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UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

**Subsidiary Body for Scientific and Technological Advice**

**Thirty-eighth session**

**Bonn, 3–14 June 2013**

Item 7 of the provisional agenda

**Research and systematic observation**

**Update on developments in research activities relevant to the needs of the Convention; and information on technical and scientific aspects of emissions and removals of all greenhouse gases from terrestrial ecosystems**

**Submissions from regional and international research programmes and organizations**

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its twenty-sixth and subsequent sessions, invited relevant regional and international climate change research programmes and organizations to regularly inform it of developments in research activities relevant to the needs of the Convention.<sup>1</sup>

2. At its thirty-seventh session, the SBSTA welcomed the continuation of the research dialogue during SBSTA 36.<sup>2</sup> It invited Parties and regional and international research programmes and organizations active in climate change research to provide information on the technical and scientific aspects of emissions by sources, removals by sinks and reservoirs of all greenhouse gases, including emissions and removals from terrestrial ecosystems such as steppe, savannah, tundra and peatlands, with a view to identifying and quantifying the impact of human activities. This information would be considered as a theme for the next research dialogue, during SBSTA 38.<sup>3</sup>

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<sup>1</sup> FCCC/SBSTA/2007/4, paragraph 47(a–f).

<sup>2</sup> FCCC/SBSTA/2012/5, paragraph 47.

<sup>3</sup> FCCC/SBSTA/2012/5, paragraph 52.

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3. The secretariat has received two such submissions. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced\* in the language in which they were received and without formal editing.

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Contents

	<i>Page</i>
1. Global Change System for Analysis, Research and Training (Submission received 12 April 2013) .....	4
2. Inter-American Institute for Global Change Research (Submission received 11 April 2013) .....	8

## **SysTem for Analysis, Research and Training**

### **Introduction**

START (the SysTem for Analysis, Research and Training) is a non-governmental research organization that assists developing countries in Africa and Asia-Pacific to build the scientific expertise and knowledge needed to explore the drivers of and solutions to global and regional environmental change. Our goal is to reduce vulnerability through research-driven capacity building that informs decision-making. START's long-term commitment to building capacity through promoting multidisciplinary and multi-sectoral research and assessment activities and science-based communication has contributed significantly to enhancing the capabilities of individuals and institutions in Africa and Asia-Pacific to undertake global environmental change research.

### **Program highlights**

#### ***Promoting adaptation research in Africa***

The *African Climate Change Fellowship Program (ACCFP)*, a collaboration between the University of Dar es Salaam and START, promotes innovative research and education on adaptation in Africa. The program supports African professionals, researchers, educators and graduate students to undertake activities that enhance their capacities for advancing and applying knowledge for climate change adaptation in Africa, through Policy Fellowships, Doctoral Research Fellowships, Post-Doctoral Fellowships and Teaching Fellowships. Through three rounds of the program, 180 Fellows from 25 countries in Africa have worked at 15 African 'host' universities and research centers to complete their studies. The Fellowships cover areas of food security, human health, ecosystem services, and disaster risk reduction. In 2012, START organized a 5-day *ACCFP Writing Retreat* designed to enable a small, committed group of ten Round 1 Fellows to rework, refine and improve manuscripts based on their ACCFP Fellowship projects. The manuscripts have been published in a Special Issue of Environmental Development entitled: *Climate change risk management in Africa*, Vol. 5, (2013) 1-182. (see <http://www.sciencedirect.com/science/journal/22114645>.)

#### ***Advancing knowledge about global environmental change, agriculture and food security in the urban context***

*Assessments of urban and peri-urban agriculture and climate change.* START in partnership with UNEP, WMO, IPCC, USAID, the University of Ghana, the University of Dar es Salaam and the Bangladesh Centre for Advanced Studies is leading a 9-city assessment effort on urban and peri-urban agriculture that includes examination of climate issues that have bearing on urban agriculture. Interdisciplinary teams of scientists are carrying out the assessment in Dakar, Senegal; Tamale, Ghana; Ibadan, Nigeria; Dar es Salaam, Tanzania; Kampala, Uganda; Addis Ababa, Ethiopia; Dhaka, Bangladesh; Kathmandu, Nepal; and Chennai, India. The assessment focuses on how rapid urbanization and global environmental change, including climate change, could affect food production systems in and around these cities. Such production systems generate much of the non-staple foods that contribute significantly to nutritional security for urban dwellers and are a key livelihood resource of the urban poor.

*Workshops on urban/peri-urban issues:* Recently START hosted a pair of workshops that examine critical climate information needs for urban areas. In February 2013, START, with the support of CDKN, co-organized a workshop with the University of Cape Town in Dar es Salaam, focusing on the role of climate information for decision making in the context of peri-urban areas facing land-use pressures from urban encroachment. Teams of experts from 5 African cities participated. In March 2013, START, with the support

of SIDA, USNSF and CCAFS, organized a workshop in Addis Ababa, focusing on potential interactions of urban food security and climate change. ,

### ***African Grants Program on Global Environmental Change***

START's Global Environmental Change Research Program in Africa awards one-year grants for global environmental change research projects. In 2011, START awarded grants to research teams in 16 African countries to examine how changes in ecosystem services affect livelihoods and food security, the potential for promoting adaptation through diversification of farming systems, and climate change impacts on staple food crops. In November 2012, START also convened a Research and Learning Forum created a space to present research, and catalyze knowledge sharing, creative strategizing and future collaboration through face-to-face interactions among recipients of 2011 GEC grants and other regional and international experts. Targeted training was designed to strengthen future research design and promote increased and more effective communication between communities of science, policy and practice. In 2013, START awarded 11 research teams from Morocco, Nigeria, Uganda, Zimbabwe, South Africa, Colombia and the US; the theme of 2013 GEC research is *glco-obal environmental change, agriculture and food security*, with an emphasis on understanding linkages to ecosystem services and sustainable livelihoods.

### ***Building skills for interpretation, analysis and application of climate model data in Africa***

START is partnering with the WCRP, the Climate Systems Analysis Group at the University of Cape Town, the International Center for Theoretical Physics and the Swedish Meteorological and Hydrological Institute, the Climate and Development Knowledge Network and the UNDP Africa Adaptation Programme to promote skill development for analyzing and interpreting data generated from the WCRP-led Coordinated Regional Downscaling Experiment (CORDEX) initiative. The training program engages African hydro-meteorology and climate experts with vulnerability and adaptation experts. Over 40 Africans have been engaged. In 2012, START, the University of Cape Town's Climate Systems Analysis Group, ACMAD and UNDP-AAP held a workshop in Ouagadougou, Burkina Faso, examining how climate information can be better utilized to inform the management of climate sensitive diseases in West Africa, engaging 35 participants from 12 African countries.

### ***Supporting adaptation planning in vulnerable cities***

START's ongoing, multi-year program "*Cities at Risk (CAR)*" promotes and supports the development of urban adaptive capacities in Asian coastal megacities, with particular emphasis on integrating science and policy in managing and reducing risks and vulnerabilities brought on by climate change and urban growth. The program engages scientists, city planning professionals, representatives from policy and development organizations and other civil society practitioners in visioning exercises, training on vulnerability assessments and communication initiatives. This effort is in collaboration with START's Southeast Asia Regional Research Center, the East West Center, Asia-Pacific Network, and Academia Sinica based in Taipei. START is currently working on application of tools such as social vulnerability mapping and robust decision-making in Asia. Currently, the cities at risk program is being expanded to cover African cities; a scoping workshop was held in Durban in March 2013, bringing together 34 participants mostly from Africa, including academics, practitioners and municipal representatives to assess knowledge and capacity needs in urban Africa.

### ***Promoting research on disaster risk reduction and global environmental change***

*Integrated Research for Disaster Risk (IRDR) Program.* Over the next several years, START will be engaged in international capacity building activities to support the Science Plan of the Integrated Research for Disaster Risk (IRDR) program— a global initiative co-sponsored by ICSU, the United Nations International Strategy for Disaster Reduction, and the International Social Science Council. The three IRDR priority themes are characterization of hazards, vulnerability and risk; understanding decision-making in

complex and changing risk contexts; and reducing risk and curbing losses through knowledge-based actions. In October 2012, START and the IRDR International Center of Excellence (ICoE) in Taipei, together with IRDR International, ICSU and Taiwan's National Science and Technology Center for Disaster Reduction (NCDR) co-convened Advanced Institute on Data for Coastal Cities at Risk, providing 29 international participants from Asia and Africa with the enhanced understanding, skills, and resources to use and collect data for coastal cities related studies in their own countries. The 6-day intensive training event included educational modules, hands-on interactive exercises and field visits.

*Disaster risk research in South Asia.* START with support from the Climate and Development Knowledge Network (CDKN) awarded 6 interdisciplinary research projects for integrating disaster risk reduction and climate change adaptation in resilient development in South Asia. Under this broad research theme, scientists are investigating: institutional arrangements and governance structures, policy innovations that promote convergence of DRR and CCA into policy and practice, and the changing nature of development factors, which shape vulnerability to disasters. These research projects cover three countries; namely, Pakistan, Nepal and India, and span a 12-24 month period. The program will convene a research and learning forum in 2013 that will bring together grantees from the 5 projects and other experts from Asia to share findings of their research, develop synthesis papers, and examine ways of more effectively communicating their findings to decision makers.

*Games for a New Climate:* START Secretariat staff were part of a small group of scholars and practitioners who met at Boston University to review and discuss the real-world application of participatory games and experiential learning in important decision related to climate, development, disaster, and humanitarian work.

The outcome of this meeting is a Pardee Center [Task Force Report](#). The Task Force Report titled “*Games for a New Climate: Experiencing the Complexity of Future Risks*” was released at UNFCCC COP 18, provides a detailed exploration of the current and potential ways in which games can be used to help a variety of stakeholders - including subsistence farmers, humanitarian workers, scientists, policymakers, and donors - to both understand and experience the difficulty and risks involved related to decision-making in a complex and uncertain future. This report and was the basis for a training event involving negotiators from developing countries.

A related program is the Graduate Student Research Opportunity in Climate Risk Management to foster a network of young researches interested in action-oriented and collaborative research on climate, development, and humanitarian work. The program aims to enhance knowledge about how climate threats and risks should be taken into account to improve humanitarian decisions within Africa. Research projects conducted by graduate students will contribute to the goal of the program which is to embed science into humanitarian work by creating tools for smart forecast-based decisions and by managing climate risks and promoting effective responses for development and adaptation. Students attended an intensely participatory workshop focused on an innovative approach: games that simulate the complexity of decision making of people and organizations confronting serious challenges on climate, disasters and ecosystems. Through presentations, small group tasks, plenary discussions and gameplay, participants discussed how new tools can support existing initiatives for climate-compatible development. This program is a collaboration between START, The Red Cross / Red Crescent Climate Centre and Climate Development Knowledge Network. For more information, please visit <http://start.org/programs/grad-student-climate-risk-mgmt>

### ***Promoting Global Change Education***

The International Start Secretariat is integrating climate change into tertiary education in developing countries. In collaboration with the University of Dar es Salaam (UDSM), START has helped develop and support an innovative Masters of Science in Climate Change and Sustainable Development, which began with 48 students in March 2013. The multidisciplinary curriculum includes courses in the science of climate

change, vulnerability and adaptation, gender, engineering, governance, and ecosystem management. In addition, START strengthening institutional capacity with the new Centre for Climate Change Studies at UDSM. With the Centre, START is co-facilitating faculty development workshops, including a workshop on academic writing with participants from all faculties in April 2013. The collaboration between START at the Centre for Climate Change Studies will also include a small grants research program for Masters and PhD students and young faculty. START and the Centre for Climate Change Studies are also developing short courses on climate change science for use by government officials and non-government organizations to understand and integrate climate change into their own sectors, as well how the various faculties at UDSM can include climate change into their current coursework

***Global Observation of Forest and Land Cover Dynamics (GOFC-GOLD)***

START, with funding from NASA, is involved in capacity building in the developing world on Global Observations of Forest Cover and Land Dynamics (GOFC-GOLD). The effort aims to improve the quality and availability of remote-sensing observations of forests and land cover at regional and global scales, and to produce useful, timely, and validated information from these data for application in land cover/land use management and research by a wide variety of users. During May 2012, START supported the "GOFC-GOLD Workshop on Monitoring of Land Cover Change using Remote Sensing" for young scientists with skills and experience in spatial data analysis and management of large datasets of space-based and in-situ observations of forests and other land cover. The 8 selected Fellows, from Argentina, Congo Brazzaville, D.R. Congo, Ghana, Mexico, Mozambique and Vietnam, spent two weeks at the USGS Earth Resources Observations and Science (EROS) Center in Sioux Falls, South Dakota for training on earth observation data. This was followed by two weeks of advanced training at Boston University, which focused on data analysis and applications. The Fellows have submitted proposals for funds in support of activities in their home countries for analysis, application, and dissemination of region-specific earth observation data, which can be used by a wide range of stakeholders. START has also helped facilitate similar meetings in Russia, Bulgaria and Chile in 2012 and, in 2013, in Tanzania and India. In April 2013 START will be facilitating participation of 15 scientists for a GOFC-GOLD Symposium with Land Cover and Fire Implementation Team in Wageningen, the Netherlands. Four similar meetings are scheduled to be held in Japan (June 2013), Maputo (June 2013), Prague (June 2013) and Tashkent (Oct 2013). *Additional information on the program is available at <http://start.org/programs/gofc-gold> or <http://www.fao.org/gtos/gofc-gold/overview.html>.*

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**Submission from the Inter-American Institute for Global Change Research (IAI)**

In response to the invitation by the 37<sup>th</sup> meeting of the Subsidiary Body for Scientific and Technological Advice (SBSTA) to provide information on the technical and scientific aspects of emissions by sources, removals by sinks, and reservoirs of all greenhouse gases, including emissions and removals from terrestrial ecosystems such as steppe, savannah, tundra and peatlands, with a view to identifying and quantifying the impact of human activities, the Inter-American Institute for Global Change Research (IAI), presents in this submission emerging findings from its collaborative research network project on *Human, ecological and biophysical dimensions of tropical dry forest* (Tropi-Dry, <http://www.tropi-dry.eas.ualberta.ca>).

The Tropi-Dry team has produced comprehensive and comparative land use and policy studies in tropical dry regions in the natural and social sciences and incorporates researchers and institutions from Brazil, Canada, Costa Rica, Cuba, Mexico, United States of America and Venezuela. They have for the past 6 years examined the functioning and management of dry forests across the American continent. Their findings indicate that dry forests are showing strong signals to climate change. Their study employs cutting-edge science, such as multi-spectral remote sensing, and wireless sensor networks that can monitor changes in climate condition and forest productivity.

Knowledge of emissions and sources of greenhouse gases (GHG) in tropical dry forests and their savannah transitions is limited. Information on the overall reservoir size and emissions from key GHGs such as CO<sub>2</sub>, NO<sub>x</sub> and CH<sub>4</sub> is fundamentally non-existent with the exception of some small sites in the Americas and Australia. In addition, data on contributions from anthropogenic forces, such as conversion from savannah or tropical dry forests to agriculture, are limited. In general, more information on tropical dry forests is available for CO<sub>2</sub> fluxes while information on NO<sub>x</sub> and CH<sub>4</sub> is scarce. This not only introduces uncertainties at the global level but it also complicates modeling efforts since there is not enough information available to validate regional or global models.

In savannahs, work by Bristow et al. (2013) that aimed at quantifying differences in CO<sub>2</sub> balances before and after transformation of a tropical savannah to agriculture fields in northern Australia, indicated that emissions of CO<sub>2</sub> before transformation “*were very weak*”, generally in the order of ~0.5 Tons of Carbon per hectare per year. Land clearing transformed the region into a long-term source of CO<sub>2</sub>. Clearing and burning emitted an overall 31.4 t C or 115.4 t CO<sub>2</sub> per hectare. Overall, the authors indicate that the net difference between pre and post clearing was equivalent to 12-years of carbon sequestration for that specific tropical savannah.

Klink and Machado (2005) estimated that up to 50% of all Cerrado ecosystem in Brazil (the largest Neotropical savannah), or 1-million Km<sup>2</sup>, has been transformed into agriculture over the last 35-years. If we assume that the observations presented by Bristow et al. (2013) approximate the Cerrado system, current deforestation and land degradation in this important ecosystem are a significant contributor to overall GHGs emissions in the Americas, and it is clear that a sound strategy to better understand GHGs emissions is necessary at the continental level.

Estimates on tropical dry forests GHG emissions are even more difficult to find than those for savannahs. The only network aimed to produce comparative studies from Carbon fluxes in tropical dry forests environments will start producing their first results over the next two years. This IAI network is deploying carbon flux systems in Mexico and Costa Rica with the goal of understanding the temporal and spatial dynamics of CO<sub>2</sub> and H<sub>2</sub>O fluxes on ecosystems that are extremely sensitive to rainfall change and land use conversion.



Information on total carbon reservoirs and emissions for tropical dry forests has been identified only for Mexico. Jaramillo et al. (2003) have estimated that the total Carbon reservoir for Mexico's tropical dry forest may be approximately 2.3 Pg of Carbon. De la Barrera-Bautista et al (2010) consider that, in Mexico, total emissions from tropical dry forest conversion to agriculture and pasture (usually by slash and burn) can reach the order of 708 Tg of Carbon. This estimate is higher than total carbon emissions estimated for tropical evergreen forests in Mexico which are in the order of 569 Tg of Carbon.

Such findings are important because of the high level of anthropogenic pressures that have been historically put on dry forest and savannah ecosystems. For example, based on comparisons between current tropical dry forests extent and historical ecological potential distribution Portillo & Sanchez-Azofeifa (2010) estimated that 66% of the original neotropical dry forest has already been converted to other land uses. In North and Central America, 72% of dry forest has disappeared, while South America has lost 60%. In addition, Portillo & Sanchez-Azofeifa (2010) found that only a small fraction of tropical dry forests and savannahs are being preserved (4.5% of dry forests and only 3.3% of neotropical savannahs are under legal protection). The level of protection for humid forests is much greater and accounts for 1,567,022 km<sup>2</sup> (25%) of its total extent (Scharlemann et al. 2010).

Carbon losses by deforestation in tropical dry forests and savannahs are currently difficult to estimate, since annual deforestation rates have been only calculated for few sites and for specific periods, but there are no systematic continental, national or regional analyses that have calculated annual deforestation rates for these ecosystems.

The identification and quantification of GHGs and emissions from tropical savannahs and dry forests are highly affected by the length of their growing season which is affected by climate change (specifically, timing and duration). Climate variation such as el Niño Southern Oscillation in countries with large fractions of forests on their Pacific Coast also affect phenology. Studies such as this one aim to provide clarity on the overlapping and cumulative effects of climate change and climatic variability. For example, work by Tropi-Dry, on neotropical dry forests and savannahs has found important phenological changes in the duration of the growing and dry seasons for dry forests and savannahs away from the equator, which correspond to long term changes in temperature.

Tropi-Dry will spend the next 5 years improving knowledge on GHGs emissions and reservoirs that is fundamental to better understand global effects of land transformation and land degradation. Their work is supported by outreach and capacity-building initiatives that involve both scientists and stakeholders, which are being used to develop strategies to communicate research findings to decision-makers in IAI member countries.

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