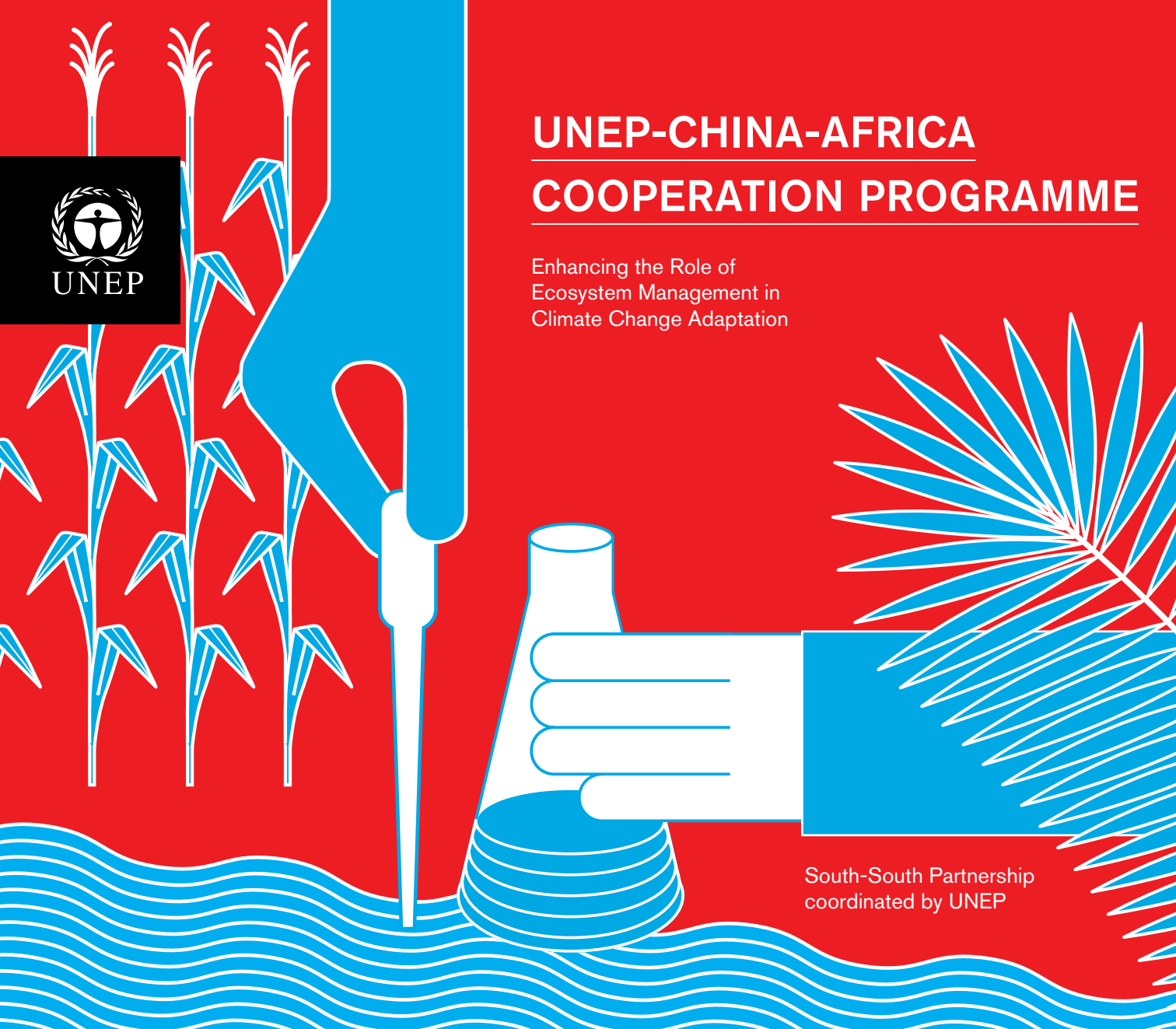

UNEP-CHINA-AFRICA COOPERATION PROGRAMME

Enhancing the Role of
Ecosystem Management in
Climate Change Adaptation

South-South Partnership
coordinated by UNEP

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UNEP-CHINA-AFRICA COOPERATION PROGRAMME

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Ecosystem Management in
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CONTENT

Mr. WAN Gang, Minister of Science and Technology of the People's Republic of China, signing MoU with Mr. Achim Steiner, UN Under-Secretary-General and UNEP Executive Director


2011 Board Meeting
北京

FOREWORD

WAN Gang
Minister of Science and Technology of the People's Republic of China

Science and technology are an important means to tackle climate change and improve the living environment. For developing countries with similar natural conditions and economic development levels, it is particularly important to carry out long-term international scientific and technological collaboration. Joint efforts in enhancing technical professionals' training, improving research approaches and sharing data for collaborative studies are especially meaningful in addressing common challenges such as food safety, public health, energy crises and disaster warning.

As a major developing economy, China has proactively promoted science and technology collaboration with African countries. The United Nations Environment Programme (UNEP) has substantive experience in managing projects for environmental protection and sustainable development, as well as a broad network of environment professionals. In 2008, the Ministry of Science and Technology (MOST) of China and UNEP signed a Memorandum of Understanding (MoU) on Framework of Technical and Institutional Cooperation on Environment in Africa, kick-starting China-Africa cooperation on the environment. Under this framework, four projects focusing on water security and sustainability in Africa were launched. In 2011, MOST and UNEP renewed the MoU, initiating 6 projects for Phase II cooperation. Seventeen Chinese research institutes have collaborated with 16 countries bordering the Nile, Lake Tanganyika and the Sahara Desert in projects involving water planning, utilization and protection, drought warning and adaptation, dryland water-saving agriculture, as well as desert control, through technology cooperation and transfer, capacity-building and demonstration projects. Given the notable results, the

projects have received recognition of African leaders, and offered valuable experience for trilateral cooperation.

To sum up experiences and share best available practices, Chinese and African experts together completed this report, including the achievements in some of the main environmental problems, particularly water issues in the context of climate change adaptation in Africa, China-Africa technological cooperation and research, and proposing next steps for addressing remaining issues. This marks a new phase in China-Africa collaboration on the environment. A cooperation mechanism based on mutual trust has been in place, the joint pilot projects have been progressing well, and encouraging research results are emerging.

China and Africa face similar challenges. Our own development brings opportunities to each other. Given this fact, it's our shared responsibility to address global climate change and protect the environment. China will continue to collaborate with UNEP and African partners, make science and technology play a bigger role in spurring economic and social development, so as to achieve common development and prosperity and make both China and Africa better and greener.

WAN Gang
Minister of Science and Technology of the People's Republic of China

PREFACE

Achim Steiner
UN Under-Secretary-General and UNEP Executive Director

Many nations on the African continent are facing severe challenges from the escalating impacts of climate change. Climate change represents a serious threat to Africa's sustainable development, hampering efforts to eradicate poverty and improve human well-being. Technological support and capacity building can help address these challenges and should play a fundamental role in the post-2015 development agenda and the achievement of the proposed Sustainable Development Goals.

The United Nations Environment Programme (UNEP) is committed to working with developing countries to enhance their capacity to integrate climate change responses into national development processes. This work is made more effective with the assistance of partners such as China, who have committed to working with countries across the Global South to assist them to transition to more inclusive green economies. In 2008, UNEP, in partnership with the Ministry of Science and Technology of China, launched the UNEP-China-Africa Cooperation Programme on the Environment. The Programme, which has now completed its second phase, has been implemented with the support of 17 Chinese institutions and 16 African countries through demonstration projects and numerous capacity building programmes.

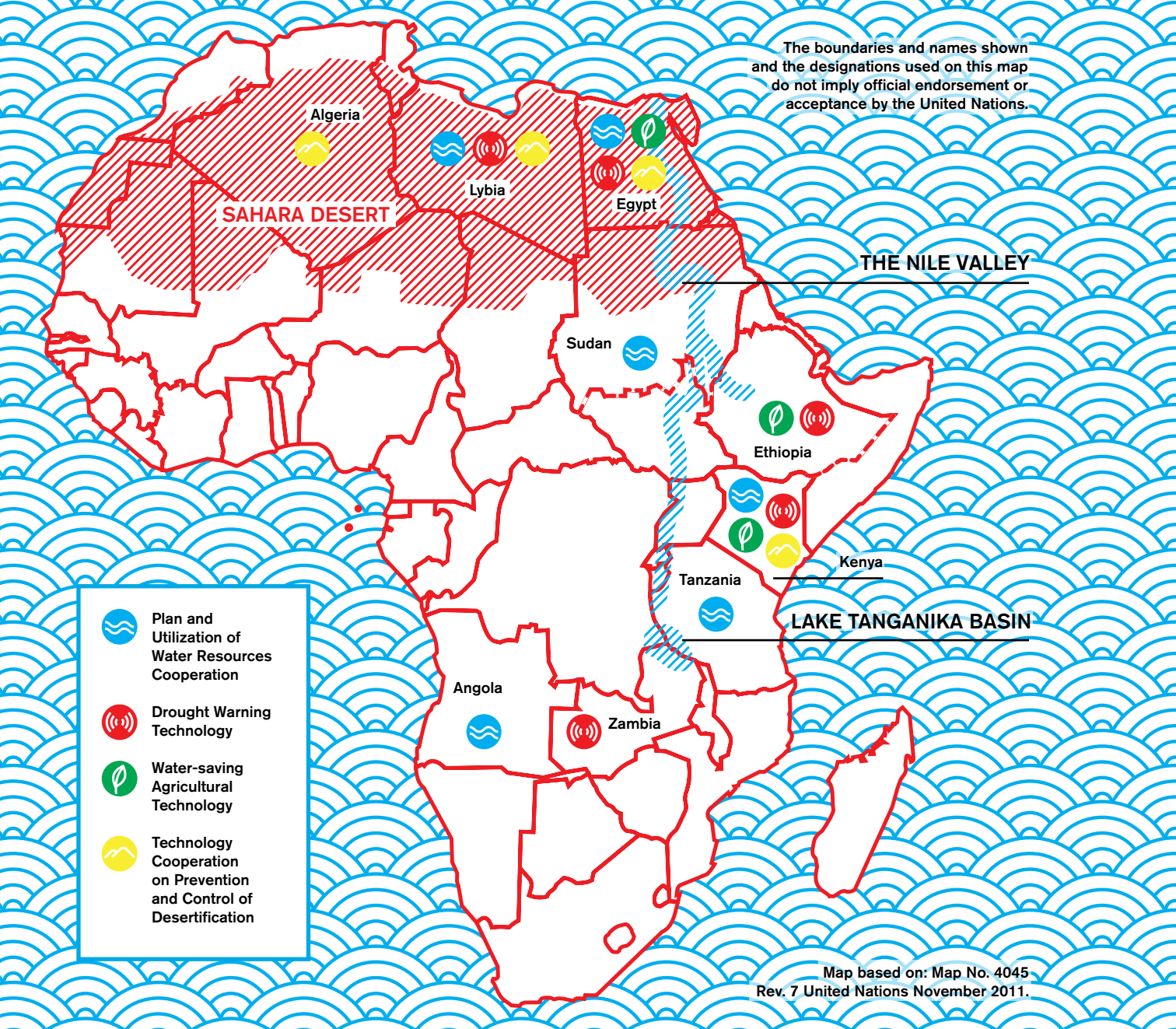
This report highlights key outcomes from the Programme that focuses on strengthening the climate change adaptation and mitigation capacities of countries, and on raising awareness of climate change technologies and their impacts among decision-makers. The report includes examples of Chinese and African partnerships that have provided local communities with access to affordable clean drinking water, effective water quality monitoring systems and innovative approaches to combating desertification.

In May, 2014, UNEP and China signed a new high-level agreement to harness their strengths, capacities and resources to further assist countries of the Global South with climate adaptation projects, with co-funding from the Global Environment Facility and the Government of People's Republic of China.

Thousands of people, especially local farming communities, have benefited from the collaboration between UNEP and China, and it is our intention that thousands more do so as we embark on the next phase of this partnership. It is our hope that the technologies and capacity-building approaches outlined in this report will be promoted by governments and local communities across Africa in an effort to deal with the impacts of climate change in ways that support sustainable economic growth.

Achim Steiner
UN Under-Secretary-General and UNEP Executive Director

UNEP


The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
Algeria
SAHARA DESERT
Lybia
Egypt
THE NILE VALLEY
Sudan
Ethiopia
Kenya
Tanzania
LAKE TANGANIKA BASIN
Angola
Zambia
Plan and Utilization of Water Resources Cooperation
Drought Warning Technology
Water-saving Agricultural Technology
Technology Cooperation on Prevention and Control of Desertification
Map based on: Map No. 4045 Rev. 7 United Nations November 2011.

INTRODUCTION

Africa is endowed with a very rich and diverse natural resource base on which the livelihood of its people, especially the rural population, depends. Natural resources in Africa, especially land, water, forests, plant and animal diversity, renewable energy sources and related ecosystem services are fundamental for improving livelihoods and achieving sustainable development. However, Africa remains one of the most vulnerable continents, with deepening poverty levels and worrying trends of degradation of natural resources. And climate change is posing considerable risks to the health of ecosystems and compromising their ability to provide services.

The UNEP-China-Africa Cooperation Programme on Environment was funded by the Ministry of Science and Technology (MOST) of China and initiated jointly by UNEP and MOST. The objective of the programme is to mitigate the adverse effects on Africa, brought by climate change, through technology support, capacity-building, and exchange of information and experience with Chinese experts.

The programme was jointly implemented through two phases: Phase I (2008-2011) involving four environmental demand driven projects and Phase II (2011-2014) under the theme "One Lake, One River and One Desert", targeting the Nile River, Lake Tanganyika and the Sahara Desert, entailing six subprojects, with 17 Chinese institutes and16 participating African countries and organizations.

EXECUTIVE SUMMARY

Africa, a continent endowed with rich and diverse natural resources still remains one of the most vulnerable continents facing adverse effects of climate change. In this regard, the Ministry of Science and Technology of China (MOST) and UNEP signed the UNEP-China-Africa Cooperation Agreement in 2008 to enhance capacity of African countries in addressing environmental challenges, especially from the effects of climate change through experience exchange, technical support and information sharing with Chinese scientists. This programme has proven to be a significant partnership platform to facilitate knowledge sharing between African and Chinese experts to address the on-going and emerging environmental challenges through capacity development and institutional strengthening.

This programme was implemented in two phases: The first phase started with four environmental demand-driven projects implemented in Africa, focusing on enhancing the capacity of monitoring shared water resources of Lake Tanganyika; re-use of waste water for forest irrigation; drought early warning systems and adaptation to drought; and promoting rainwater harvesting in Africa. The second phase under the theme **"**One River, One Lake, and One Desert**"** targeted the River Nile, Lake Tanganyika and the Sahara Desert.

Some of the key achievements from this triangle of cooperation includes the use of a Watershed Management and Rainwater Harvesting system that has shown to contribute to African's water crisis mitigation; China's experience in soil erosion mitigation with the Yellow River Basin and rainwater harvesting techniques which proved valuable with similar projects in the Nile River Basin and Lake Tanganyika catchment; a South-South

Cooperation approach where the advantage of inexpensive devices, equipment and reagents in enhancing water quality provides great potential for scaling up and replication; and a preventive measure for lands that are not yet degraded, which was aimed at the Sustainable Land Management and Combating Desertification project. An integrated system of desertification combating and deserticulture development was achieved through R&D and technical fusion between China and Africa's expert teams.

Based on the achievements gained under the triangular cooperation, communication mechanisms have been built, construction of demonstration projects and technology training programmes held which show a wider range of achievements. UNEP and MOST are planning to move the cooperation programme forward and make it a showcase for South-South and Triangle Cooperation.

SUMMARY OF ACHIEVEMENTS

1 WATERSHED MANAGEMENT AND RAINWATER HARVESTING

Water resource security is one of the major issues seriously affecting sustainable development in many countries, especially in Africa. Ninety-three per cent of cultivated land totally depends on natural rainfall. It is estimated that 450 million Africans will live in countries with less than 1700 m^3 of water per capita a year and crop yield will decrease by 23 per cent due to water shortages in the next two decades. In addition, one third of Africans have no access to drinking water, and nearly half of them suffer from waterborne diseases because of drinking unclean water[1].

To contribute to mitigating Africa's water crisis, a Chinese team shared its successful experience and technology on improved water management to promote efficient watershed management and rainwater harvesting technologies in Africa.

COUNTRIES INVOLVED:

Uganda, Kenya, Burundi, Ethiopia, Sudan, South Sudan, Egypt, Democratic Republic of Congo, Tanzania, Zambia, Rwanda and Eritrea.

PARTICIPATING INSTITUTES:

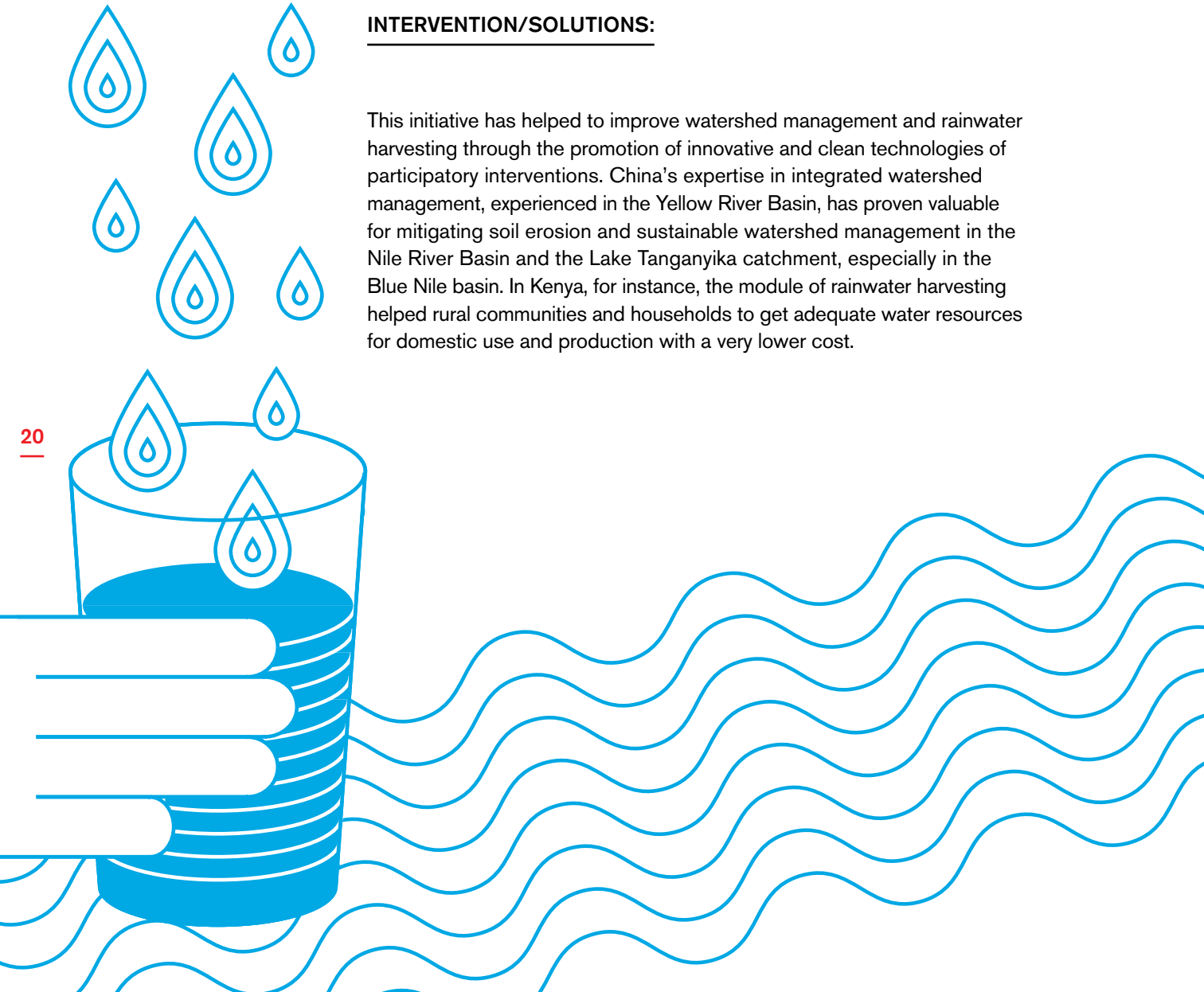
Gansu Research Institute for Water Conservancy, China Academy of Space Technology, Tongji University, China Science and Technology Exchange Centre.

1 *Global Water Resources, UNEP, 2006.*

Rainwater harvesting demonstration project in Kenya

INTERVENTION/SOLUTIONS:

This initiative has helped to improve watershed management and rainwater harvesting through the promotion of innovative and clean technologies of participatory interventions. China's expertise in integrated watershed management, experienced in the Yellow River Basin, has proven valuable for mitigating soil erosion and sustainable watershed management in the Nile River Basin and the Lake Tanganyika catchment, especially in the Blue Nile basin. In Kenya, for instance, the module of rainwater harvesting helped rural communities and households to get adequate water resources for domestic use and production with a very lower cost.



KEY OUTCOMES:

- Assisted the Ministry of Water and Environment of Uganda to study and develop the National Water Reources Master Plan to improve water resources management, development and protection to ensure water supply for sustainable social and economic development. This will provide technical strategy for national action on urban and rural drinking water supply, agricultural irrigation, water environment protection for the coming 20 years.

- Analysed status quo of water resources of the Nile Basin, diagnosed challenges on water management and developed corresponding counter measures to improve the situation of the Nile Basin through adoption of China's expertise on sustainable watershed management.

- Cooperated with the Lake Tanganyika Authority and the ministries in charge of water of the riparian countries to produce a comprehensive investigation and assessment of the water resources situation of the Lake Tanganyika catchments. Analysed the challenges on watershed management, predicted balance estimation of water demands and supply for whole basin, and produced a proposal for improved watershed management.

- Supported the Ministry of Environment, Water and Natural Resources of Kenya to study and developed a National Master Plan for Rainwater Harvesting, which provides strategic technical guidance for national action on rainwater harvesting development as a supplement to domestic and agricultural water supply for the next 20 years. Being the first rainwater

harvesting plan developed in Africa, it will play a critical role as an example for other African countries in the future.

Demonstrated China's appropriate technologies for safe rural water supply: rainwater harvesting, water purifying systems, solar pumps and hand pump facilities. Innovative of rainwater storage structures minimized consumption of building material and simplified the building engineering, with half of the original cost.

SCALE-UP POTENTIAL:

The context-specific adaptive approach used in implementing the interventions through the introduction of appropriate technological solutions adapted to local needs and conditions will enhance resource sustainability. Moreover, the implementation of the master plan on natural water resource use could serve as a supportive projection tool to help local governments prioritize the allocation of resources according to identified technical, financial, socioeconomic and environmental criteria. The regional approach used in evaluating the shared water resources could facilitate an active exchange of resources among practitioners and policymakers on cooperation matters at regional levels. This dialogue will help to foster experiential learning, further increasing domestic capacities. Therefore, the gains made through this initiative can be accelerated in other regions facing similar challenges through replication and scaling up. This will help in the achievement of a balance between values such as economic benefit, equity, environmental sustainability and public participation.

Rainwater harvesting demonstration project in Kenya

2 AFFORDABLE DRINKING WATER AND WASTEWATER TREATMENT

With the existing climate change scenario, almost half the world's population will be living in areas of high water stress by 2030, including between 75 million and 250 million people in Africa. And sub-Saharan Africa has the largest number of water-stressed countries of any region[2]. Contaminated water from inadequate wastewater management brings one of the greatest health challenges, restricting development and increasing poverty through costs to health care and lost labour productivity. As African countries are experiencing rapid population growth and economic development, this is causing serious challenges to the supply of safe drinking water and water quality monitoring.

COUNTRIES INVOLVED:

Kenya, Tanzania, Burundi, D.R Congo and Zambia.

PARTICIPATING INSTITUTES:

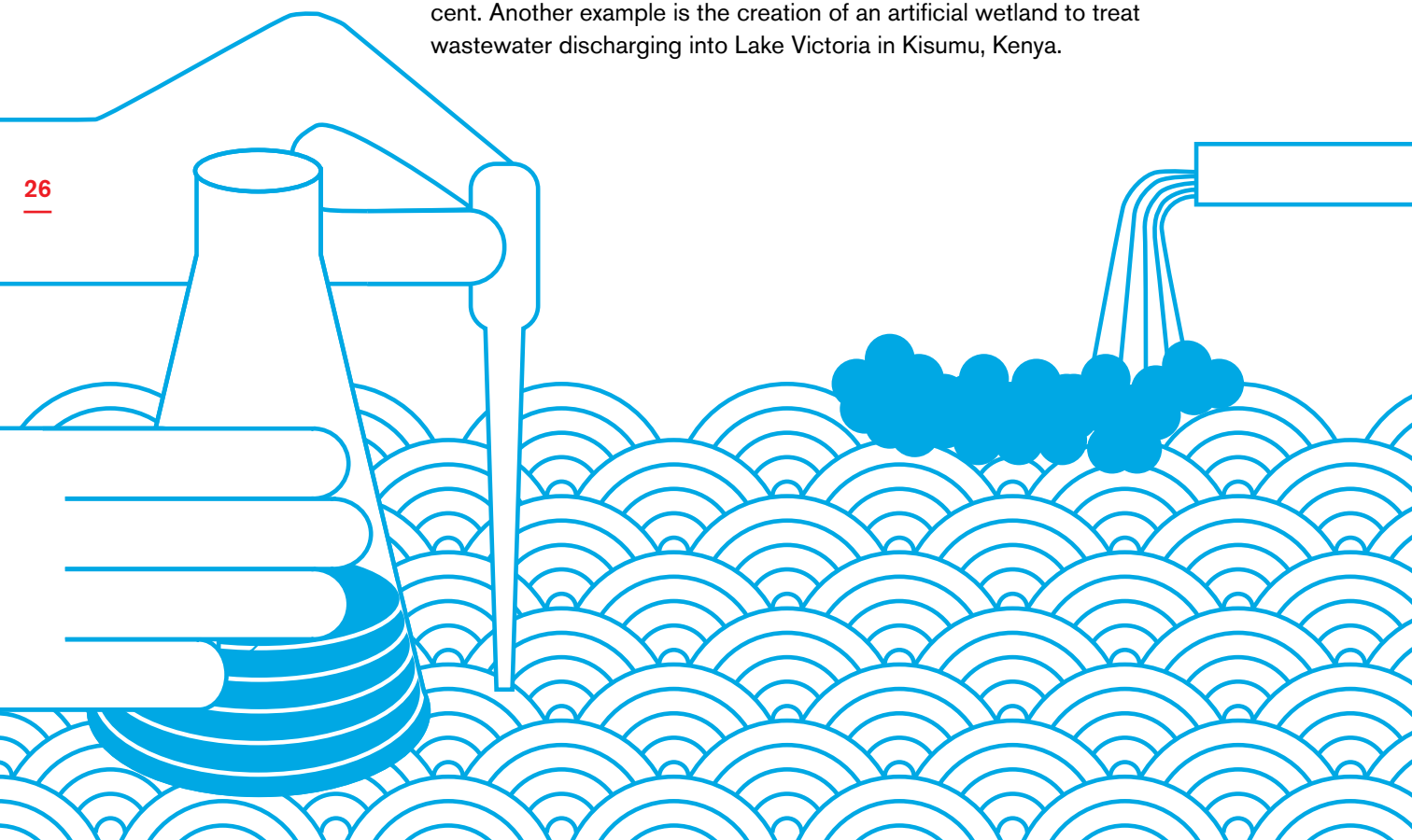
Nairobi City Water and Sewerage Company, Kenya Ministry of Water and Irrigation, Kisumu Municipality, Kisumu Water and Sewerage Company Limited, Maseno University, Lake Tanganyika Authority and VPO Tanzania, Tanzania Fisheries Research Institute, National Institute of Environment and Nature Conservation, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences, the Institute of Botany of Chinese Academy of Sciences, Lanzhou University, China University of Geosciences, Tongji University, United Nations Environment Programme.

2 *UN-Water factsheet on water security, UN Water, 2007.*

Demonstration laboratory in Kigoma, Tanzania

INTERVENTION/SOLUTIONS:

The solutions for smart wastewater management provided through this initiative are not only socially and culturally appropriate, but are economically and environmentally viable in the future. One of the best solutions proved is the use of new coagulants for water treatment in Nairobi which can save between 15 and 25 per cent in chemical costs, reduce sludge by up to 20 per cent, and improve treatment efficiency by 20 to 25 per cent. Another example is the creation of an artificial wetland to treat wastewater discharging into Lake Victoria in Kisumu, Kenya.



KEY OUTCOMES:

- Established a demonstration laboratory in Tanzania Fisheries Research Institute, Kigoma, to monitor and analyse surface water with donated equipment and training courses by Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences.

- Initiated the database management system for water monitoring in Kigoma, Tanzania,

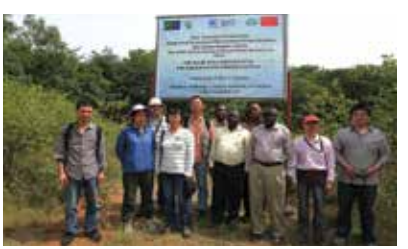
- Completed four monitoring sites to demonstrate ecosystem monitoring by the Institute of Botany of Chinese Academy of Sciences: Chato Forest Plot in Geita Region of Tanzania, El Rawakeeb Desert Plot in Khartoum State of Sudan, Kenyatta Savanna Plot in Kenya and Shashemene Forest Plot.

- Cooperated with Lanzhou University to develop Ecological Assessment and Management (EAM) systems have been developed in Ethiopia, to simulate the process of plant growth and different water and nutrient demand throughout growing seasons, in order to predict crop production in different scenarios of hydrology and climate conditions.

- The technique of Constructed Rapid Infiltration (CRI) has been optimized for treatment of domestic wastewater in construction camps, and special equipment developed for oil production wastewater treatment. The treated water can be reinjected without contaminating the groundwater.

El Rawakeeb Desert Plot, Sudan

Drinking water treatment in Kenya

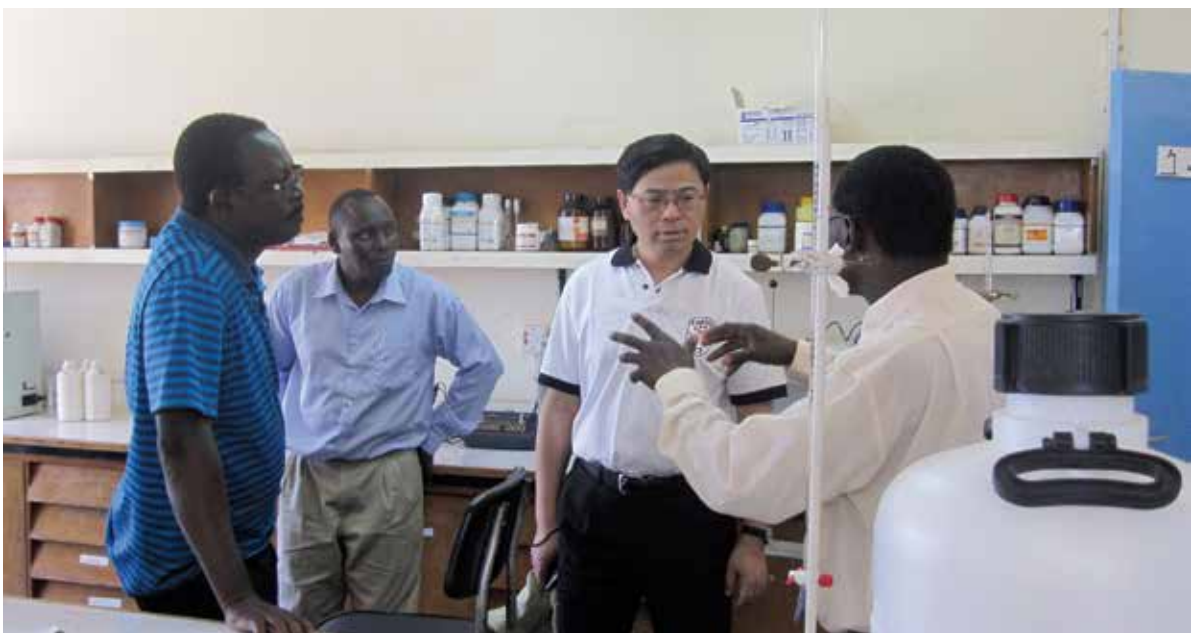


Chato Forest Plot, Tanzania

SCALE-UP POTENTIAL:

By employing inexpensive devices, equipment and reagents in enhancing water quality, this initiative provides great potential for scaling up and replication, particularly in countries that have a need for similar impacts. This innovative and holistic approach to the provision of safe and clean water can be adopted by policymakers and decision-makers in the search for economically feasible, resource efficient and technically viable solutions, mainly by countries in the global South.

Drinking water treatment test in Ngethu, Kenya



3 SUSTAINABLE MANAGEMENT OF DRYLAND AGRICULTURE

Agriculture plays an important role in the national economies and social life in Africa. In the past several years, drought has become a structural constraint to some African countries' agricultural production; some are now facing a grave situation and struggling to meet domestic demand. Dry areas in Africa are, by definition, characterized by persistent water scarcity and commonly suffer from land degradation. Dry areas face several demographic challenges, including rapid population growth, high urbanization, age distribution that is heavily skewed towards youth, and high unemployment rates. Projections based on population growth and food consumption patterns indicate that agricultural production will need to increase by at least 70 per cent in order to meet demands by 2050[3]. As a result, several African governments have sought to address the challenges drought imposes on agricultural production, achieve food self-sufficiency and enlarge the exportation of fruits and vegetables as a strategic objective of a series of policies to encourage investment in agriculture.

COUNTRIES INVOLVED:

Morocco, Zambia, Egypt, Kenya, Ethiopia

PARTICIPATING INSTITUTES:

Zambia Meteorological Department, Regional Agricultural Research Centre of Settat (CRRA-INRA Settat), University of Khemis

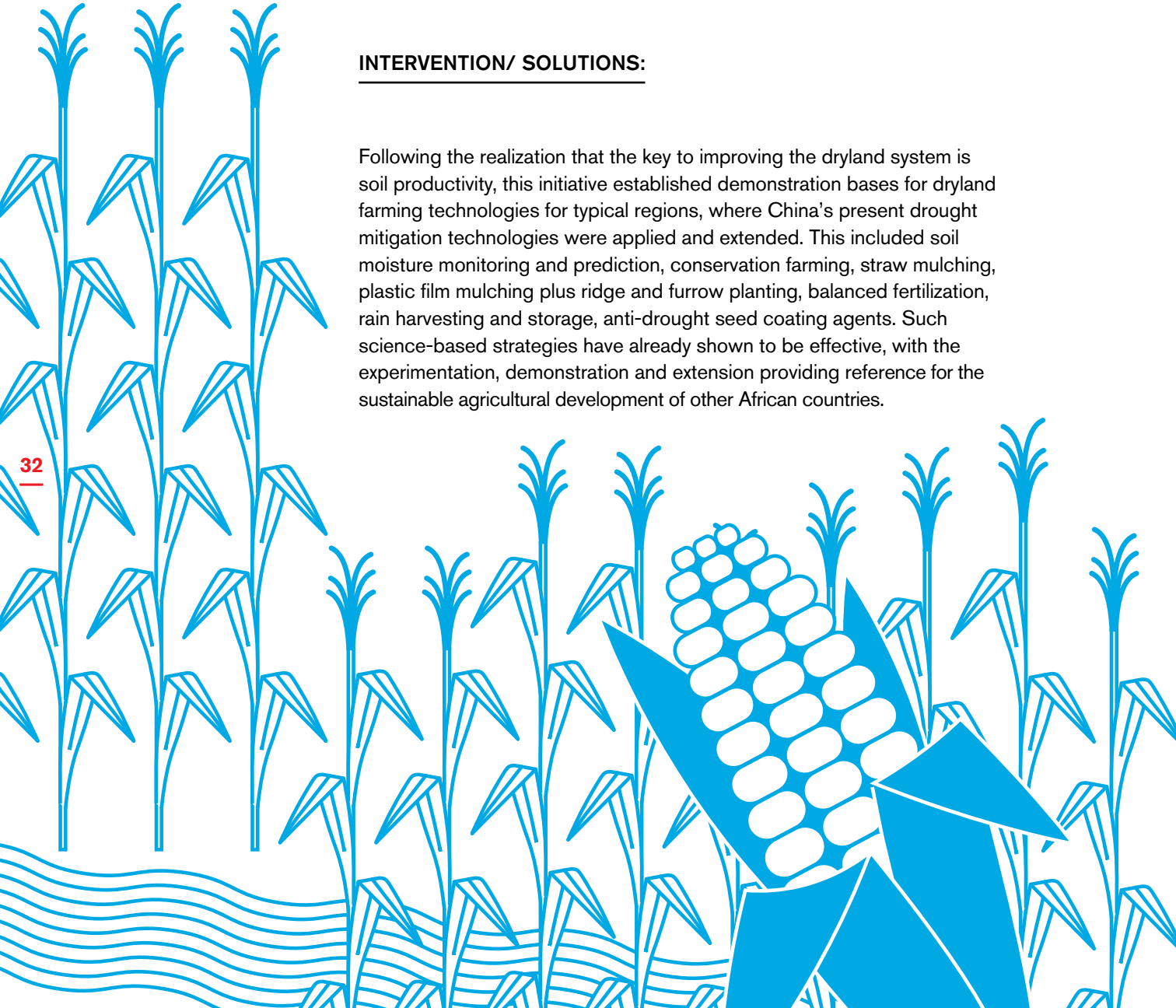
3 *"Climate-Smart" Agriculture-Policies, Practices and Financing for Food Security, Adaptaton and Mitgaton. FAO, 2010.*

Mialana, University of Nairobi, Kenya Agricultural Research Institute, Addis Ababa University, Shanxi Academy of Agricultural Science, Lanzhou University, Northwest Agriculture and Forestry University, Gansu Desert Control Research Institute, Suez Canal University, Xinjiang Tianye Co. Ltd., Space Technology Designing Institute and Yuan Longping High-Tech Agriculture Co. Ltd.

Dryland agriculture experiment in Ethiopia

INTERVENTION/ SOLUTIONS:

Following the realization that the key to improving the dryland system is soil productivity, this initiative established demonstration bases for dryland farming technologies for typical regions, where China's present drought mitigation technologies were applied and extended. This included soil moisture monitoring and prediction, conservation farming, straw mulching, plastic film mulching plus ridge and furrow planting, balanced fertilization, rain harvesting and storage, anti-drought seed coating agents. Such science-based strategies have already shown to be effective, with the experimentation, demonstration and extension providing reference for the sustainable agricultural development of other African countries.



KEY OUTCOMES:

- Established three demonstration bases for Drought Adaptation Technology in Safi, Morocco, Liempie, Zambia, and in the Nile Delta, Egypt.

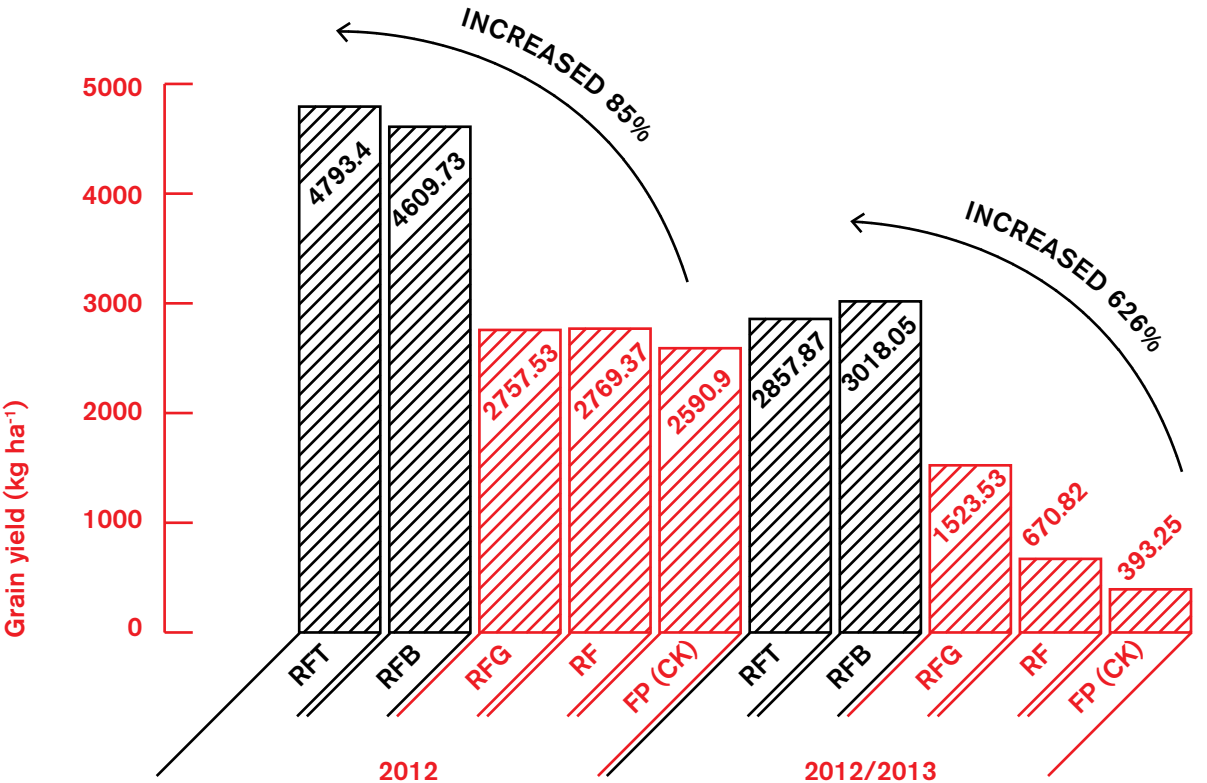
- Field trials of chemical agent application, straw mulching and zero tillage, balanced fertilization and anti-drought film-mulched alternate large and small ridges and furrow sowing have been constructed for three consecutive years in Safi demonstration base, Morocco. The application of selected drought adaptation technology increased the production of wheat and legumes by 20 to 30per cent.

- Finalized the Dought Early Warning System (DEWS) platform and the data integration platform, and constructed a model using Ethiopia as an example.

- Preliminarily constructed the agriculture production models for Ethiopia, Kenya, Zambia, Morocco and Niger; extended and showcased the mobile versions of DEWS software based on iPhone and iPad in Morocco, Kenya and Ethiopia, and verified the software using actual data.

- In Kenya for example, grain yield, rainwater use efficiency and biomass accumulation increased by 85 to 627 per cent as a result of the introduction of rainfed farming Techniques. These technologies were also integrated to develop water-conservation dryland farming technology packages that suit different local situations in Africa.

SUITABLE RIDGE-FURROW TECHNOLOGY FOR RAINFED WHEAT PRODUCTION IN KATUMANI, KENYA:



RFT, Ridge and Furrow with Transparent plastic mulching
RFB, Ridge and Furrow with Black plastic mulching
RFG, Ridge and Furrow with Grass straw mulching
RF, Ridge and Furrow without mulching
FP (CK), Flat Planting without mulching

Notes: The data as indicated in this figure refers to as local maize hybrid of Kenya. The first growing season was from May to September, 2012, i.e. long rainy season. The second growing season was from November 2012 to March 2013 with short rainy season.

SCALE-UP POTENTIAL:

These solutions can be modified and transferred to other countries facing persistent droughts, such as Chad, Mali and Niger, for similar or even wider impact and also documented for knowledge exchange. Countries facing persistent drought should invest in such dryland agriculture innovations along with appropriate policy support in order to significantly increase agricultural productivity. However, in order to maximize the potential impact of these recommendations, they must be introduced as part of a package, alongside sustainable natural resource management techniques, appropriate policies, and income-generating activities.

In the future, under the comprehensive calibration and validation, the DEWS can be extended to the whole East African region or beyond and used for crop production prediction and drought early warning.

Suitable ridge-furrow technology for rainfed wheat producton in Katumani, Kenya

Demonstration base for drought adaptation technology Safi, Morocco

Suitable ridge-furrow technology for rainfed wheat producton in Katumani, Kenya

Demonstration base for drought adaptation technology in Liempe, Zambia

Field trials of drought adaptaton technology in Egypt

4 SUSTAINABLE LAND MANAGEMENT AND COMBATING DESERTIFICATION

The increasing African population without a corresponding increase in land, calls for a serious effort to curtail further degradation of productive land and restore that already degraded. Desertification brings about many social, political and economic problems that can spiral into conflicts and lead to acute poverty and more land degradation. A total of 1,274 million ha of Africa are deserts: the Sahara Desert in northern Africa, the Kalahari Desert and the Namib Desert in southern Africa. While irrigation can enhance food production, its inefficient application can contribute to land degradation, particularly in terms of salinization. It has been estimated that desertification undermines the fertility of productive agriculture in the dry areas, with productivity losses reaching 50 per cent in some areas. Africa also accounts for 27.4 per cent of global land degradation and 500 million ha of the African continent are moderately to be severely degraded[4]. The priority in combating desertification should be the implementation of preventive measures for lands that are not yet degraded, as it is easier to prevent than to reclaim a degraded land. In combating desertification and drought, the participation of local communities, rural organizations, government, non-governmental organizations and international and regional organizations is essential.

4 *Economic Commission for Africa, 2005.*

COUNTRIES INVOLVED:

Morocco, Zambia, Egypt, Ethiopia, Algeria, Kenya, Niger, Nigeria and Mauritania.

PARTICIPATING INSTITUTES:

Zambia Meteorological Department, Regional Agricultural Research Centre of Settat (CRRA-INRA Settat), Institute of Agricultural Environment and Resources, Shanxi Academy of Agricultural Sciences, Gansu Desert Control Research Institute, Xinjiang Ecology & Geology Research Institute of Chinese Academy of Sciences, Lanzhou University, China Science and Technology Exchange Centre, Africa Desertification Control Initiative, Nigeria.

Windpreventing and sand-controlling plant belt

INTERVENTION/SOLUTIONS:

The integrated system consists of implementation of both mechanical and biological measures to combat desertification. Through foreign-aid training, African-Asian drought adaptation fora, study tours and other cooperative activities, local capability, international cooperation and exchange have been enhanced significantly.

KEY OUTCOMES AND SCALE-UP POTENTIAL:

- Analysed the status quo and development trend of desertification in Nigeria, Mauritania, Niger, Kenya, Egypt, Algeria and Libya.

- Appropriate methods on the existing problems and proposals have been proposed via an integrated system of desertification combating and deserticulture development, achieved through R&D and technical fusion between China and counterpart countries' expert teams, as a result of establishing demonstration and extension bases in Nigeria, Niger, Mauritania and Egypt.

- Conducted desertification assessments in Nigeria, Niger, Egypt, Algeria, Kenya and Mauritania.

- Established database concerning eco-environment and desertification in the Sahara Desert.

- Wind preventing and sand controlling plant belts in urban fringes; sand blocking and protecting suburban infrastructure have been constructed.

- Demonstrated regional desertification combating and deserticulture technologies in Niger, Nigeria and Mauritania.

- Applied programmes on shifting sand control and shelterbelt systems.

The integrated system is an outstanding example of technical fusion between China and the African counterparts involved in the project. This provides a strong basis for enhancing incremental gains in the area of sustainable land management and desertification in areas that have similar environments.

Demonstraton of desert control technologies and desertculture in Mauritania. The 10 ha demonstartion sites showcased different mechanical and biological measures.

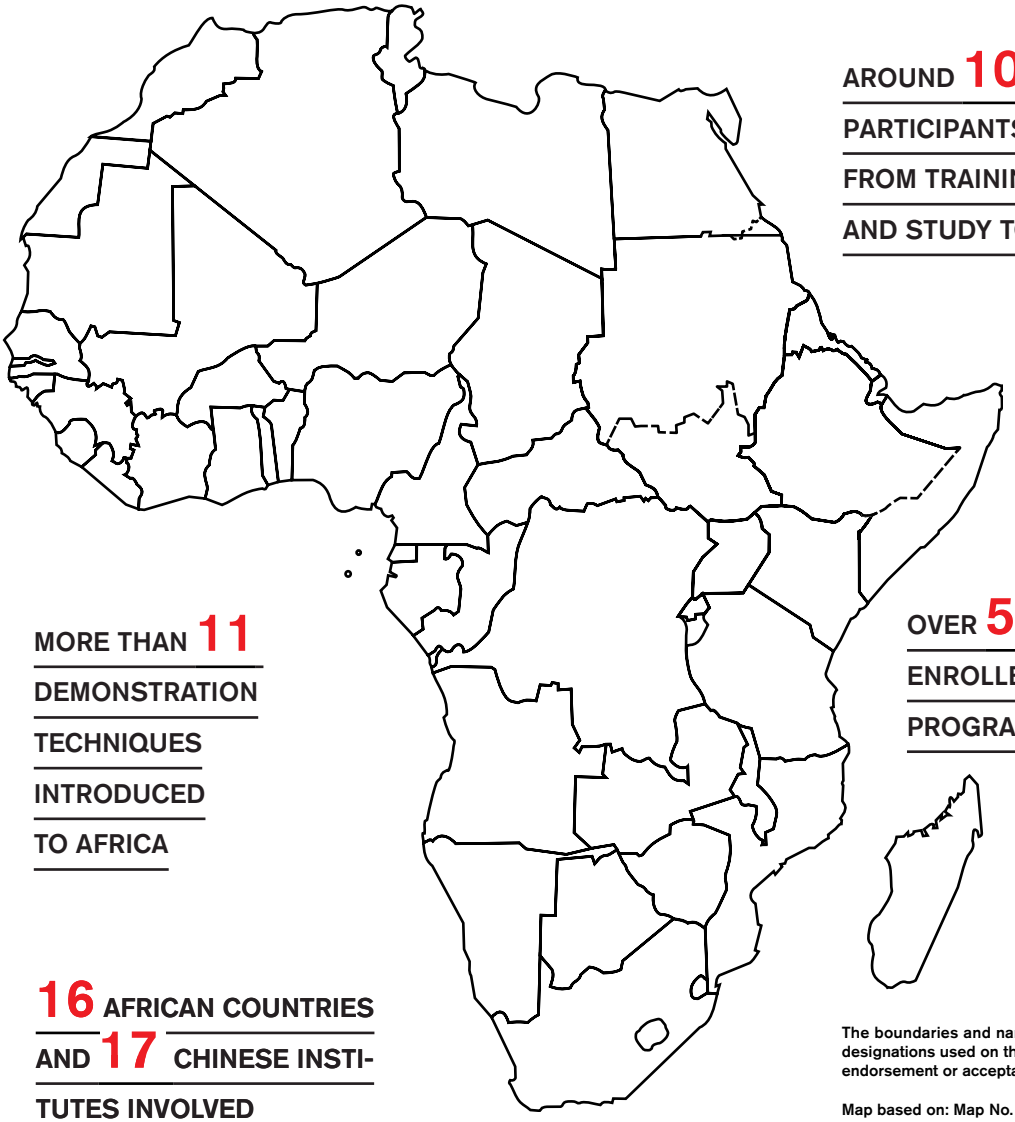
Technology demonstraton on desertculture development in Egypt. Demonstraton on planting of economic trees and medical herbs, and greenhouse agriculture were conducted in Egypt, over an area of 3.5 ha.

CAPACITY DEVELOPMENT AND LESSONS LEARNED

CAPACITY DEVELOPMENT

With the joint efforts of 17 Chinese institutes and African partners, more than 11 demonstration techniques have been introduced in over 16 African countries to address the environmental challenges in the context of climate change. Furthermore, to promote the sustainable running of the programme and to scale up and spread suitable techniques to other countries, capacity building programmes have been particularly emphasized through scholarship-sponsored degree programmes, training workshops and study tours in China, as well as on-site training in certain African countries.

Around 1,000 technicians, officers and farmers in African countries have benefited from such trainings covering techniques on water-saving agriculture, rainwater harvesting, drinking water and wastewater treatment, combating desertification, and environmental database management. These trainings have built the capacity of the beneficiaries to cope with the challenges of the various environmental issues facing their respective countries. The multiplier effects of these trainings have also been passed down to other African technicians and farmers, resulting in overall improvement in the affected areas.



AROUND **1000** AFRICAN PARTICIPANTS BENEFITED FROM TRAINING COURSES AND STUDY TOURS

MORE THAN **11** DEMONSTRATION TECHNIQUES INTRODUCED TO AFRICA

OVER **50** STUDENTS ENROLLED IN DEGREE PROGRAMMES IN CHINA

16 AFRICAN COUNTRIES AND **17** CHINESE INSTITUTES INVOLVED

TRAINING WORKSHOPS IN CHINA

Time	No. of Participants	Topic
Jun-Aug. 2011 Jul-Sept. 2012	36	Combating Desertification for African Countries
Jun. 2011	30	Water Resource Management and Water Treatment
Oct-Nov. 2011	15	Desertification Study and Control Technology for Developing Countries
Sept. 2011	18	Technology of Combating Desertification
Aug. 2012	20	Combating Desertification
Jun-Jul. 2012 Jun-Jul. 2013	36	Eco-restoration and Eco-industry Development In Desert Areas
Sept. 2011 Aug-Sept. 2012	38	Training Workshop on Combating Desertification
Oct. 2012	12	Rainwater Harvesting and Water Resources Planning
Nov. 2012	10	Drinking-Water Treatment
Mar. 2013	6	Drinking Water Treatment
Apr. 2013	90	Dryland Farming and Water Conservation Technologies
Jun. 2013	7	Constructed Wetland for Wastewater Treatment
Jun-Jul. 2013	18	Rainwater Harvesting and Watershed Management
Aug-Sep. 2013	11	Remote sensing Application for Water Management
Apr-Jul. 2013	7	Water Resources Management
2011, 2012, 2013	49	Rainwater Harvesting

OVER 50 STUDENTS HAVE BEEN ENROLLED IN DEGREE PROGRAMMES IN CHINA WITH FULL SCHOLARSHIPS.

Students have been recommended through project teams to suitable programmes in Tongji University, Lanzhou University, Chinese University of Geosciences, and Northwest Agricultural and Forestry University among other Chinese universities, with full scholarships sponsored by the Chinese Government. Most of the graduates are now working for their governments, academic institutions and private sectors, with Post-Doctoral, PhD, Master's and Bachelor's degrees in environment-related subjects.

MORE THAN 300 PEOPLE FROM AFRICA ATTENDED THE TRAINING WORKSHOPS AND STUDY TOURS IN CHINA.

Various training workshops and study tours with specific topics have been carried out for African students, professors, technicians and management personnel throughout the project time.

ON-SITE TRAINING WORKSHOPS IN AFRICA

Time	No. of Participants	Participants	Topic	Place
Apr. 2011	30	Technicians	Combating Desertification for African Countries	Uganda
June 2011	80	Technicians, farmers a and academicians	Combating Desertification and Deserticulture Development	Nigeria
Oct. 2011	70	Technicians, farmers	Desertification Study and Control Technology for Developing Countries	Safi, Morocco
Aug. 2012	40	Professors, post & undergraduate	Dryland Drought Adaptation Technology in the Nile Delta	Egypt
Aug. 2012	80	Farmers	Dryland Wheat Cultivation	Egypt
Apr. 2013	30	Technicians and managers	Safe Drinking Water Treatment	Nairobi, Kenya
Apr. 2012	7	Scientists and technicians	Water-Monitoring Methods	Kigoma, Tanzania
Feb. 2013 Mar. 2014	6	Scientists and technicians	Water-Monitoring Methods	Bujumbura, Burundi
Apr. 2013	30	Technicians and managers	Safe Drinking-Water Treatment	Nairobi, Kenya

ON-SITE TRAINING COURSES WERE HELD IN PROJECT COUNTRIES IN AFRICA.

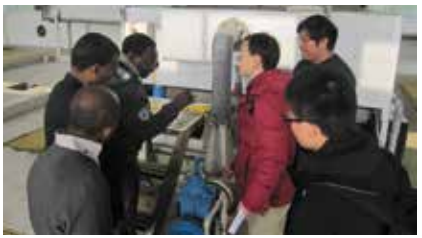
To better introduce suitable techniques, on-site training courses have been conducted to meet different needs of African countries with different environmental challenges, and to deliver the know-how to a greater audience. More than 800 local people attended and benefited from such training courses.

VISITING SCHOLARS FROM AFRICAN COUNTRIES TO CHINESE PARTNER ORGANIZATIONS.

Joint research and scholar visiting can not only generate more advanced scientific findings and effective techniques for both Africa and China, but also educate more beneficiaries in these scholars' home countries. For example, one scientist from Tanzania who visited NIGLAS participated in research for three weeks in September, 2013, in China. Four visiting scholars from Niger visited Gansu Desert Control Research Institute during October and November, 2012, and during July and September, 2013. And another four scientists from Morocco and Zambia undertook research in the Institute of Agricultural Environment and Resources, Shanxi Academy of Agricultural Sciences as visiting scholars twice for 3 months in 2012 and 2013. Through such communication, fruitful joint research papers have been published with important findings in the field of combating desertification and water-saving agriculture.

Training on rainwater harvesting (carried out by Gansu Research Institute for Water Conservancy)

Technical closing workshop on UNEP-China-Africa Cooperaton Programme Phase II (carried out by Tongji University)



Training on wastewater treatment
(carried out by Tongji University)

Training on environmental monitoring
(carried out by Insttute of Botany of
China Academy of Science)

Training on water-saving agriculture
(carried out by Lanzhou University visitng scholars)

LESSONS LEARNED

Climate change can come with great uncertainty and devastating extreme climate disasters. Water and food security are the key challenges under such scenarios, particularly in Africa, which has a fragile environment, is still struggling with poverty eradication and is eager to develop its economies. Proven and effective practices and techniques in China can be transferred to and localized in African countries with similar challenges, as presented in this report. The UNEP-China-Africa Cooperation Programme, with a focus on enhancing the role of ecosystem management in climate change adaptation and as an outstanding example of South-South Cooperation coordinated by UNEP, has successfully reached the end of Phase II. It brings valuable experience that can be gained from trilateral cooperation and at the same time addressing environmental problems on a cooperation mechanism based on the trust placed between China and Africa. The lessons learned from here are invaluable for future cooperation.

Training on water quality monitoring and lake-basin ecosystem management (carried out by Nanjing Insttute of Geography and Limnology of CAS)

Demonstraton on aforestation for desertification control in Niger

Drinking water treatment plant in Nairobi, Kenya

EARLY IDENTIFICATION OF LOCAL NEEDS

Local needs should be identified before the projects commence and be adjusted throughout the whole project period. For example, in places where water resources and irrigation have a high dependency on the rainy season, researchers worked together with local people and improved the technology of rainwater harvesting in the long term. In some projects, the African partners were more interested in cutting-edge instruments and medium- and small-sized agricultural machines while in other projects the initiative of local farmers was a key way to create a self-sufficient food production region.

LOW-COST SOLUTIONS

Lower-cost solutions are more accessible to less developed places, and they are more sustainable and easier to replicate. Example of these include effective drinking water treatment techniques and the creation of artificial wetlands to treat wastewater in Lake Victoria. The long term and integrated water monitoring part of the Affordable Drinking Water and Wastewater Treatment project shows that low-cost monitoring technology can cut down the amount of consumables used and it can be undertaken by a local laboratory with basic infrastructure.

DATABASE AND TECHNICAL FUSION

A database of key environment information at important hotspots should be created, for monitoring and evaluation, and to promote technical fusion, locally and regionally. The sites of water monitoring data for Lake Victoria, and desertification of the Sahara desert should be developed, and more and diverse data should be included. For example, a Drought Early Warning System that can share the data over mobile apps on smartphones and tablets was developed and introduced. These tools can help with stabilization and improvement of crop production and as well policymaking.

CAPACITY DEVELOPMENT

Around 1,000 African technicians, managers, farmers, students and professors were engaged in this project's various capacity building sessions, indicating the essential focus of this cooperation. For example, workshops were held by Tongji University to help African manufacturers to produce local coagulants, reducing the cost of transportation and increasing the level of expertise locally for drinking water treatment. Particularly, the scholarship-sponsored degree programmes for students provided the backbone of the future development of Africa and the opportunity for a broader vision and platform. They are the vibrant links between China and Africa and among African countries, and they will be the power to scale up South-South and Triangular Cooperation in the near future.

ANNEX

ANNEX 1: BIBLIOGRAPHIC REFERENCES

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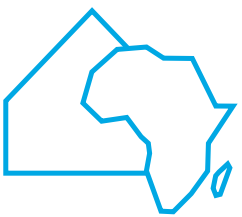
ANNEX 3: AFRICAN PARTICIPATING ORGANIZATIONS



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