GLOSAS/USA

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The Global Knowledge Center Network (GKCN) with The Global University System (GUS)

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Synopsis

SUMMARY: The highly interconnected and coupled nature of energy, healthcare, food security, natural resource management and sustainable economic growth have in the past stymied the effectiveness of traditional international development efforts focused on each of these areas in isolation. The aim of this combined research and education initiative is to engage national and international stakeholders in jointly developing customized national sustainability simulation models that can explore the comparative effectiveness of development interventions from a systems perspective. Specifically, the initiative proposes to bring together young decision-makers from selected countries of the **Economic Community Of West African States** (**ECOWAS**) with academics and development practitioners from the United States, Asia, Europe and Africa.

We will form a coalition among the members of the ECOWAS to study their co-prosperity, which will later be expanded to other regions of the globe. They will focus on subjects such as the management of water in crucial river basins, education, telemedicine, and democratic processes.

OBJECTIVES AND METHODS: At our workshop we will demonstrate the **Global Knowledge Center Network (GKCN)** concept of the combined use of normative (role-playing) gaming and quantitative (model-based) simulation with distributed simulation mode under the auspices of the School of International and Public Affairs (SIPA) of Columbia University. Our model is Nigeria, which depends heavily on revenue from petroleum exports. We will examine the effect that energy policies regarding the increased use of renewable energy sources around the world, especially in the USA, have on Nigeria.

PURPOSE: Our purpose is to establish a high-technology system that will train young bureaucrats and decision-makers, particularly women, to better manage resources vital to national prosperity in their countries. This training is for leadership skills, conflict resolution and management, negotiation around scarce resources, increasing population and climate changes. The GKCN will foster a rational, fact-based process for developing plans and policies.

SYSTEM: The socio-economic-energy-environment simulation models in each of participating countries of our GKCN project will be interlinked together through broadband Internet, thus forming distributed simulation mode with massive parallel processing simultaneously. This will form a global model for globally collaborative analysis of issues faced by the participating stakeholders that could provoke confrontation, and matters relevant to economic expansion and individual wellbeing. The result is a peaceful road to increased prosperity. The **Global University System (GUS)** (a UNESCO program initiated with funds from the World Bank and the NSF) is a companion global alliance of major universities that will support GKCN in finding, collecting, model building, maintaining, and processing data.

INTELLECTUAL MERIT: We work closely with the ECOWAS through our major partner, the Millennium Institute. Schools participating in GKCN/GUS are numerous, including Stevens Institute of Technology, School of International and Public Affairs (SIPA) of the Columbia University, University of Tampere in Finland, University of Tennessee, and others.

GKCN represents substantial paradigm shifts, including:

(i) Gaming and simulation based on facts and figures rather than exclusively upon insights, habits or traditions, transforming adversaries into collaborators for confrontation prone problems;
(ii) The development of global “virtual” supercomputer capacity with globally scattered simulation models, which would become a single global model linked through broadband Internet;
(iii) A hands-on experiential learning apparatus for people who hold leading positions and those training for similar roles, with a special emphasis on women’s participation.

We will perform a series of face-to-face workshops and online meetings over the following years in Nile River basin countries in east Africa for its water management, Democratic Republic of Congo (DRC), Russia, Scandinavia, Bangladesh, Japan, etc.

The most significant contribution of this project is its transformational use of stakeholder-crafted models for developing sustainable development strategies, leveraging an unprecedented critical mass of global expertise for national level problem-solving. The multi-disciplinary multi-institutional project team consists

of academics and researchers with substantial experience in using modeling and simulation for development objectives, supported by the Millennium Institute and the ECOWAS. The creation of a global network of federated and standardized systems models of national sustainable development is an unprecedented effort, since it will collect and share data on complex energy, healthcare, food security and natural resource management problems. It will transform the effectiveness of development efforts and foster global collaboration in solving "wicked" problems collectively.

BROADER IMPACTS: This initiative is unique in that it integrates advances in understanding complex development problems through modeling and simulation with training and educating young decision-makers from developing nations in systems thinking for sustainable development. Given its developing country focus and gender empowerment objective, the initiative will both engage and serve underrepresented population groups and potentially enhance broader societal welfare within the target countries. At later stages, the team plans to leverage resources from other agencies and donor countries to develop dozens of additional national sustainable development models, creating a larger and more effective global network in the form of a **Global Knowledge Center Network (GKCN)**, serving as simulation and gaming hub for global sustainable development efforts focused on energy, healthcare, food security and natural resource management.

1. Project Description:

1.1 Background:

The **Global Knowledge Center Network (GKCN)** is a technically sophisticated, computer-based network that combines data from individual disciplines into practical strategies of intervention and progress. The GKCN is a unique research and education initiative with broad applications. Using high technology, it engages national and international stakeholders in seeking out and defining effective development interventions. Its foundation is a systems perspective that is goal-oriented.

1.2 Objectives:

This GKCN project will foster rational scientific thinking and methodology for policy analysis, evaluation and planning among young bureaucrats and aspiring decision-makers. This will equip them to implement effective strategies in areas such as energy management, sustainability of the environment, and the various components of national prosperity. They will learn the strategic use of technologies and the importance of cooperation as they seek effective advocacy, informed policy, public understanding and participation, and concrete community development. This training is for leadership skills, conflict resolution, management, and negotiation around scarce resources, increasing population and climate changes. In each country, GKCN will have a national simulation model, all of them interlinked through broadband Internet to form a global model for globally collaborative peace building. The resulting system can effect positive change for millions in developing regions.

They will conduct the followings;

1. To identify key/critical drivers/root causes of national and regional developing problems and explore highly effective system-level solutions,
2. To share best practices amongst GKCN centers, enabling participatory democracy and community/societal ownership of development processes,
3. Integrate systems approaches as a key element within development policy and build capacity to leverage such approaches within decisions-makers and youth/women.

The aim of this combined research and education initiative is to engage national and international stakeholders in jointly developing customized national sustainability simulation models that can explore the comparative effectiveness of development interventions from a systems perspective. This network will be a forum for addressing economic, social, and environmental issues.

Our main objective will be to initiate a ***paradigm shift in international political science*** in utilizing both "normative (role-playing)" gaming and "quantitative (model-based)" simulation approaches for globally collaborative education and training.

This initiative is unique in that it integrates advances in understanding complex development problems through modeling and simulation with training and educating young decision-makers from developing nations in systems thinking for sustainable development.

1.3 Activities:

This initiative will bring together young decision-makers from participating countries to jointly craft socio-economic-energy-environmental simulation models for their respective countries, which will be interlinked together for their collaborative policy analysis on their co-prosperity. They will learn from and collaborate with their counterparts in the other countries to develop more effective policies for sustainable development.

1. Look at local/provincial/state/national problems through systems approach-based gaming and simulation together with respective national stakeholders (National regional)
2. To create a network interlinking the various national models through establishment of GKCN in higher education institutions within developing countries

We will establish a high-technology system – a network of mini-supercomputers and individual laptops programmed with GKCN software -- that will train young bureaucrats and decision-makers, particularly women, to better manage resources vital to national prosperity in their countries. The GKCN will foster a rational, fact-based process for developing plans and policies.

In a sense, this project envisions future direction toward establishing trans-border governance institutions, which include trans-governmental networks, multi-stakeholder initiatives, voluntary regulations and innovative tools for adjudication and financing offering functional benefits over more "traditional" governance arrangements.

1.3.1 Capacity Building with Distributed Simulation:

The repetitive mode simulation approach of our GKCN can create simulator/trainer for government bureaucrats and future leaders for their capacity building on policy analysis, evaluation, with hands-on experiential learning in global collaborative fashion, thus building trust and comradeship. Instead of simulating all countries in a single aggregated simulation model, this distributed simulation approach emphasizes the uniqueness of each country for the sake of accuracy. This approach also encourages participating local stakeholders to take ownership.

The dynamic simulation tool will support comprehensive, integrated long-term national development planning. This is because it will provide comparative analysis of different policy options, and help users identify policies that lead to a desired goal. This will expand insight into how different indicators of development interact, and deepen the understanding of development challenges. The simulation model is built on the philosophy that national planning is an integrated process; that economic, social and environmental variables must be considered to achieve sustainable development. This is especially useful for preparing Poverty Reduction Strategies that emphasize the Millennium Development Goals (MDGs), and monitoring their progress. These simulations would be very useful to generate post 2015 development agenda.

1.3.2 Paradigm Shift:

Our main objective will be to initiate a ***paradigm shift in international political science*** in utilizing both "normative (role-playing)" gaming and "quantitative (model-based)" simulation approaches for globally collaborative education and training. This is a new, NON-TRADITIONAL approach for policy analysis that sets a new and high standard in the search for human and sustainable national development. As will be described below (Section 5.1), we will demonstrate this combined use of normative gaming and quantitative simulation with world experts from the School of International and Public Affairs (SIPA) of Columbia University, a former executive of Shell Oil Development Co. who has lengthy experience in Nigeria, system dynamics simulation experts from the Millennium Institute (a world-renowned organization based in the Washington DC), and technical experts on Internet and simulation. The FUGI world economic model of Prof. Onishi in Japan would also be featured (2), (3).

Other paradigm shifts are:

a) Construction of global virtual supercomputer with globally scattered simulation models in laptops, all of which would act as a single global model by interlinking them via broadband Internet, and
b) Our GKCN repetitive simulation approach will also back up the validity of the intangible variables, such as the so-called "Gross National Happiness" Index, which is a priority of the Japanese government following discussions with HM the King of Bhutan during his recent trip to Japan, and major topic discussed during several recent UN sessions.

To achieve this we are establishing a global alliance of universities and experts. They will be linked within our system and apply the most sophisticated mathematical modeling techniques and multidisciplinary scientific skills to key issues and solutions. **This is the foundation of the Global University System (GUS).**

Using global cloud computing, we will develop a socio-economic-energy-environmental simulation system and a climate simulation system in parallel in each country, all interconnected within our global network of mini-supercomputers to directly address fundamental issues of human wellbeing. The corresponding GUS will maintain its own sub-models. Each will construct and maintain its own databases, while interacting with overseas counterparts through the global Internet. The Millennium Institute in Washington DC and other noteworthy institutions worldwide have already constructed models of many countries.

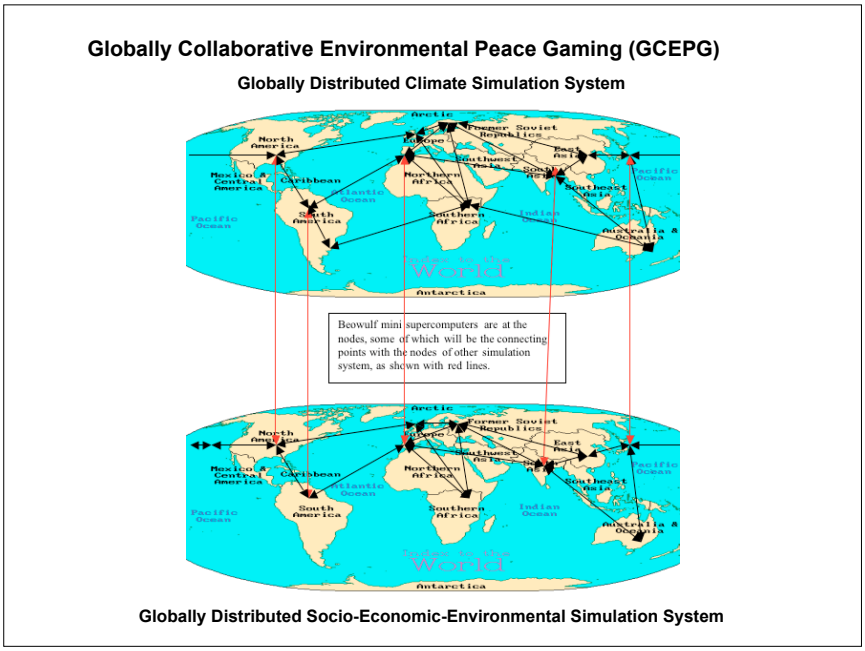

Figure 1: Globally Collaborative Environmental Peace Gaming (GCEPG) <http://tinyurl.com/cmcjsqw>
By nature of phenomena, the climate model has to ignore national boundaries,
but the socio-economic-environmental models cannot ignore them.

GKCN will consist of regional "hubs," each with its own supercomputer. These will receive data on matters such as land use, water use, agriculture, energy sources and use, health systems, commercial marketplaces, and other matters of everyday living. It will assemble the data into "models" and "peace games" (i.e., "what-if" type policy analysis as similar to a "war game" at the Pentagon). By seeing the models, current and aspiring leaders can consider rational choices; by playing the games, they can project the consequences of alternate choices.

2. Global Knowledge Center Network (GKCN):

We will create the **Global Knowledge Center Network (GKCN).** This network will be a forum for addressing economic, social, and environmental issues. We will begin this in the nations of ECOWAS. All will be connected through broadband Internet for conducting the following two-tier system:

a. One as a resource for decision makers in developing and using a globally distributed decision support system for wide-ranging policy analysis and evaluation, seeking positive sum/win-win alternatives to crisis, conflict and war;
b. The other for training aspiring decision makers for understanding world phenomena through rational analysis and critical thinking for implementing effective strategies managing energy, environmental sustainability, and national prosperity. They will learn to negotiate, manage crises, and resolve conflicts by relying on facts and figures.

The **specific socio-technical objectives** of the project will include:

a. The development of national dynamic simulation models that address matters such as socio-economic realities, energy, health, and environmental matters;
b. The creation of GKCN centers in regional hubs to promote and coordinate sustainable development strategies and crisis/conflict prevention initiatives, particularly in key regions such as the Nile, Niger, Congo River basins in Africa and along the Ganges River in Asia – which are the "shared" ecosystem.

Each GKCN is linked with all the others globally, along with the experts and university resources of the GUS. Each country and region will have its own unique database and model, but all be linked and will interact through the global Internet. This will be accomplished as having those models replacing the corresponding ones in the World Model of FUGI (Futures of Global Interdependence) global modelling system, which has 194 country models and 6 UN sector models, thus increasing its prediction accuracy (3).

The dynamic simulation tool promotes long-term national development planning. It will allow users to identify the set of policies that lead towards a desired goal. This insight deepens understanding of critical development challenges. Our GKCN system is to become a simulator/trainer on a global socio-economic-energy-environmental system for bureaucrats and future leaders at various government levels. "Hub" facilities will appear similar to those simulator/trainer for nuclear power plants or large oil tankers, with a hands-on experiential learning apparatus. This will allow them to learn by playing simulation "games."

Internet connectivity is the core of GKCN, globally and locally. From each GKCN, cabling will spread out like a spider-web into remote areas. Millions will have access to the global web for the first time. There are profound implications in areas such as education, telemedicine, and furthering democratic processes.

In times of great systemic uncertainty, like the present, broadband (BB) Internet and system dynamic modeling combined is a logical way to employ our powerful technologies, manage conflict, risk and instability, and promote long-term sustainability. Control room terminals of the GKCN will monitor situations, collect real-time data, offer analysis of policy options, and serve as early alert for users to impending crisis with adjacent real-time simulator/trainer capabilities. A special interest will be placed in searching for ways to contribute to conflict resolution and a search for common ground in strategic development decisions and in the promotion of peace.

It also creates an infrastructure for building an unprecedented global network of academics, decision-makers and practitioners who can share knowledge, expertise and data as well as the cyber-infrastructure necessary to allow large-scale education and training of students and citizens across the globe in sustainable development strategies through gaming and simulation.

The GKCN represents substantial paradigm shifts, including:

a) Gaming and simulation based on facts and figures rather than exclusively upon insights, habits or traditions, transforming adversaries into collaborators for confrontation prone problems;
b) The development of global "virtual" supercomputer capacity with globally scattered simulation models, which would become a single global model linked through broadband Internet;
c) A hands-on experiential learning apparatus for people who hold leading positions and those training for similar roles, with a special emphasis on women's participation.

The GKCN in each country conduct the followings;

- ✓ integrates economic, environmental and social elements using a system dynamics approach;

- ✓ helps create sustainable development strategies and policies by simulating possible impacts of alternative policy choices and strategic options;
- ✓ facilitates transparency, participation, and consensus building by encouraging open consultations with diverse stakeholders and external development partners within a common framework and an easy-to-understand interface;
- ✓ flexible and can be customized to address the unique needs of individual countries through the use of a modular design where existing sectors can be modified and new sectors can be added;
- ✓ produces output for policy documents including a national budget, national development plans, the Country Assistance Strategy (CAS), the Poverty Reduction Strategies (PRSs) or UN Development Assistance Framework (UNDAF);
- ✓ generates nearly all of the MDGs indicators;
- ✓ Develop and disseminate advanced analytical tools that support prospective and holistic strategic planning dialogues at community, national and global levels;
- ✓ Build a network of supporters and partners across the globe to inspire, promote, endow, and implement holistic integrated planning;
- ✓ Increase capacity among a broad range of partners to promote sustainable development using advanced communication means, and establishing centers of excellence in System Dynamics and modeling around the world.

2.1 Global University System (GUS):

The GUS is a companion global alliance of major universities that will support GKCN in finding, collecting, model building, and processing data. GUS is to launch a trans-cultural, global-wide initiative (using modern techniques of communication) to promote the kinds of global education that will advance peace, justice, understanding, and human wisdom. The GUS seeks to encourage a sense of transnational identity, a feeling of global community, which is necessary for the survival, creative growth and constructive transformation of our species (10).

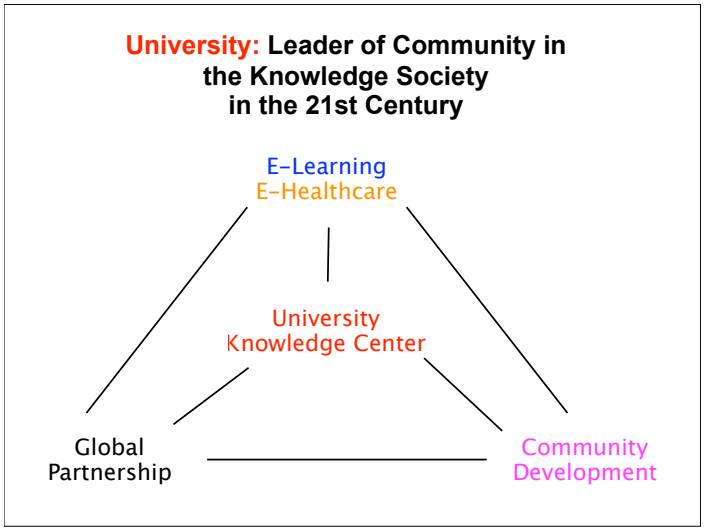

Figure 2: University: Leader of Community in the Knowledge Society of the 21st Century <http://tinyurl.com/kn6xg3s>

In Figure 2, the word “University” has a connotation of “universe.” Hence, the university in remote/rural areas of developing countries ought to act as the knowledge center of their community for the eradication of poverty and isolation through the use of advanced Information and Communication Technologies (ICTs). The university has to provide not only e-learning and e-healthcare services to their community, but also to lead their community development. It also ought to be the gateway for globally collaborative research and development (as our GKCN project) as fostering the Globally Collaborative Creative Economy in the borderless Knowledge Society of the 21st century.

3. Technical Infrastructure and Approach:

3.1 Broadband Internet:

The communication and dynamic modelling of GKCN project will require fiber optic cable Broad Band (BB) Internet. Promotion of BB infrastructure globally is a top priority. We accomplished in the summer of 2012 the connection of the Global Ring Network for Advanced Applications Development (GLORIAD) network (which has been funded by the US National Science Foundation) with the **"**Africa Coast to Europe (ACE)**"** ultra high-speed (5 tera bps) optical submarine cable along the west coast of Africa, through one of its consortium members, the Baharicom Development Company at Stevens Institute of Technology in Hoboken, New Jersey (14). This is the extension of our initiation of globalizing Internet in 1970s to early 1980s (see Section 8 below).

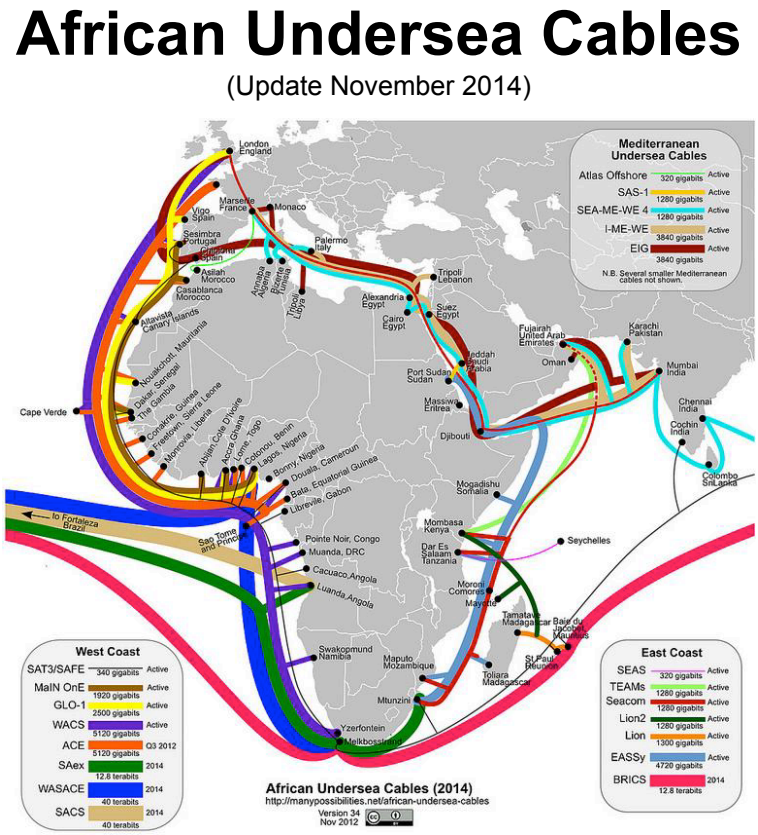

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Figure 3: African Undersea Cables (2014) from Figure 12 in <http://tinyurl.com/kqnff4p>

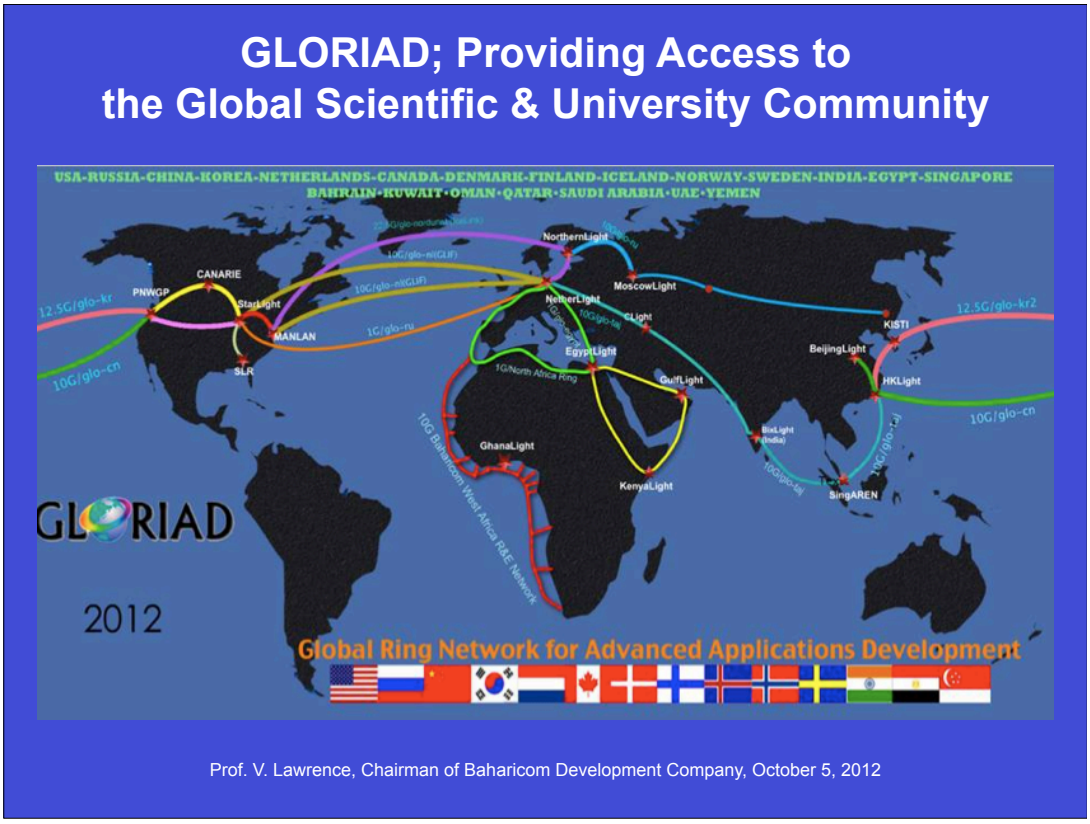

Figure 4: GLORIAD World Map <http://tinyurl.com/awabmbd>
Africa Coast to Europe (ACE) (in Figure 3 above) is expected to extend to South Africa by the end of 2014, and then to be interlinked with EASSy along the east coast of Africa. GLORIAD may then go along with it to circumvent around African continent.

We will use a cloud-computing environment. This will allow us to generate constant updates and allow data streaming from different local and national sources; it will also make it possible for the model to evolve and respond to changing situations. “Games” will generate different scenarios.

Regarding human settlements and the use of land for agriculture, this must be planned to enhance the health and wellbeing of the populations. This in our opinion is a key organizing principle for modeling sustainability. The basins of major rivers, for example, must be used in coordinated fashion. The relevant countries can manage the basins sustainably by regarding them as shared regional ecosystems.

In times of great systemic uncertainty, like the present, BB Internet and system dynamic modeling combined is a logical way to employ our powerful technologies, manage conflict, risk and instability, promoting long-term sustainability. Control room terminals of the regional hubs will monitor situations, collecting real-time data, offer analysis of policy options, and serve as early alert for users to impending crisis with adjacent real-time simulator/trainer capabilities.

3.2 Using Modelling and Simulation for Development Processes:

3.2.1 System Analysis:

The complex socio-economic-energy-environmental system of a country should firstly be system analyzed, hopefully, utilizing the cause-and-effect diagram of the system dynamics methodology, which is based on feedback mechanisms of cybernetic theory. Each component or stakeholder may be identified for their behaviors with positive or negative feedback mechanisms. This diagram may help to subdivide the complex total system into appropriate sectors. Knowledgeable experts of each of sectors may then refine the system analysis and inter-relations among their component sectors with the feedback mechanisms. Simulation models may then be constructed for their sectors. At each simulation time

intervals, each of those models, which may be located in computers at various dispersed locations, may send their computed results in time-series table formats to a central database computer through Internet.

3.2.2 Simulation Methodology:

The simulation models of the selected methodology, which can produce time-series table, may be included in at least one computer with a user interface. The computer may include any computer including, but not limited to, a desktop, laptop, and smart device, such as, a tablet and smart phone. The computer may access the software via the web browser using the internet, extranet, intranet, host server, internet cloud and the like.

Using a network of mini-supercomputers, our GKCN project will provide simulation models that are interlinked through broadband Internet to form a global model for globally collaborative analysis of confrontation prone issues and co-prosperity among the participating stakeholders for peace building. The simulation models of this network may address economic, social, and environmental issues in various countries, all connected through broadband Internet.

3.2.3 Distributed Simulation for Superior Approach:

Global simulation models of socio-economic-energy-environmental systems are currently constructed and executed as aggregating several or all countries without any considerations of national boundaries and hence without paying any considerations to the uniqueness of those individual countries. The models are also constructed without participation of knowledgeable experts of participating countries, hence lacking vital necessity of faithfully simulating not only the intricacies of those countries, but also the important interrelationship among the simulating countries to others. This is the direct violation of the most basic iron rule of simulation. Subsequently, the most of current simulation projects lack accuracies, in spite of huge expenditures for highly intellectual manpower with large monetary expenses for computing, information and telecommunication facilities. Further, it is an urgent need to promote rational and scientific approach to the policy analysis and evaluation basing on the facts and figures, among government bureaucrats and future leaders, especially on confrontation prone issues. Lastly, they need to know how to live peacefully with their neighbours with thorough knowledge on their inter-relationships, as transforming adversaries into global collaborators.

Our GKCN project will enable each specific country to have their own simulation models constructed and maintained autonomously by the knowledgeable experts of the country, even utilizing real-time data, hence increasing its accuracy. They can also have the over-all picture of the combined/interlinked system. They may be processed in the computer located in the country preferred by the country's specialists. The simulation model in each country may then be interlinked through Internet to act as a single global model in a virtual global scale supercomputer for solving national, regional or global problems. National integration centers (i.e., GKCNs) will house model maintenance and coordinate activities at the national level. They will also coordinate activities with regional and international bodies. This is now possible with the proliferation of broadband Internet around the world.

There is a need for superior results compared with the aggregated approach, as (1) letting knowledgeable experts in the country constructing their models thus improving the accuracy of the models, i.e., democratic approach compared autocratic/totalitarian approach, (2) realizing the simulation basing on the facts and figures with insertion of real-time data into the simulation models, (3) utilizing inexpensive Beowulf mini-supercomputer approach with a cluster of laptops, thus avoiding a large foot-print and extensive electrical power usage in million dollars/year range for large supercomputer, and (4) preserving the security of data within their own national boundaries, if necessary. In a sense, our GKCN will solve simultaneous ordinary differential equations of system dynamics distributed interactive simulation models with asynchronous human interventions.

3.3 Inter-linkage Mechanism for Creating Electronic United Nations:

Our GKCN project provides an inter-linkage mechanism for distributed simulation models with human intervention. Those models scattered around the world may then send their computed results in a time-series table format at certain time intervals to a central database computer through Internet. An inter-linkage program at the central database computer may be constructed according to the scenario of the data interchange. The data of exogenous variables in the table may be exchanged with the corresponding

data in the designated model, according to the scenarios set previously. After this inter-linkage program is executed, the data in the new time-series table may then be transmitted back to the designated country's computer for its next time step execution.

The construction of this data exchange scenarios and hence programs may be made as conducting videoconference among participants (see Section 7.1 below). There may be a pre-set scenarios made by those experts telling which of exogenous variables of which sector/country to be matched with which of exogenous variables of which sector/country in real-time world. They may correspond to the data of commercial trades. This scenario may be programmed in the inter-linkage program in the central database computer. The execution of this program may let each of those models exchange their pertinent data among designated models. The exchanged data may then be sent to the designated models through Internet for their next simulation time interval execution.

This process may be repeated at every time interval until the end of execution of exercise. The entire process from the initial time point to the end of the simulation may then be repeated until the end of the numbers of the specified simulation executions, thus enacting the so-called repetitive analog computer in digital computer. Any real-time data may be inserted in the appropriate country's computer at any time, so that this computer system may be based on real-time data as to be the real-time simulator/trainer as devising a man-in-the-loop interaction, as similar to the flight simulator.

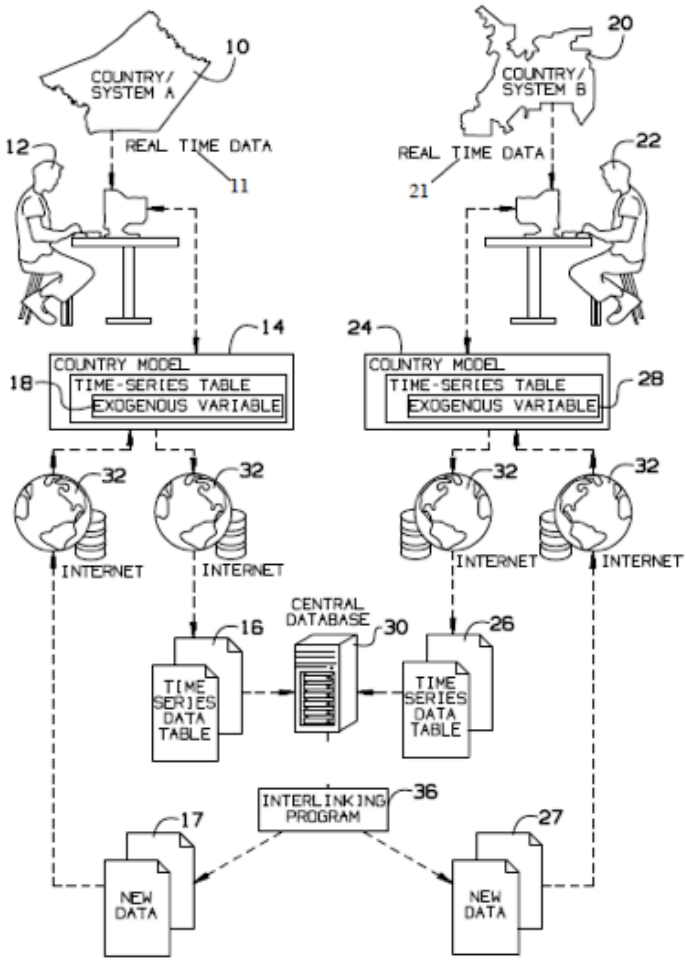

Figure 5: Inter-Linkage Mechanism For Distributed Simulation Models With Human Intervention (US Patent Pending #61/764,843) <http://tinyurl.com/d4oj9py>

Simulation models of GKCN globally will be interlinked with use of GLOSAS/USA's procedure (US Patent-Pending #61/764,843 -- Figure 5). This first step is to be taken in collaboration with the ECOWAS countries along the west coast of Africa, followed by the Nile river basin countries in east Africa, the African Union, and ultimately globally.

In certain embodiments, the exchanged data may then be sent back to the designated models for the next time interval execution, thus performing the inter-linkage and inter-operability among the geographically distributed models through the Internet. This process fosters understanding of inter-relationships among social factors as well as mutual understanding among the participating countries. Once this has been completed, data transmission of afterward time intervals may be changed to circuit switched connections from the packet-switched ones, thus saving latency delays and improving the quality of service. Thus, the urgent task of our GKCN project is to design the inter-linkage mechanism among those dissimilar distributed simulation models dispersed and scattered around the world to enact inter-relationships together among the simulation models, as forming a global simulation model in a global scale virtual supercomputer through the Internet.

The distributed simulation approach of our GKCN project may enable such computations to be performed by computers located at any desired locations around the world, but interlinked through Internet. Namely, the GKCN project is to enable performing distributed simulation with massively parallel processing simultaneously. Those dispersed computing facilities scattered around the globe resemble electronic elements connected by electrical circuitries on the motherboard in a personal computer. In a sense, we are now in the stage of "Proof of Concept" for creating the electronic United Nations starting from the GKCN/ECOWAS.

4. Case 1: Co-Prosperity Among ECOWAS Countries:

4.1 Problem/context:

There has never been a more exciting time for action-research and development. Potentials to improve the ECOWAS region's co-prosperity could be achieved if we take more advantage of new opportunities. A combination of technical, policy and market developments in relation to food production is holding out real possibilities of induced ecosystem innovations and provides options for human adaptability to climate change. Inland valleys (also referred to as wetlands, lowlands or swamps) offer great potentials for the sustainable expansion, intensification and diversification of rice-based systems but very little is done to exploit them in West Africa endowed with an estimated 20 million hectares of cultivable inland valleys. If just one million hectares of these lands are grown to rice, producing an average yield of only 3 tons per hectare, the region could easily reduce by half its costly rice imports.

4.2 Hypothesis:

The appropriate framework providing a clear, sound and holistic understanding of how various factors and their combinations would stimulate and enhance the successful exploitation of inland valleys in West Africa is still to be built. Certainly, inland valleys provide enormous wealth for users, but represent complex ecosystems to operate. As well, research and development challenges of these inland valleys are complex and diverse, and cannot be dealt with by an individual or single institution acting alone and with non sophisticated apparatus. These challenges call for integrated, collective and concerted framework of actions, policies and technological options in sustainable production, processing, and marketing of goods and services.

4.3 Objective:

This research explores environmental, agronomic, economic and policy options necessary to challenge the climate change and its induced economic and social effects in relation to the exploitation of inland valleys in west Africa. It identify and analyze the dynamic interactions among numerous natural and environmental, social and economic, technical and institutional factors at national, regional and international levels that have a bearing on the successful exploitation of inland valleys. The purpose is to enhance the productivity and competitiveness of inlands valleys through sustainable intensification and diversification of agricultural productivity and product value chain development, while conserving land and water resources. In a sense, our GKCN approach is to study the co-prosperity among ECOWAS countries.

4.4 Methodology:

The GKCN/GUS approach to inter-link simulation models will be applied to capture the numerous multifaceted factors and their interplay that affect the development and the exploitation of inland valleys

within ECOWAS under various scenarios. The model variables are identified based on the possible and plausible defined scenarios. The Global Knowledge Center Network (GKCN) with the Global University System (GUS) constitutes powerful tools and offer a multidimensional framework for addressing the innovative exploitation of inland valleys. Indeed, creating synergies between science, agricultural practices and policies requires an approach embedded in a social learning process in which farmers, scientists, development practitioners and policy makers try to find innovative and socially equitable and optimal solutions.

4.5 Other Countries:

We are also working to establish a GKCN hub in Kigali, Rwanda, in cooperation with the National University of Rwanda (NUR), in Tanzania with the University of Dar es Salaam, in the Democratic Republic of Congo (DRC) with the University of Kinshasa, and in Bangladesh with Brac University, etc. Their main objectives are peaceful co-existence with water management among Nile, Congo and Ganges River basin countries.

5. Case 2: Country Problem Emerging in Nigeria:

Our Nigerian colleague's primary focus is to create a network of collaborative research and capacity building for climate change adaptation in Nigeria, with emphasis on the Niger Delta Marshlands. The Niger Delta is of great significance, as it is the region that provides the greatest source of national income for Nigeria (97% of Nigeria government revenue). Violent clashes have limited oil and gas production to about 50% of installed output capacity, thereby seriously reducing national income.

Using System Dynamics methodology, a Niger Delta Energy and Climate Change Impact model will be developed to aid policy planning and management of the environment. This will be integrated with the Nigerian National Economy Model developed by the Millennium Institute, and ultimately linked to the GKCN and its models from various ECOWAS countries. The simulation models developed will be planning tools for policy makers and education, in partnership with several universities in Nigeria.

In Nigeria we have a unique partnership with the Institute of Software Practitioners of Nigeria (ISPON). They perceive the urgent need to promote and coordinate sustainable national development strategies and crisis/conflict prevention initiatives in Nigeria as well as in other African countries, particularly along the Niger Delta Region and the Nile and Congo River basins.

The strong interest and vision of our Nigerian partners could make our facility there a continental hub, more extensive than others, with 15 member countries of the ECOWAS. With Global Cloud Computing Technology (GCCT), we use the Nigeria hub to develop a ***satellite-enabled, socio-economic-energy-environmental simulation system*** with the use of newly launched Nigerian satellites. This would be extremely valuable not just to Nigeria, but continent-wide. Climate change and issues linked to climate are fundamental; in the Nigeria hub, we could operate a simulation system specifically devoted to climate issues.

5.1 Gaming/Simulation Demonstration on Nigerian Oil Export:

We will conduct a gaming/simulation demonstration on the following two GKCN concepts under the auspices of the School of International and Public Affair (SIPA) of Columbia University in New York City;

(a) Paradigm shift in the international political science field with the combined use of normative (role-playing) gaming and quantitative (model-based) simulation,
(b) Distributed simulation as using both of Nigerian and US simulation models, which will be interlinked through broadband Internet with the GLOSAS/USA's patent pending procedure, mentioned above.

The objective is to verify the energy policy proposed by President Barack Obama and former Vice President Al Gore (both Nobel Peace Prize Laureate), specifically, their emphasis on replacing fossil fuels with renewable sources (e.g., wind and/or solar energy) to generate electricity in the USA in ten years <http://tinyurl.com/66sk9d> in relation to appropriate allocation of oil revenue in Niger Delta of Nigeria <http://tinyurl.com/2df8ybu>.

We will examine how this would affect oil revenue in Niger Delta of Nigeria, and the consequences to other economic and social structures, particularly in Nigeria. If their policies succeed, there would be a change in revenue to the Nigerian government. Also, what would be the consequences to other economic and social structures in the US and in other countries, particularly Nigeria? Would this be a viable direction with global perspectives?

This is because 97% of total Nigerian federal government revenue comes from oil export, 40% of which is exported to North America — another 23% to Europe and 16% to the Far Eastern countries, including Japan, South Korea, and China. Thus, if Gore and Obama's proposals succeed in the U.S. (and are emulated in Far Eastern countries later), it would mean the end of oil revenue for the Nigerian government — in a sense, a severe blow to them.

We will balance the global consequences of the proposal with the national consequences for Nigeria, which could be devastating, particularly when the US is expected to become energy independent with the use of hydraulic fracturing technology for producing shale oil and gas by 2030, in addition to Gore/Obama energy proposition mentioned above.

A remedy to cope with this devastating crisis could be as follows: the money saved by the US and the Far Eastern countries as a consequence of not importing oil from Nigeria may be reserved as credits for the Cap and Trade system, which would be donated to:

(a) Nigeria, to establish the so-called Education Center in Niger Delta region emulating Qatar, to export educational services to nearby countries as Cuba does,
(b) ECOWAS (which includes Nigeria) to foster e-learning, e-healthcare and e-governance, etc. in its member and other African countries with "Peace-Corps" type help from Nigeria, particularly with the use of newly launched Nigerian domestic satellite.

This would be the win-win solution at a global scale.

After this event, we plan to continue this gaming/simulation exercise in collaborative fashion between Columbia University and Nigerian universities, e.g., Obafemi Awolowo University, Rivers State University of Science and Technology in Port Harcourt, etc.

6. Case 3: Regional Problem (Water management for the Nile river):

Tributaries of Nile River, the world's longest river, are 9 countries, i.e., Egypt, Sudan, Ethiopia, Democratic Republic of Congo (DRC), Uganda, Rwanda, Kenya, Burundi, and Tanzania. The colonial accord provides 90% of the Nile River water to only Egypt and Sudan, for which other countries now severely dispute.

Growing water demand, driven by population growth and foreign land and water acquisitions, are straining the Nile's natural limits. Huge hydroelectric dams on the Nile in Ethiopia and Sudan would also reduce the water flow to Egypt even more, where the water is the national security matter.

The land grabs shrink the food supply in famine-prone African nations and anger local farmers. Unfortunately for Egypt, two of the favorite targets for land acquisitions are Ethiopia and Sudan, which together occupy three-fourths of the Nile River Basin. Today's demands for water are such that there is little left of the river when it eventually empties into the Mediterranean. All of Egypt's grain is either imported or produced with water from the Nile River, and since rainfall in Egypt is negligible to nonexistent, its agriculture is totally dependent on the Nile.

Avoiding dangerous conflicts over water will require three transnational initiatives;

1) Governments must address the population threat head-on by ensuring that all women have access to family planning services and by providing education for girls in the region.
2) Countries must adopt more water-efficient irrigation technologies and plant less water-intensive crops.
3) For the sake of peace and future development cooperation, the nations of the Nile River Basin should come together to ban land grabs by foreign governments and agribusiness firms.

International help in negotiating such a ban, with the use of distributed simulation approach of the GKCN for policy analysis and evaluation would likely be necessary to make it a reality. None of these initiatives will be easy to implement, but all are essential. Without them, rising bread prices could undermine Egypt's revolution of hope and competition for the Nile's water could turn deadly. With populations soaring, demand for water increasing and climate change having an impact, there are warnings that wrangling over the world's longest river could be a trigger for conflict. If there is no agreed co-operative framework, there will be no peace,

7. Planning Workshop:

We will hold a series of workshops. The first one will be for the global launching of our GKCN/GUS program, so that it will be a comprehensive event, crucial to organizing the work of many experts and scholars and developing specific plans for implementing the GKCN/GUS systems.

The workshop will demonstrate how GKCN/GUS can advance media literacy in different parts of the world, creating plausible tools to understand the future consequences of today's decisions. This requires a communications medium of the highest power: a fiber optic Broadband Internet infrastructure. Using it, GKCN will coordinate minds that will gradually promote problem solving, and critical thinking. Active citizens and communities will have sustainable paths, overcoming conflicts as transforming adversaries into collaborators, and promoting intercultural understanding and peace in this world.

The followings will be discussed and planned with colleagues from selected overseas countries;

1) Construction of socio-economic-energy-environmental simulation models of each of their countries which can produce output data in time-series format, and
2) Interlinking them all through Internet to form a global simulation model, which will perform in parallel and distributed simulation mode.

7.1 Public Seminar:

As the prelude to this planning workshop, we organized a public web seminar on "African Broadband Internet and Early Warning System (*) Launch" at the Stevens Institute of Technology in Hoboken, New Jersey, on April 18, 2013, (16) and (17). This was, in a sense, a prelude to get-knowing each other for building camaraderie for subsequent proposed GKCN project on the collaborative research on the co-prosperity of ECOWAS countries. At this occasion, an international alliance of eminent scientists detailed new broadband Internet capabilities that provide opportunities to enhance basic human services for millions in African countries.

(*) The naming of our project has been changed from "Globally Collaborative Environmental Peace Gaming (GCEPG)" (11), to "Global Early Warning System (GEWS)" (12), and then to the current Global Knowledge Centre Network (GKCN). We will use them inter-changeably.

The meeting featured a "Global Lecture Hall (GLH)"^{TM} (**) multipoint-to-multipoint, multimedia, interactive videoconference through Internet with participants from some of the ECOWAS countries. The videoconference was originated at Stevens Institute of Technology. Among those participating were Dr. Thomas Mensah, a leader in the development of broadband Internet (from Atlanta, Georgia), Dr. Victor Lawrence, Distinguished Professor of Electrical Engineering at Stevens, Dr. Hans Herren, President of the Millennium Institute (from Addis Ababa, Ethiopia), Prof. Tapio Varis, Acting President of Global University System (GUS), Prof. Muhammadou M. O. Kah, Vice Chancellor, University of The Gambia (from Banjul, Gambia), Ms. Dorothy K. Gordon Director General, Advanced Information Technology Institute (AITI), Ghana-India Kofi Annan Center of Excellence in ICT (from Accra, Ghana), and Dr. Takeshi Utsumi, Founder of the Global Knowledge Network (GKCN). The discussion focused on a significant expansion that is taking place of communications capability in West Africa (see Figures 3 and 4 above) for institutions providing education, health care delivery, and other of basic services.

(**) 1994 GLH at the University of Tennessee in Knoxville (UTK) initiated GLORIAD (8)

Dr. Cole, Principal Investigator of Global Ring Network for Advanced Applications Development (GLORIAD), and Professor Lawrence, Chairman of Baharicom Development Company, one of members of the Africa Coast to Europe (ACE) consortium (see Figure 3 above) are leading Internet development

efforts in West Africa that are opening up these new opportunities with the significant support from the National Science Foundation, the European Union and the participation of the African Union.

Stevens Institute of Technology facilitated this GLH videoconferencing by using Blackboard Collaborater which creates virtual classrooms that open more possibilities to more students, wherever they are, so that they can communicate using: Voice over IP (VoIP), text chat, webcam, virtual whiteboard, screen sharing, and guided web tours. The web conferencing platform also allowed for up to six simultaneous speakers (some from ECOWAS countries, such as Gambia, Ghana, and Ethiopia, etc.) including visual and voice to foster real time collaboration on a global scale. General public could also view and raise questions through their Internet access. Participants at this event were from Finland, Norway, Germany, Ethiopia, Gambia, Ghana and several locations in the U.S.

7.2 Gaming/Simulation Demonstration:

We will demonstrate the GKCN concept under the auspices of the School of International and Public Affairs (SIPA) at Columbia University in Manhattan, New York City, as mentioned in the Section 5.1 above.

8. Background of GLOSAS/USA:

8.1 Initiating Globalization of Internet:

Since early 1970s, GLOSAS/USA played a major pioneering role as having initiated the closing of the digital divide with the extension of U.S. data communication networks to Japan and other Asian countries (5), (7), and deregulation of Japanese telecommunication policies for the use of email with a help from the Late Commerce Secretary Malcom Baldrige <http://tinyurl.com/2e2o7rc>, and de-monopolization and privatization of Japanese telecom industries, which practices have been emulated in many countries, thus having led to more than 2.5 billion email users around the world nowadays (13), even facilitating the so-called “Arab Spring.”

8.2 Demonstration of Global Peace Gaming in Quantitative Mode:

GLOSAS/USA conducted a demonstration of global-scale peace gaming at the conference on "Crisis Management and Conflict Resolution" that was organized by the World Future Society (WFS) in New York City, in July of 1986. It was one of the largest and perhaps the most successful demonstration of global gaming/simulation so far. The event was on a crisis scenario involving the U.S.-Japan trade, and economic issues. Nearly 1,500 people took part in New York, Tokyo, Honolulu, and at the World's Fair in Vancouver, B.C., (1), (2), (3), (4).

8.3 Global Lecture Hall (GLH)^{TM} Videoconference:

Since email at that time was only text-oriented without graphic and video capabilities, GLOSAS/USA developed innovative distance teaching trials with "Global Lecture Hall" multipoint-to-multipoint multimedia interactive videoconferencing technology using hybrid delivery technologies, which spanned the globe <http://tinyurl.com/6r8c63>. We have conducted a number of GLHs, ranging from Korea, Japan, Australia, New Zealand, North and South America, entire Europe, Scandinavia, and Russia, with tremendous cooperation and help from educational, industrial, domestic and international governmental organizations. The GLH employed inexpensive media accessible to the less developed countries (6).

GLOSAS/USA greatly appreciated "in-kind" services from various parties, such as National Technological University (NTU), INTELSAT, Hughes Communications, US Sprint, to name but a few. We shared free Sprint account privilege (equivalent to US$ 1 million/year) with many colleagues in developing countries, initiating Internet in Central and South America.

These GLH demonstrations aroused awareness on technical and economic feasibility of global electronic distance education and telemedicine, thus, helped build a network of leaders in the global electronic distance education movement. They are becoming core groups to form Global Knowledge Network (GKCN) and Global University System (GUS) in their countries.

8.4 Lord Perry Award for the Excellence in Distance Education:

Thanks to those efforts and the movement of global e-learning initiated since early 1980s by Dr. Utsumi of GLOSAS/USA with his private funds, he received the prestigious Lord Perry Award for the Excellence in Distance Education (Highest award in distance education) in the fall of 1994 from Lord Perry, the founder of the U.K. Open University (9). The two-year senior recipient of the same award was Sir Arthur C. Clarke, the inventor of satellite telecommunications. Dr. Utsumi also received Benjamin Franklin Pathfinder Award: Planet Earth in 1999.

9. Supporting Organizations:

- ✓ Baharicom Development Company <http://tinyurl.com/lkszouj>,
- ✓ Center for International Conflict Resolution (CICR) of Columbia University <http://www.columbia.edu>,
- ✓ Global Ring Network for Advanced Applications Development (GLORIAD) <http://www.gloriad.org/>,
- ✓ GLObal Systems Analysis and Simulation Association in the U.S.A. (GLOSAS/USA) <http://www.friends-partners.org/GLOSAS/>,
- ✓ Millennium Institute <http://www.millennium-institute.org/>,
- ✓ Stevens Institute of Technology <http://www.stevens.edu/sit/>

In addition to the above, current institutions with faculty members who are participating in GKCN/GUS development projects are numerous; as including the University of Tampere in Finland, UK Open University, University of Tennessee in Knoxville, Montana State University, Houston Community College, University of Hawaii, University of Michigan, Maui Community College, and many others. GUS will serve as an educational broker for universities, thus helping them gain international influence and access to students that they would otherwise not reach.

10. Conclusions:

We intend that ultimately, GKCN will be a part of the United Nations University. African colleagues will form teams on many subjects, planning for 3-year periods. These plans with the results of various policy analysis and evaluation with the use of aforementioned simulation models will be submitted for Japanese ODA funds totaling US$ 3.5 billion (education) and US$ 5 billion (health care) (15) (*). Their GKCN study will also advocate that optical fiber should be laid along new transportation highways in Africa, which are now being constructed with US$ 4 billion (**) pledged by the Japanese government at the Tokyo International Conference on African Development (TICAD) in Yokohama, Japan in 2008. The GKCN will be especially suited for fostering camaraderie around the globe, leading to the next stage of human development -- globally collaborative creativity with abundantly available young brainpower in African continent.

(*) In addition to this, the Japanese government pledged US$ 32 billion at the TICAD in Yokohama, Japan in June 2013. See more in Fifth TICAD <http://www.mofa.go.jp> and Japan's Assistance Package for Africa at TICAD-V <http://www.mofa.go.jp/files/000005505.pdf>
(**) This was added by US$ 6.5 billion by the Japanese government at the TICAD-V.

E-mail and multimedia World Wide Web of Internet so far contributed significantly to the world society on the dissemination of information. The next phase of the Internet development with global broadband Internet of neural computer networks should be the globally collaborative experiential learning and constructive creation of wisdom with interactive actions on virtual reality simulation models of joint global research and development projects on various subjects.

This will promote trustful friendship among youngsters around the world to realize the Knowledge Society of the 21st century, and their globally collaborative creativity will enlarge the size of pie for stakeholders to reach peaceful win-win consequences. Senator Fulbright once said that learning together and working together are the first steps toward world peace.

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