO, Uganda

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PART I: Activity Description

1. Introduction

The GDP of countries in the Great Lakes is still largely dominated by primary products which have led to unfavorable balance of payments, low skills transfer and development, low levels of employment and poverty. Today, technology development in Great Lakes countries is generally characterized by low levels of science and technology resulting in development of products that have low value, low quality and low standards. In addition to the problem of exporting primary products with limited value addition, the Great Lakes region is facing challenges related to low electricity coverage for both domestic and commercial use, dependence on unsustainable biomass particularly charcoal and wood as cooking fuel, inadequate clean water supply, inadequate sanitation facilities, and an increase in diseases like Cancer in addition to high prevalence of HIV and Malaria. Uganda's Vision 2040 highlights nanotechnology as a driver towards attaining middle income status. Such an approach on focusing on advanced technology has transformed the economies of China, Brazil, Taiwan and India.

To compound this, the current alignment of universities, research centers and higher institutions of learning in the Great Lakes region cannot contribute to solving any of these problems because of their self-imposed restrictions to a single area of study. This rigid non-translational structure has resulted in spectacular failure for the problems affecting the Great Lakes region to be researched and solved in a cross-cutting and multi-disciplinary way. In order to solve these challenges, the MAPRONANO ACE will provide training to over 80 Master's students in two new Master's programs in nanotechnology, Materials and Product Development. Short courses such as Health and Safety Engineering, Oil and Gas Technology, Product Design and Development and Welding Technology will be provided to 200 industry professionals and policy makers over a four-year timeline. The PhD training in the MAPRONANO ACE will focus on: Materials and product development; Nano-technology innovations for the Great Lakes region; and, Nano-medicine. The MAPRONANO ACE will train 12 PhD students. In order to build regional linkages half of the places available for Master's and PhD training will be reserved for students outside Uganda. The MAPRONANO ACE will develop state of the art Laboratories in Nano characterization and product development. These labs will provide testing and quality assurance services to industry in the great lakes region so that the products that they develop will be of high quality and standard. The MAPRONANO ACE has national, regional and international partners associated with it.

2. Project Objective

The MAPRONANO ACE will focus on enhancing materials and product development through value addition. The MAPRONANO ACE will utilise nanotechnology to solve problems in the areas of energy (e.g. in solar technology, wind, etc.), oil and gas production, medicine (for cancer therapy, diagnostics, and tissue engineering), material and product development (e.g. raw material extraction, value addition, etc.), and environmental applications (e.g. bio-remediation, water filtration and purification etc.), Nanotechnology presents possible solutions to mitigate these problems in the Great Lakes region.

3. Project description

The MAPRONANA ACE will develop two Master's programs which are Master of Science in Nanotechnology and Master of Science in Materials and Product Development. Each of these Masters programs is expected to train over 68 students over a period of 4 years which implies that over 68 Master's graduates will be produced by the MAPRONANO ACE. The intensive training provided through the Masters in Materials and Product development is intended to urgently fill the gap required in promoting value addition of primary produce in the Great Lakes region. It is expected that the trained graduate students will have a direct impact on industry. Additionally, both Masters programs will have about 10 places reserved for industry professionals and policy makers who will also enhance direct impact on value addition in materials and products produced. The Masters in Nanotechnology is important for the purpose of building a critical mass within the Great Lakes region with knowledge, skills and understanding on nanotechnology. The over 60 trained graduate students will produce nano-related solutions to problems of energy, water and environments affecting the Great Lakes region.

From a research view-point, the Materials and Product Development theme focuses on value addition of raw materials for the explicit purpose of enabling industries in the Great Lakes region develop products that are of high quality and of internationally accepted standards. This research theme is expected to train 4 PhD students. One interesting example is the transportation of oil and gas along the pipeline from Uganda to Kenya. The quality of Uganda's oil is known to be high; however, it also has abrasives. If not carefully catered for in the design of the pipeline, it is possible that these abrasives will cause the pipe to lose it structural integrity as a result of surface wear. The application of thin films at nano-scale which are wear resistant can increase the life of the pipeline. This is an example of how nanotechnology can be used to enhance product development and value addition for the nascent oil and gas sector in the region.

Nano-technology innovations will focus on state of the art research on energy, water and the environment. These are critical components in relation to combating climate change and yet they are also very important for both Human and National development. Nano-technology innovations in solar technology, water purification, environmental bio-remediation, thin film technology and applications in oil and gas production shall be sought. Another 4 PhD students shall be trained under this research theme. The third component of MAPRONANO ACE shall be Nano-medicine. The high incidence of certain diseases within the Great Lakes region like Ebola, Malaria, Cancer and HIV requires more effort be made locally to understanding the diagnostics and treatment options for these diseases. 4 PhD students shall be trained under this research theme. Nano-medicine is inherently linked to materials and product development because drug delivery systems and components, implants and tissue engineering need careful design considerations between the body, mechanical and electrical component in order to be effective and have potential applicability. In total the MAPRONANO ACE intends to train 12 PhDs in three different research themes over a period of 5 years. This will provide a potentially large number of highly trained researchers who will drive the research agenda in the Great Lakes region for the next 30 to 60 years. The MAPRONANO ACE will tap into its network of local, regional and international partners to ensure that the PhD students receive the best supervision. One major complaint from industry in the Great Lakes region is the low capacity to test the quality of their products against international standards. The MAPRONANO ACE will procure the latest state of the art equipment required for materials (nano) testing and characterization. Product development laboratories and rapid prototyping equipment will also be sought. Industry in the Great

Lakes region is willing to pay for testing if it will provide their products with a quality assurance mark that will be acceptable in the international market.

This collaboration with industry will also provide additional income to the MAPRONANO ACE.

4. Environment and Social Footprint/Impact

The project aims at research activities and training graduate students to developing their practical and academic skills for the regional and international market needs. The foreseen environmental and social risks and impacts are very minimal to negligible. The negative impacts are localized, site specific and easily manageable.

5. Policy, Legal and Administrative Framework

The phases of the proposed project that include preparation and implementation are guided by national environmental legislation and the World Bank operational safeguard policies OP/BP 4.01. The project will maintain compliance to the above requirements throughout the project period.

6. Relevant World Bank Policies

World Bank operational safeguard policy, OP/BP 4.01(*Environmental Assessment) is* applicable to this project. The prepared ESMP therefore is a demonstration of compliance to the World Bank safeguard requirements.

7. Implementation Arrangements

The governance structure of the MAPRONANO consists of a core management team, a national and international advisory board and 3-4 staff members. The management team consists of the center leader, deputy center leader, Projects coordinator and Monitoring and Evaluation Officer. The National advisory board consists of members from College of Health Science, Uganda Cancer Institute, Uganda Industrial Research Institute, and Uganda National Bureau of Standards. Uganda Industrial Research Institute and Uganda National Bureau of Standards are under the Ministry of Trade, Industry and Cooperatives and as such will provide policy guidelines to the MAPRONANO center. The international advisory board consists of members from University of Nairobi (Department of pharmaceutics and pharmacy practice, Department of pharmaceutical chemistry), University of Illinois at Chicago, CSIR-Indian Institute of Toxicology Research, Prime Business LLC and Malsch Techno Valuation. The ACE will focus on three major areas which include: Nano-medicine, Nanotechnology for innovation in great lakes and Materials and Product development. As such the center will employ 3 – 4 supervisors with expertise in these areas. This clear governance structure will enhance MAPRONANO ACE's ability to acquire more sustainable financing in the medium and long term.

The center will follow Makerere University Financial management and procurement policy infrastructure and manual. The center assistant accountant will serve as the link between the center and the University for Accountability and timely execution of financial transactions. Makerere University uses financial packages like Sage, Quick Book; it also has in place financial regulations and Grants Management units with highly qualified accountants with considerable experience in financial and management accounting. The center and the University will follow World Bank procurement policies and procedures. Makerere University has strong internal and external auditors responsible for the auditing of the accounts of the center.

Makerere University has the required procurement structures/systems in place and qualifies as a procurement entity. Each college has a highly qualified procurement Officer responsible for the Procurement processes for each college. The University is also guided by the legal framework of PPDA act, 2003. Furthermore, the entity has a Procurement committee, Procurement Evaluation panels and procurement boards. The procurement unit of the college has a fundamental role in ensuring that goods and services for externally funded projects are procured in a timely manner based on approved budget lines and specifications. The MAPRO-NANO ACE will adhere to highest standards of ethics and integrity in all its financial and procurement transactions. The World Bank's Policy on corrupt and fraudulent practices will be followed and the guidelines will be firmly enforced and all the MAPRO-NANO management team will be educated on these guidelines.

8. Environmental and Social Screening, assessment and management The preparation of the ESMP was based on the Environment and Social Management Plan for ACE

9. Potential Environmental and Social Impacts

The potential impacts include minimal to negligible disruption to air and water quality and noise pollution. The project will be housed in already existing building at the College of Engineering, Design, Art and Technology, some part of the activities will be housed at the College of Health Sciences, at Mulago hospital. The ESMP has adequate provision for the mitigation of all possible impacts.

10. Environment and Social Management Approach

The ACE proposal has attached EMP checklist that has been completed and disclosed at the institutional and World Bank website to comply with environmental and social safeguard. The project team at Makerere University will work in consultation with the World Bank team to implement the ESMP. The Team at Makerere University has adequate knowledge on safeguard to implement the ESMP recommendations.

11. Monitoring and reporting

Monitoring and evaluation activities within MAPRONANO ACE will contribute to all project objectives, ensuring that project development objective (PDO) is achieved. The results of the MAPRONANO monitoring and evaluation activities will be the

accomplishment of performance-based indicators, such as number of students enrolled and staff hired, facilities becoming fully operational, etc. Disbursement of funding will depend on meeting these indicators to the extent feasible.

PART II: ENVIRONMENTAL AND SOCIAL SCREENING

S/N	Center Name	ESMP required?	Issues	Mitigation Measures
	Uganda– Africa Center of Excellence for Materials, Product development and Nanotechnology - MAPRO-NANO	Yes [√]	**1. Refurbishment** • Increase in dust and noise from demolition and/or construction • Construction waste generated during demolition of walls for creation of laboratory space • Equipment installation and optimization conditions	**Air Quality** (a) The MAPRO-NANO ACE will ensure that demolition debris is in a controlled area and spray with water to reduce debris dust (b) The workers will also wear Protective gears (mouth masks) to prevent inhalation of the dust. (c) The surrounding environment/corridors will be kept free of debris to minimize dust (d) Training of staff personnel in safety measures to avoid accidents that may arise from the demolition (e) The creation of space/demolition works will also follow University policy and guidelines. (f) The MAPRO-NANO ACE will subcontract a Waste disposal company for disposal of any waste that may arise from the demolitions; strict adherence to NEMA guidelines will also be followed. (g) For any burnings that may arise, the College of Health Sciences which is partner for the MAPRO-NANO ACE has well-built incinerator which will be used in case there is any hazardous waste that may need incineration. (h) The University has medical insurance for its entire staff and therefore for any emergencies/traumatic injuries or any respiratory complications that may arise from exposure to the dust (i) First Aid Boxes will also be implemented in all work sites as stipulated in University Guidelines. (j) works involved in repair of Equipment, installation, Refurbishment or any other construction activities (demolition/extensions) meet appropriate standards of responsible environmental management and safety practice (k) The MAPRO-NANO ACE project monitoring and Evaluation programme will also include inspection of safety equipment use

				Noise (a) The noise that may be generated during Equipment installation, demolition works will be limited to restricted times during day time and also ACE will strictly adhere to University policies for mitigation of Noise. people working in offices around the site are not adversely affected by noise due to the activities at the construction sites, quarry and borrow pit areas (b) During operations the engine covers of generators, air compressors and other powered mechanical equipment will be closed, and equipment placed as far away from residential areas as possible (c) The MAPRO-NANO ACE will also hold focus group discussions with Hostel owners, shop attendants and other tenants at the University on possible ways to abate Noise pollution. (d) Sensitization and discussion with residential and office workers around the sites about the working hours and the impact of noise (e) use of hearing protection gears by workers when exposed to noise levels above 85 dB (A) (f) Fitting proper mufflers to construction equipment or any other equipment to minimize noise pollution (g) Noise abatement on refurbishment/demolition works for laboratory Equipment will be minimized through emphasizing working during day time

				Water Quality (a) Precaution measures will be put in place to avoid oil spillage from mechanics works or any other Equipment into the water system of the University (b) Standard operating procedures/Protocols for ensuring water safety as stipulated by NWSC guidelines and University policy will be adhered to (c) Safety measures under the University framework for protection of drinking water system such as avoidance of spillage of toxic chemicals /biological organisms in water drainage systems will be adhered by all staff in the ACE. **Fires** (d) Fire extinguishers will be installed in all laboratory and working environments of the MAPRO-NANO ACE (e) Staff will be oriented on safety measures for mitigating exposures to fire outbreaks and also good working practices within the University Safety Practices. (f) The MAPRO-NANO ACE will also have contacts with Fire Brigades so as to avoid the risk of property destruction or for timely interventions. (g) Highly combustible chemicals/consumables will be kept away from Non-combustible chemicals but also following standard laboratory practices such as ensuring the implementation MSDS (Materials Safety Data Sheet). (h) Smoke detectors have been installed in most of the labs /infrastructure as per the University framework. **Waste Management** (a) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities. (b) The records of waste disposal will be maintained as proof for proper management as designed.

			2. Handling/ management of medical waste in the MAPRO-NANO ACE • Biomedical waste from research work/ micro-organisms/biological samples • Clinical waste from patient samples • Consumable reagents used in the labs which toxic/corrosive • Radioactive waste, organic domestic waste • Disposal of all biomedical/medical waste during Nano-medicine research at the college of Health Sciences at Makerere University • Ethical issues on use of Human subjects/animals and test of new devices	**Medical waste management /Mitigation** (a) Standard Biosafety guidelines, SOPs/Protocols in the labs at the College of Health Sciences and College of Engineering will be adhered during research and all project activities (b) The College of Health Sciences is well equipped with an Autoclave for sterilization of all biomedical waste before disposal. (c) The transportation of any laboratory samples will follow standard operating procedures within the University framework. (d) Packaging and transportation of all biological samples will be in bio-hazard bags and will be approved by an accredited lab. (e) Transportation of samples internationally will follow IATA guidelines. (f) MSDS will be installed in all the upgraded labs. (g) The management of all waste will follow Mulago policies and NEMA guidelines (NEMA act, 1999). (h) Short courses on Good Laboratory Practice will be offered to all staff. (i) Vaccination of all staff working on biomedical waste is a must. (j) Medical insurance is part of the University policy for all staff. (k) Appropriate storage facilities for medical waste and disposal are in place; and If the activity includes facility-based treatment, appropriate disposal options are in place and operational such as incinerator at Mulago Hospital (l) The ACE will also use available IRB bodies at the College of Health Sciences and College of Engineering to mitigate any Ethical issues involving use of Human subjects/human samples, test of new devices or products on Humans, the ACE may also have to follow FDA

				guidelines for test of new devices/prototypes and Conducting clinical trials. (m) Ethical approval for research will also be sought from UNCST. (n) Standard protocols for respect of animal rights for use in Experimental studies especially during Nano-medicine research and innovations will be adhered to by all the staff.
			3. <u>Legal and social implications</u> • Societal aspects on Technology development • Government policies on technology and innovation • Technology standards development • IP issues	**<u>legal issues</u>** (a) The MAPRO-NANO ACE will follow NSTIP policy guidelines under the custody of Uganda National Council for Science and for materials, product development and Nanotechnology innovations and Nano-medicine. (b) The MAPRO-NANO ACE will also respect IP issues and copyrights that may arise from the research that is done collaboratively. (c) The University has a well streamlined policy framework on IP patents and copyrights and also works hand in hand with the UNCST (d) The ACE will also support staff for trainings in standards development for nanotechnology, materials and product development (e) The ACE will design short courses organize stake holder meetings in Nano-ethics and responsible nanotechnology development for the staff, students and the society.

PART C: MONITORING PLAN							
Phase	**What (Is the parameter to be monitored)**	**Where (Is the parameter to be monitored)**	**How (Is the parameter to be monitored)**	**When (Define the frequency / or continuous?)**	**Why (Is the parameter being monitored)**	**Cost (If not included in project budget)**	**Who (Is responsible for monitoring)**
During activity implementation	Water quality	Onsite monitoring	Water quality tests including mineral load	Once a year during the project life time	Safeguard safe water for use by population		Project Administrator
	Air quality	Onsite	Air quality indicators such as percentage of dust/carbon	Twice monthly	Safeguard clean air working environment		Project manager
	Waste disposal	On site trash bins	Identify type and amount of disposable waste	Weekly basis	For a clean and health working environ		Project Admin

ANNEX A : PUBLIC CONSULTATIONS

Country – Center of Excellence	Date of consultative meeting	Stakeholders present	Issues raised	Response to the issues
Uganda- Africa Center for Materials, Product development and Nano –technology (MAPRO-NANO)	18th December, 2015	CEDAT and MakCHS management	Implementation and Review of existing MSDS to Cater for new Labaratory consumables that may come in as result of refurbishment and commissioning of new Equipment	Members agreed on reviewing of SOPs and MSDS documents in all the existing labs to cater for safety concerns
		MakCHS, CEDAT technical staff	Plan to have short courses for occupational health and safety for all students (MSc/PhD) and staff at the beginning of the programs	Members agreed to have short training courses on biosafety issues at the time of commissioning of new Equipment
		MakCHS, CEDAT technical staff	Plan to organise a consultative meeting with some of the Advanced partners on training on Biosafety issues associated with new Equipment	Members agreed this will form part of the activities at start of First year at the time of Equipment procurement.
		MakCHS, CEDAT technical staff	The need for a Project Occupational Health and (OHSA) Safety Officer	Members agreed to use the Safety Officer within the University framework
		MakCHS, CEDAT technical staff	Members highlighted on the existence of a Biosafety law at UNCST	Members agreed to consult the Biosafety law at UNCST