

UNITED NATIONS / INDONESIA INTERNATIONAL WORKSHOP

INTEGRATED SPACE TECHNOLOGY APPLICATIONS TO CLIMATE CHANGE

**United Nations Office for Outer Space Affairs (UNOOSA) and
National Institute of Aeronautics and Space (LAPAN)**

**2-4 SEPTEMBER 2013
JAKARTA, INDONESIA**

Ghana Technology Needs Assessment (TNA) Project for Climate Change Adaptation and Mitigation

Executed by

**Environmental Protection Agency (EPA) For The
Ministry of Environment Science and Technology
Ghana (MEST)**

2011 - 2012



Supported by:



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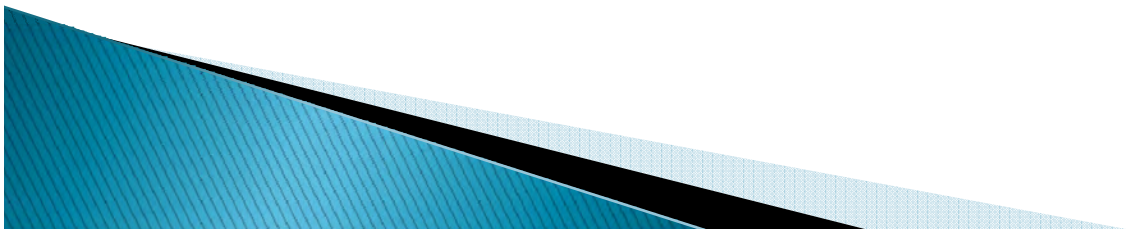
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ENERGY, CLIMATE
AND SUSTAINABLE
DEVELOPMENT



Project Coordinating Team

- ▶ ENVIRONMENTAL PROTECTION AGENCY (EPA)
- ▶ CENTER FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR)
- ▶ MINISTRY OF AGRICULTURE (MOFA)



INTRODUCTION – Background

- ▶ The development goals of Ghana are intractably linked to its ecosystems and environmental conditions. In this regard, Ghana is committed to addressing the challenge of climate change from the local perspective even as it joins the international community to carry out the vital actions to meet the global challenge.
- ▶ Ghana ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 and since then a number of programmes and projects that address the climate change challenge have been conducted and includes the National Climate Change Adaptation Strategy (NCCAS) in 2011 and key policy documents including the Climate Change Policy.
- ▶ These documents served as blueprint to guide the adjustment of Ghana's economy to expected climatic stimuli and their affects, and strengthens its adaptive capacity with regard to climate change impacts by building the resilience of the society and ecosystems.



Background – Ghana's Environmental Perspective

- ▶ Immense endowment in natural resources including minerals and crude oil; it has a fairly good human capital

ENVIRONMENTAL CHALLENGES:

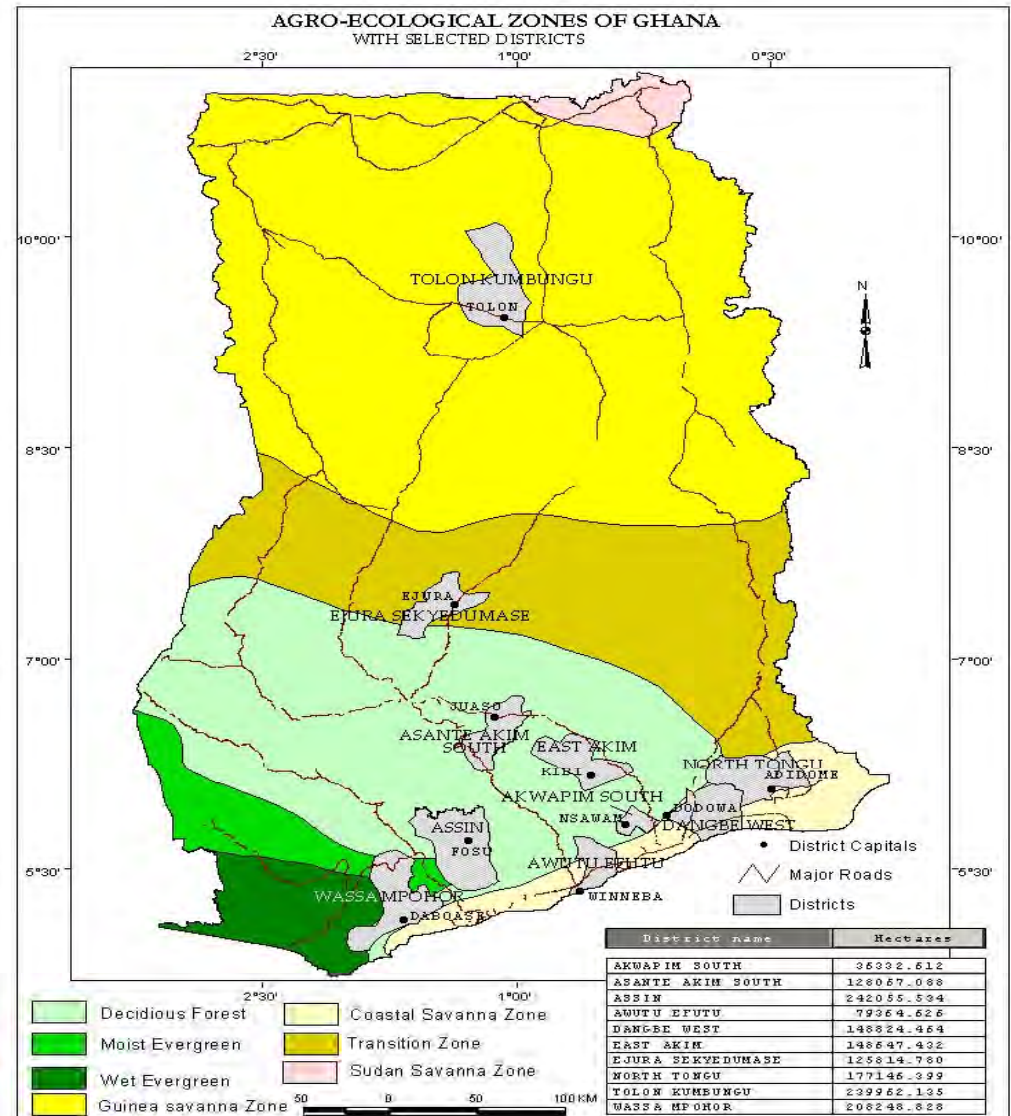
- ▶ Land degradation with gradual loss of forest cover
- ▶ Variability of climactic conditions with uncertain rainfall
- ▶ Drought,
- ▶ Increasing temperatures (Rate = 0.21°C per decade, estimated to reach between 1.7°C to 2.04°C by 2030 in the north
- ▶ Flush floods,
- ▶ Sea level rise and sea erosion of the coastline.

Example:

- Analysis of national data (1960–1990) shows a progressive rise in temperature and decrease in mean annual rainfall in all agro-ecological zones in Ghana.

Background – Ghana in Retrospect

Map of Ghana



Background – Statistics of Ghana

DEMOGRAPHY

- ▶ Population = 24.66 Million
- ▶ Population growth rate = 2.5%/annum(2010 Census)

LAND

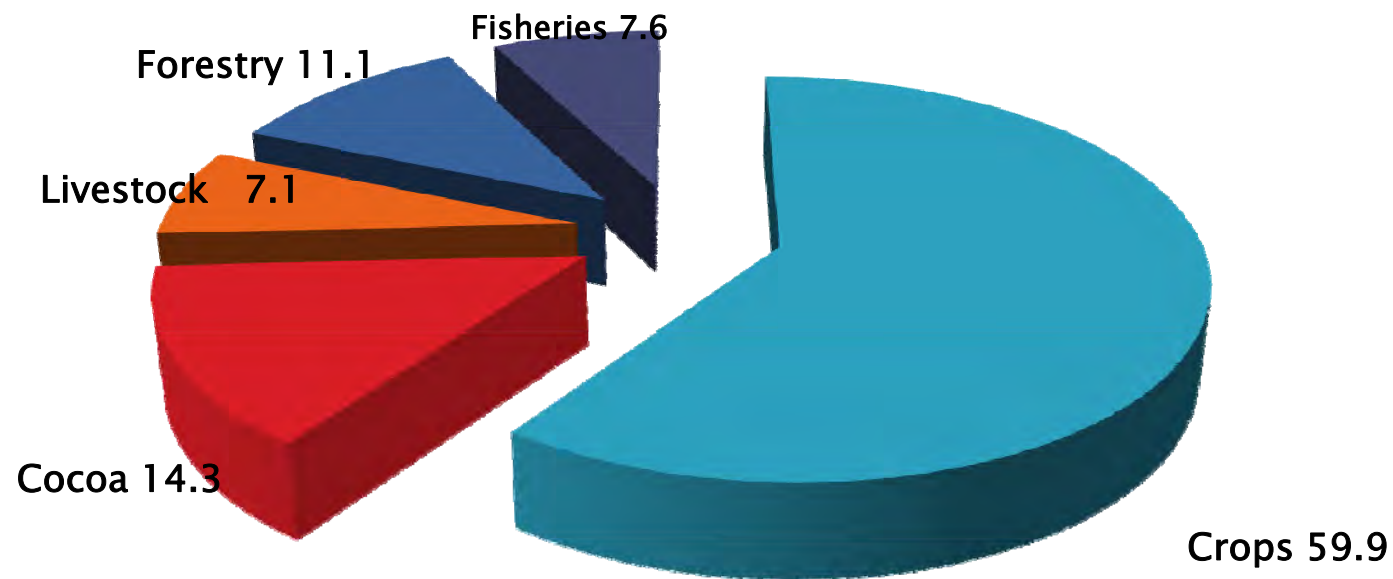
- ▶ Total Land area = 23,853,900ha
- ▶ Agricultural land Area = 13,628,179ha (57.1%)
- ▶ Cultivated Area = 7,458,000ha (54.7%)



Background – Sector Contributions to National GDP(%), 2006 – 2010

SECTOR	2006	2007	2008	2009	2010
Agriculture	30.4	29.1	31	31.7	30.2
Industry	20.8	20.7	20.4	18.9	18.6
Services	48.8	50.2	48.6	49.5	51.1
Total	100	100	100	100	99.9

Background – Agricultural Sub-Sector Contribution to GDP (%) –2011



Source: Ghana Statistical Service, Accra

Background– Agriculture Perspective

- ▶ Agriculture Growth Rate = 4%
- ▶ Agric. Product (GDP) growth rate = 6 %

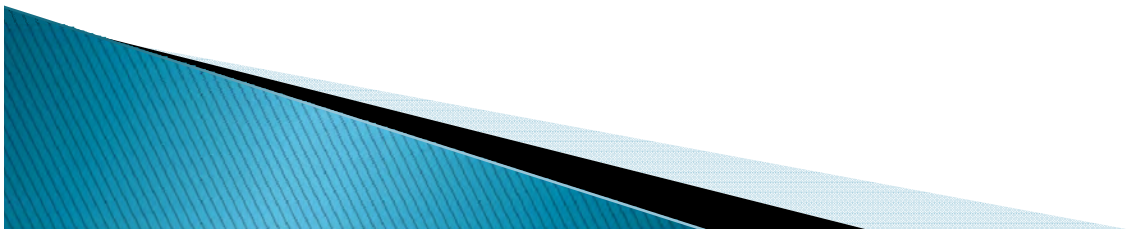
CROPS

Staples = (Cassava, Cocoyam, Yam, Maize, Rice, Millet, Sorghum, Plantain)

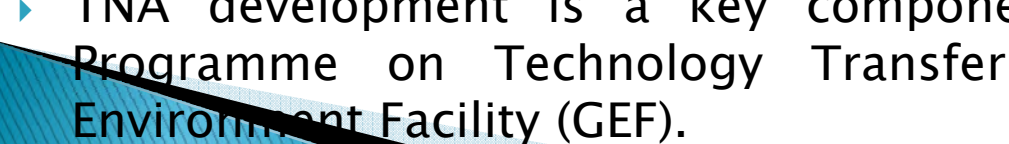
Vegetables = (Tomato, Pepper, Okro, Egg Plant, Onion, Asian Vegetables)

Industrial = (Cocoa, Oil Palm, Coconut, Coffee, Cotton, Kola, and Rubber)

Fruits = (Pineapple, Citrus, Banana, Cashew, Pawpaw, Mangoes)



Background – What are TNAs?

- ▶ Technology Needs Assessments (TNAs) are a set of country-driven activities that identify and determine the mitigation and adaptation technology priorities of countries to climate change.
 - ▶ They are central to the work of Parties to the United Nations Framework Convention on Climate Change (Art. 4.5 of the convention).
 - ▶ TNAs present a unique opportunity for countries like Ghana to track evolving needs for new equipment, techniques, services, capacities and skills necessary to mitigate Green House Gases (GHGs) emissions, enhance adaptation and reduce the vulnerability of sectors and livelihoods to climate change.
 - ▶ TNA development is a key component of the Poznan Strategic Programme on Technology Transfer supported by the Global Environment Facility (GEF).
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Background– TNA Project in Ghana

- ▶ **PROJECT DURATION:–**

- 2011–2012

- ▶ **IMPLEMENTING AGENCY:–**

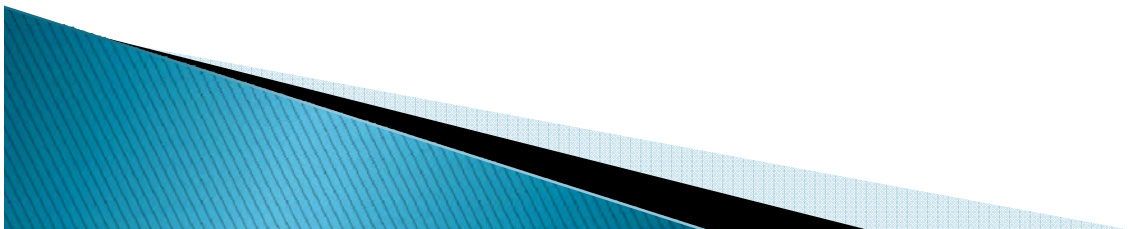
- Environmental Protection Agency under the auspices of the Ministry of Environment Science, Technology and Innovation (MESTI)

- ▶ **FUNDING:–**

- Global Environment facility (GEF)

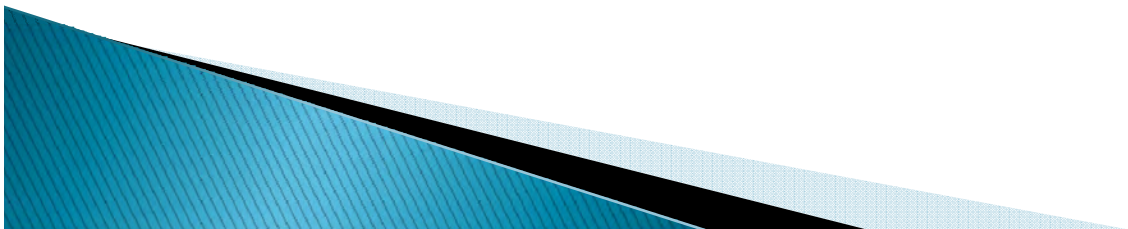
- ▶ **TECHNICAL SUPPORT:–**

- UNEP–DTIE (Division of Technology Industry Economic of UNEP), UNEP Risoe Centre (URC) and Environmental Development Action (ENDA) an international NGO.



Background – Project Objectives

- ▶ identify and prioritize through country-driven participatory processes, technologies that can contribute to adaptation goals of Ghana while meeting national sustainable development goals and priorities.
- ▶ **Identify barriers** that could hinder the acquisition, deployment, and diffusion of the prioritised technologies
- ▶ **Develop Technology Action Plans (TAP)** by specifying activities and enabling frameworks to overcome the barriers in order to facilitate the transfer of technology
- ▶ **Adopt and diffuse selected technologies** in Ghana by identifying projects to be implemented as pilot



TNAs and Ghana's Development Agenda

- ▶ Ghana Shared Growth and Development Agenda (GSGDA) document provides a national framework for socio-economic development (Government of Ghana, 2010).
- ▶ Sector-specific policies and plans exist that outline the national goals, priorities and mechanisms for implementing sector-specific development agenda. Each Policy addresses climate change challenges either explicitly or implicitly.
- ▶ The FASDEP II, the agricultural sector policy document notes the impact of climatic stresses on crop and livestock production. The current sector policy and investment plan identify three pillars which provide entry points for climate change adaptation; these are food security and emergency preparedness, sustainable management of land and environment and application of science and technology in agriculture development.
- ▶ In addition, the national agriculture extension service is increasing its efforts at mainstreaming environmental management including climate change in its service delivery efforts

The TNA project is enabling Ghana to be proactive about climate change adaptation. Stakeholders are continuously engaged in the efforts to ensure adaptation nationally especially in the Water and Agriculture sectors

National Climate Change Adaptation Actions

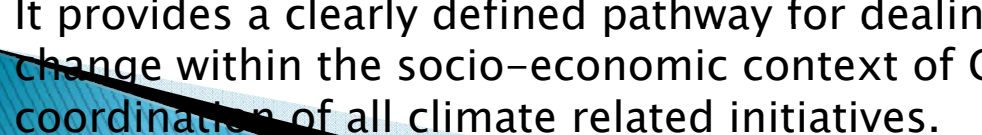
The National Climate Change Adaptation Strategy (NCCAS)

- ▶ Developed in 2011. A strategy document that serves as blueprint to guide the adjustment of Ghana's economy to expected climactic stimuli and their effects (EPA & UNDP, 2011).
- ▶ The goal is to enhance Ghana's current and future development by strengthening its adaptive capacity to climate change impacts by building the resilience of the society and ecosystems
- ▶ NCCAS specifies targeted strategies to build national capacity to deal with climate change impacts and reduce vulnerability in key sectors, ecosystems, districts and regions of the country (EPA & UNDP, 2011).

NATIONAL CLIMATE CHANGE POLICY (NCCP) – PART 1,

Developed in August 2012. It is Ghana's integrated response to climate change prepared and designed within the context of national sustainable development priorities, including achieving the objectives of the Ghana Shared Growth and Development Agenda (GSGDA).

It provides a clearly defined pathway for dealing with the challenges of climate change within the socio-economic context of Ghana and aims to achieve effective coordination of all climate related initiatives.

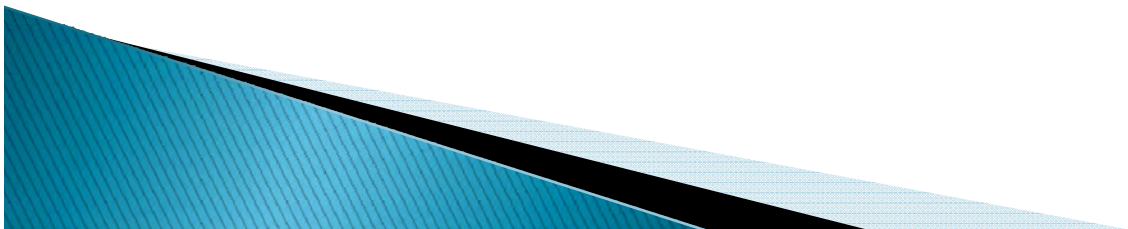


The Process – Institutional Arrangement for TNA

TNA Team –operating under the auspices of the Environmental Protection Agency (EPA)

Constitution:

- National TNA Project Coordinator;
- Assistant National TNA Project Coordinator
- Agriculture sector expert;
- Water sector expert
- Overall Lead expert

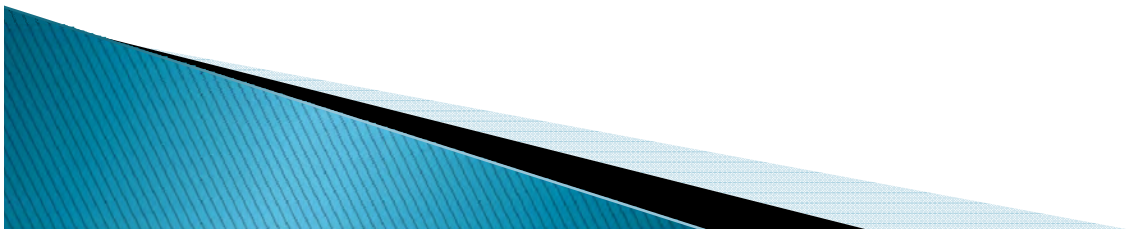


Institutional Arrangement –Project Steering Committee

COMPOSITION

- National TNA Project Coordinator;
- The three national experts;
- Representative of the Agricultural sector;
- Representative of the Water resource sector;
- Representative of Local government
- Civil society representation
- Representative of Ministry of Environment Science and Technology

Other stakeholders e.g. Irrigation Development Authority



Process Pathways

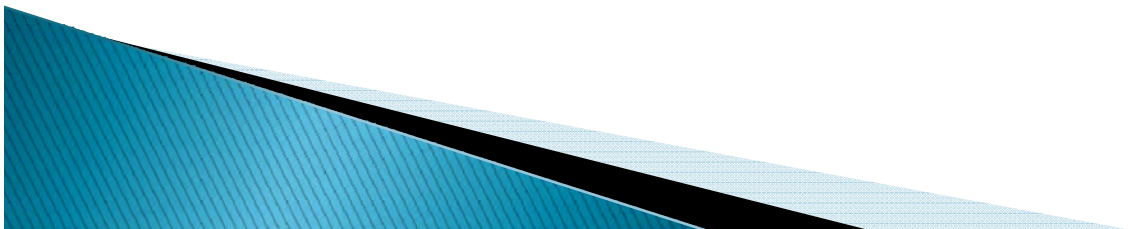
- ▶ **Identification and prioritisation of TNAs** – A market assessment was conducted to analyse barriers and develop an enabling framework for deployment and diffusion of prioritized technologies.
- ▶ **Selection of TNAs and preparation of Technology Action Plan (TAP)**
- ▶ **Seek of political endorsement and integration of the TAP into National policy/ development plans**
- ▶ **Conduct techno-economic appraisal** and development of project proposals to implemented and diffuse selected technologies in Ghana
- ▶ **Preparation of Reports (TNA)**

Process – TNA ACTIVITY SCHEDULE

ITEM	ACTIVITY	YEAR						
		2011				2012		
		1-3	4-6	7-9	10-12	13-15	16-18	19-21
1	Appoint a TNA Coordinator and Establish the National TNA Committee	=====						
2	Organise Stakeholders		=====					
3	Develop a detailed draft work plan		=====					
4	Identify institutions for data and expert support		=====					
5	Hold National Inception Workshop and finalize the work-plan based on stakeholders feedback and contract consultants		=====					
6	Participate in Regional Workshops (a) Capacity Building workshops (b) Experience Sharing Workshop			=====				
7	Prioritizing Sectors and Technologies		=====	=====			=====	
8	Prepare the prioritized technologies report (TNA report)				=====			
9	Carry out market assessment-analyse barriers and develop an Enabling Framework for deployment and diffusion of prioritized technologies				=====	=====		
10	Prepare a Technology Action Plan (TAP)						=====	
11	Seek political endorsement and integration of the TAP into national policy/ development plans							=====
12	Conduct techno-economic appraisal and develop proposals for					=====	=====	

PROCESS – Stakeholders Engagement

- ▶ The TNA scoping mission was carried out in the country from 22–25 February 2010.
- ▶ Preparatory and information sharing meetings with various organizations and experts dealing with climate change in Ghana.
- ▶ Inception Workshop was conducted on 4th May 2011 aimed at facilitating enhanced awareness and active engagement of a broader group of stakeholders on the TNA process while generating the feedback on a draft workplan

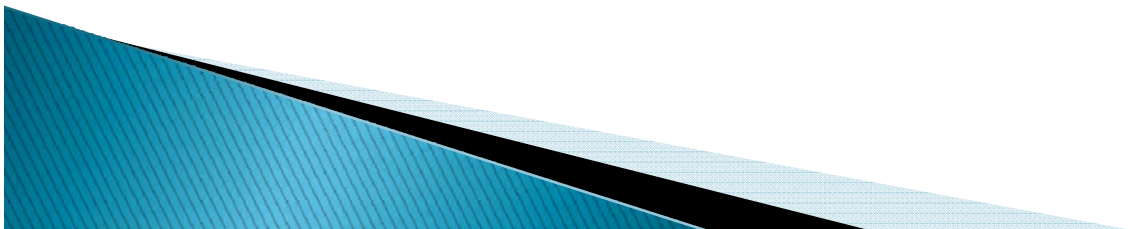


Stakeholders Engagement cont'd

- ▶ Second workshop was organised from 20th to 21st December 2011 at the CSIR–STEPRI Auditorium in Accra, to identifying technologies for climate change adaptation, which is driving the TNA project

Purpose:

1. Update stakeholders on the status of the project and obtain feedback on relevant stakeholders institutional activities;
2. Present reports on the identified technologies for the two selected sectors namely, agriculture and water;
3. Validate the list of technologies and criteria for prioritization;
4. Prioritize through a participatory process, the identified technologies using Multi-Criteria Analysis (MCA).



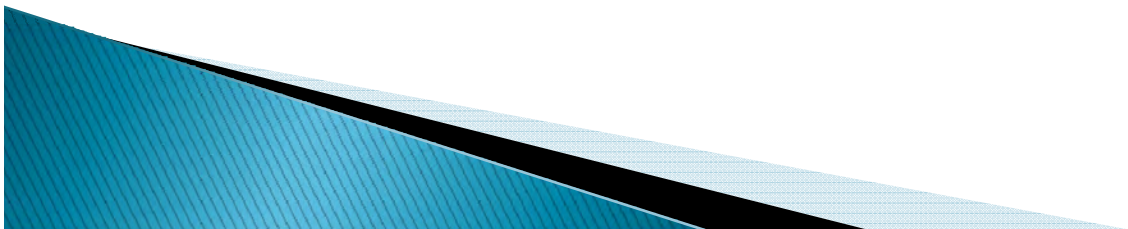
Stakeholders Engagement cont'd

- ▶ third workshop was organised from 25th to 27th July 2012 at the STEPRI in Accra, is also intended to involve stakeholders in identifying barriers hindering the acquisition, deployment, and diffusion of prioritized technologies of the TNA project.



Criteria for selecting Water and Agric sectors

- ▶ Vulnerability to climate change;
- ▶ Adaptive capacity;
- ▶ National priority based on development plans;
- ▶ Socio-economic importance;
- ▶ Technological feasibility;
- ▶ Potential impact on large segments of the population.



Identified Technologies–Water Sector

Water Sector

1. Sub-surface storage and use.	9. Water reclamation and reuse. (waste-water recycling)
2. Household water treatment and safe storage (HWTS).	10. Water safety plans (WSPs).
3. Improving resilience of protected wells to flooding.	11. Desalination.
4. Increasing the use of water-efficient fixtures and appliances.	12. Demarcation and Protection of Buffer zones for water bodies.
5. Leakage management, detection and repair in piped systems.	13. Flood warning systems.
6. Post-construction support (PCS) for community-managed water systems.	14. Flood-proofing.
7. Rainwater collection from ground surfaces. (small dams)	15. Climate Change Monitoring System.
8. Rainwater harvesting from roofs	

Identified Technologies – Agric. Sector

Agriculture sector	
1. Integrated National Climate Change Monitoring & Early Warning System	11. Seed and Grain Storage
2. Climate Insurance	12. Selective Breeding via Controlled Mating
3. Sprinkler and Drip Irrigation	13. Integrated Livestock Disease Management
4. Rain water harvesting	14. Mixed Farming
5. Slow-forming Terraces	15. Agro-forestry
6. Conservation Tillage	16. Farmer Field Schools
7. Integrated Soil Nutrient Management	17. Community Trained Extension Agents
8. Crop Diversification and New varieties	18. Community Forest Management Groups
9. New Varieties through Biotechnology	19. Water User Associations
10. Ecological Pest Management	

Criteria score and rank for selected technology – Water

Criteria												Average Score	Rank
Technology	Pove rty Redu ction of Vuln erabl e Grou ps	Econ omic Benef it for Coun try	Investme nt cost (US \$)	Environ mental Ben efit	Increase d Resilienc e and Adaptive Capacity of Vulnera ble Groups	Improve ment in Health and Sanitatio n	Communi ty participa tion in manage ment	Women' s participa tion in manage ment	National Developm ent Priority	Stakehol der Acceptab ility	Endorse ment by Experts	Average Score	Rank
15. Climate Change Monitoring System.	1.000	1.000	0.333	1.000	1.000	0.667	0.750	0.750	1.000	0.750	1.000	0.84	1
7. Rainwater collection from ground surfaces (small dams)	1.000	1.000	0.667	0.500	0.667	0.333	0.750	0.750	1.000	0.750	0.750	0.74	2
6. Post-construction support for community-managed water systems.	0.333	0.333	1.000	0.000	1.000	0.667	1.000	1.000	0.750	1.000	1.000	0.73	3
3. Improving resilience of protected wells to flooding.	0.667	0.667	1.000	0.000	1.000	1.000	0.250	0.750	0.750	1.000	0.750	0.71	4

Criteria score and rank for selected technology – agriculture

Criteria										
Technology	Maintenance or strengthening of biological diversity and environmental sustainability	Facilitation of access to information systems and awareness of climate change information.	Investment cost	Support for water, carbon and nutrient cycles and stable and/or increased productivity.	Income-generating potential, cost benefit analysis and contribution to improved equity	Respect for cultural diversity and facilitation of inter-cultural exchange	Potential for integration into regional and national policies and up-scaling.	Building of formal and informal institutions and social networks.	Average Score	Rank
17. Community Trained Extension Agents	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.00	1
19. Water User Associations	1.000	1.000	1.000	0.500	1.000	1.000	1.000	1.000	0.94	2
1. Integr Climate Change Monitoring & Early Warning System	1.000	1.000	0.000	1.000	1.000	1.000	1.000	1.000	0.88	3
7.	1.000	0.333	1.000	1.000	1.000	1.000	1.000	0.500	0.85	4

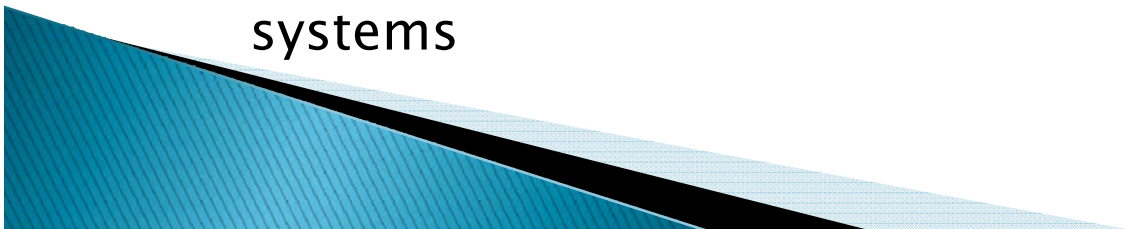
Prioritised technologies

Integrated Climate Monitoring and early warning system is a technology common and critical to all sectors

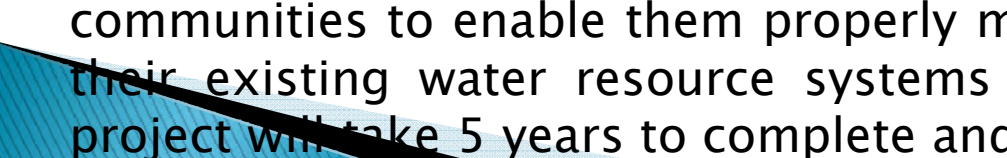
Water	Agriculture
<i>Rainwater collection from ground surfaces</i>	<i>Community Based Extension Model;</i>
<i>Post construction support for community managed water systems</i>	<i>Water User Associations;</i>
<i>Improving resilience of protected wells to flooding</i>	<i>Integrated Climate Monitoring and early warning system;</i>
<i>Demarcation and Protection of Buffer Zones for water bodies</i>	<i>Integrated Soil Nutrient Management</i>

Technology action plans

- ▶ Out of the 4 prioritized adaptation technologies in the water and agriculture sectors, two technologies for each sector were selected through a stakeholder and expert group consultation process and Technology Action Plans developed for them.
- ▶ The two prioritised technologies for the agricultural and water sectors are:
 - **AGRICULTURE:**– Integrated Nutrient Management (INM) & Community Based Extension Agents (CBEA)
 - **WATER:**– Rainwater collection from ground surfaces & Post Construction support for community managed water systems



Identified Pilot projects– water sector

- ▶ Provision of 100 run-off storage facilities (dug-outs/small reservoirs) each of 1 million m³ maximum storage capacity for 100 rural communities to provide water for multiple uses such as for domestic, livestock watering, vegetable irrigation, fish production and other income generating activities in the communities. The implementation of the first project is proposed for the Savannah communities in Ghana (Northern Ghana and the savannah areas in coastal regions) at an estimated total cost of US\$12.2 million. It is envisaged that the project will take 10 years to be executed.
 - ▶ Empowering rural communities to properly manage, operate and maintain their water systems through technical training and capacity building in financial and water systems management at the district and community levels. This project is intended to provide the necessary know how, both technical and financial, to beneficiary communities to enable them properly manage, operate and maintain their existing water resource systems designed for multi-use. The project will take 5 years to complete and cost US \$9.0 million.
- 

Identified Pilot projects– agriculture sector

- ▶ **The Integrated Nutrient Management (INM) or Integrated Soil Fertility Management (ISFM) project**

The project aims at making efficient use of both synthetic and natural plant nutrient (organic) sources to enhance soil fertility towards improving and preserving soil productivity. This project targets the dissemination of the INM technology to farmers in all the agro-ecological zones in Ghana given that soil fertility management is a fundamental challenge for all farmers. The project generally aims at having about 100,000 farmers nationwide adopt the technology and utilize it intensively. Is estimated at \$9.3 million

- ▶ **Community Based Extension Agents (CBEA) project**

Is a rural agricultural extension model based on the idea of providing specialised and intensive technical training to identified people in rural communities to promote a variety of technologies and offer technical services with support. The project targets the enhancement of extension service to 500 communities in selected districts across the country. It is intended that the transfer and diffusion of the technology will be done within a 5 years at an estimated budget of \$13 million



Application of integrated space technologies for effective implementation of the projects – Way forward

- ▶ Ecosystem enhancement through land use land cover mapping and monitoring
- ▶ Satellite Remote sensing based inventory of agriculture statistics and water resources as baseline
- ▶ Development of satellite based crop monitoring system including crop growth and yield forecasting
- ▶ Application of precision agriculture for effective nutrient management through appropriate space technology
- ▶ Development of space based climate monitoring system such as use of the Doppler Radar system for effective rainfall predictions, drought monitoring and determination of onset of rains
- ▶ Identification of project sites based on satellite remote sensing using appropriate models.

These activities however, would require logistics including adequate funding, data and information, institutional coordination and capacity building to execute the projects.



THANK YOU

