Executive Summary

"Sustainable Development Policies and Decision-Making with Distributed Simulation on Transition to Clean Renewable Energy"

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Project Executive Summary

1. Overview
The Problem: Fossil fuels that are a blessing and a curse for developing countries. They help develop the economy with foreign investments and local jobs and they generate revenues from exports. However, fossil fuels can also cause an enormous economic dependence at the expense of any other domestic development. Country revenues from fossil fuel exports are volatile with the world price of the fossil fuels. In addition, major foreign energy companies extract significant economic concessions from the developing countries in order to make attractive investments. In fossil fuels projects in developing countries the primary concerns of the foreign investor/operator companies are maximizing energy production, exports, and return on investment, even if at the expense of the country's social economic, and environmentally sustainable development goals. For example, the "Nigerian Government is conscious of the over-dependence on crude oil, which constitutes about 95% of the country's generated revenue" (Reference (1)). No policies have yet been implemented in ECOWAS for clean renewable energy. Major reasons for the slow progress on reducing GHG emissions and increasing the use of renewable resources are lack of leadership and framework for evaluating energy policy.

Our Proposed Solution: Sustainable, efficient, and cost-effective clean renewable energy policies, technologies, and investments are key drivers to grow the local economy and improve peoples' education and health in developing countries. **Our project and proposed solution focuses on developing dynamic simulation models and analyses for evaluating and implementing effective policies for transition to clean and renewable energy in ECOWAS countries in Africa by working closely with participating universities in ECOWAS.** The end result of this project will develop a strong network for e-learning and e-healthcare. The project will evaluate proposed new policies on transition to renewable and clean energy for impact on jobs, sustainable cities and rural areas with clean electricity and transport systems, commercial trade, and economic growth. Clean renewable energy policies in Africa will be evaluated for less pollution from carbon and other emissions, and improvements on clean water, climate change, and public health.

The Policy-Making New Process: Each country's energy policy impacts neighboring countries in terms of jobs and economic growth; resources like water, forests, oil/gas etc.; agriculture, food, and hunger; trade, exports, and imports; and health and epidemic disease. Energy policies impact several sectors of each country, the region, possibly the world. Education and training on the potential benefits and negative impacts of effective policies for transition to clean and renewable energy is necessary. However, most nations need to significantly improve their current pledges and plans for clean and renewable energy. Such ongoing plans, education, and training require new tools with rigorous simulation models (References (2) and (3)) and online e-learning to meet each country's stated most important Sustainable Development Goals (SDGs). Each country submitted its official pledge for SDGs (including Clean Energy SDG #7) to the United Nations in December 2015 (Reference (4)). This process requires regular and transparent global cooperation among all stakeholders with collective and shared responsibilities across countries.

We plan to develop for each ECOWAS country a dynamic simulation model tailored for the economic sectors and factors that are important to that specific country, by working with local in-country experts. We will interlink the sector models for Clean Energy and the few other SDGs important to each country with a system dynamics solver and/or NASA's Distributed Observer Network. We will produce a single country model for each ECOWAS country. The Pilot Case countries are Nigeria and Ghana, and we will then adapt the models of other ECOWAS countries. Then we plan to interlink those individual countries' simulation models with our proprietary technology through broadband Internet to form the aggregate model for "**Electronic ECOWAS**." This simulation and education methodology for transition to clean and renewable energy in ECOWAS countries can be used as a prototype for assessment and policy-making for other developing countries and sectors, e.g., agriculture, healthcare, epidemic disease etc., based on creating and using the appropriate models.

2. Our Request for Funding this Project
We are requesting funding in the range of US $0.75 million (3 years) for this project based on the scope and depth of study and simulation models to be mutually agreed with Grantor of funds.

3. Intellectual Merit

The most significant contribution of this project is its transformational use of stakeholder-crafted models for developing sustainable strategies and leveraging a critical mass of global expertise for national level   problem solving and policy making. Our multi-disciplinary, multi-institutional project team consists of academics, researchers, and business persons with   substantial experience in using modelling and simulation for country development objectives. We will create a global   network of federated and standardized system models of national sustainable development that can collect and   share data on complex energy, healthcare, and natural resource management problems. This is   an unprecedented effort that could transform the effectiveness of sustainable development and foster global   collaboration in solving "wickedly complex" problems. Pioneered in the aerospace and military industries, distributed simulation using a global virtual super-computer through broadband Internet has never been implemented for a socio-economic-energy-environment system context yet.

4. Broader Impact

This initiative is unique in that it integrates advances in understanding complex development problems through modelling, simulation, and negotiation. The project will train and educate young decision-makers from developing nations in systems   thinking for sustainable development. The   initiative will engage and serve under-represented populations and will enhance broader societal   welfare within the target countries. It also will create an infrastructure for building an unprecedented global network of   decision-makers, academics, and commercial practitioners, who can share knowledge, expertise and data to formulate effective country policies on energy. This cyber   infrastructure will allow large-scale education and training through gaming and simulation. We will provide to ECOWAS countries global e-learning and e-healthcare from; Columbia   University SIPA (Emerging Country Oil Negotiations), NY; Stevens Institute of Technology (Computing, Simulations, e-learning), NJ; NYU Tandon School of Engineering, (Energy Technologies and e-learning), NY; University of Tampere, Finland; Mayo Clinic (e-healthcare), MN; University of California, CA; United Nations Development Economic and Social Affairs (UN-DESA), NY; NASA SEE (Simulation Exploration Experience & KSC), FL; International Research Society on Methodology of Societal Complexity, Amsterdam, The Netherlands, etc. Higher educational and healthcare institutions will affiliate with the Global University System of UNESCO Unitwin Chair program at the University of Tampere, Finland. As a different project, we will create simulation models for additional countries, creating the **Global Early Warning System (GEWS),** the "**Electronic African Union**", and   the "**Electronic United Nations**."

5. Project Implementation

When this proposal is awarded, we will embark on the "ECOWAS Energy Transition Project." We will first develop the Nigeria and then Ghana Energy Transition simulation models and adapt them to other ECOWAS countries. We will use the dynamic simulation models and role-playing negotiations to assess policies for transition to clean and renewable energy (solar, wind, biomass etc.) and to reduce emissions of carbon dioxide and pollution. We will survey and analyze the best technologies and foreign vendors available for clean and renewable energy, training, and manufacturing capabilities in ECOWAS countries. We will also assess the impact of energy policies on creating new jobs, investments, economic growth, e-learning education, and e-healthcare in urban/rural areas of Africa. We will educate and train ECOWAS policy-makers, managers, workers, and students in sustainable energy development strategies and policies. This project's implementation will occur in four phases (Reference (5)) over 3-4 years:

Phase 1: Develop Dynamic Simulation Models for Clean Renewable Energy in ECOWAS countries
Phase 2: Use Models to Measure Impacts from Clean Renewable Energy in ECOWAS countries and region
Phase 3: Results of Simulation Models, Role-playing Negotiations, Surveys & Analysis of Energy Tech and Vendors
Phase 4: Educate and Train via e-learning and e-healthcare modules

6. References

(1) Nigerian Economy: <http://www.nigeriaembassyusa.org/index.php?page=economy>
(2) Video 9 min, You-Tube, The iSDG Model: <https://www.youtube.com/watch?v=Kc9rBwtrV00>
(3) Description of "integrated SDG" (iSDG) Model: <http://www.isdgs.org/#!documentation/kri3x>
(4) United Nations Sustainable Development Goals: <http://www.un.org/sustainabledevelopment/>
(5) "Sustainable Development Policies and Decision-Making with Distributed Simulation on Transition to Clean Renewable Energy" (Aug 11, 2017) <http://tiny.cc/3xz1my>