PEREZ-GUERRERO TRUST FUND FOR ECONOMIC AND TECHNICAL COOPERATION AMONG DEVELOPING COUNTRIES, MEMBERS OF THE GROUP OF 77GOVERNMENT OF CHINA

FINAL REPORT

INTEGRATED SOLUTIONS TO DRINKING WATER SAFETY ISSUES OF RURAL AREA



Promotion Association for Mountain-River-Lake Regional Sustainable Development of Jiangxi Province (MRLSD)

October 20, 2015

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1. Project information

Title: Integrated solutions to drinking water safety issues of rural area

Beneficiaries: Lake Protection agencies including NGOs and government departments in China, Sri Lanka and India; Village communities who's healthy and living condition are affected by non-portable drinking water or inferior water quality.

Duration of project: 1.5 year

Estimated starting Date: June 2014

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2. Abstract

As the living environment (esp. water environment) for developing countries is a key facts for the locals' health issue and economical development, which are important for poverty alleviation. So in the project, the objective is to enhance the institutional capacities in drinking water safety with special emphasis on wastewater treatment in small scale and for remote area. Two NGOs from Sri Lanka and India is qualified to be our target group/pattern NGOs. Three major activities should be accomplished during the project period: 1)Research and investigations on the technologies of wastewater treatment, 2) training course and experience-sharing seminar and 3)Consultation mission to India and Sri Lanka, and develop proposals to the local government or international donors.

This report states the progresses and outcomes of the three activities. 3 managers and technicians from Sri Lanka and India participated in the training course and the seminar. In the training course, the 3 persons had a better understanding on the techniques and self-managements about drinking water safety and wastewater treatment by visiting enterprises, pilot projects. During consultation mission, the Chinese experts evaluated the local situation and proposed proper suggestion. The institutional capacity of partner NGOs in waste-water treatment was further enhanced by offering governmental proposes or developing funding-raising project proposal.

3. Activities and outputs

3.1 Activity - I: Research and investigations on technologies of drinking water safety, as well as the requirements of partner NGOs

3.1.1 General aspects

The preparation work is the foundation for the next 2 activities, which should investigate two issues: 1) what the requirements of partner countries are. The task is assigned to the two partner NGOs individually. 2) based on the requirements, which technologies are worthy of introducing to the partner NGOs, MRLSD have the responsibility to invite experts to make the decision and training contents. We spent 5 months to achieve the investigation.

3.1.2 Participants

In the period, there were 9 person engaged into the activities: 3 experts and 2 project managers of MRLSD, 3 investigator of EMACE¹ Sri Lanka, and 1 investigator of CReNIEO² India.

3.1.3 The investigation

EMACE Sri Lanka and CReNIEO India carried out the requirement investigation individually. EMACE engaged much energy and attention about the investigation. So EMACE assigned 3 investigator to make a investigation about the excessive heavy metal cadmium in drinking water, which cause significant increase in patients of Chronic Kidney Disease in North Central, North Western, and Eastern and Uva provinces in Sri Lanka. The investigators visited different villages which rely on the contaminated water containing excessive cadmium by interview survey and water sample quality test. Based on MRLSD's supports and the principle of service contract between MRLSD and EMACE, the expenditure of above mentioned actions and tests are covered by the project.

As to CReNIEO, safety drinking water issue is a long-standing issue in some area. CReNIEO assigned one investigator to get well understanding about the situation of safety drinking water, as well as waste water treatment. CReNIEO took the survey expenditure by them own.

We can see the results of requirement investigation of Sri Lanka and India in the table 1.

¹ EMACE Sir Lanka – Environment & Science, Manpower & Skills, Adult & Parenthood Development Assistance, Childcare & Women's rights, Education & Culture. EMACE Sir Lanka is endeavored in environment conservation and biodiversity enhancement of Bolgada Lake for years.

² CReNIEO – Center for Research on New International Economic Orde, is committed to the total development of the socially and economically weaker sections of the Indian Society -with focus on women and children.

Country	Sri Lanka	India
In-charged NGO	EMACE	CReNIEO
Area	Rural area in North Central, North Western, and Eastern and Uva provinces in Sri Lanka	Rural area in Western India, and Center India
Problem and cause	Excessive heavy metal cadmium in drinking water, water pollution, unable to purify the drinking water	Depletion groundwater, water transportation difficult, water source pollution, large population
Requirements	Purifying water	Village level drinking water system
Affected population	About 25,000	Over 100,000
Required techniques	Purifying water facilities, membrane filter technology, PO plant	Village-level centralized water supply system, small-scale Wastewater treatment

Table 1. Requirements

Based on the requirements, MRLSD made the survey in 3 approaches:

- 1) consulting relevant experts to get the overall view about how to solve the problem for each country, such as waste water treatment, constructed wetland.
- 2) Making a cooperation with relevant enterprise, whose patented products are good facility for providing safety drinking water, such as membrane filter enterprise.
- 3) Visiting some governmental livelihood programme, such as Rural water-improving project executed by Water Resource Department of Jiangxi Province

3.1.4 Evaluation

The investigation is a preliminary preparation for the next activities. So the good communication for each other to know what you want and what we can do is very important. During the 5 months, the three parties (MRLSD, EMACE, CRENIEO) kept a constant communication by email and VOIP. We set a group discussion time a each Friday afternoon, for at least one hour, to keep the latest progress for each partner NGO. Thus, we evaluation the investigation was carried out quiet well.

3.1.5 Output and Next step

Abundant information from Sri Lanka, India and Jiangxi Province of China composed of the output of the section(see table 2). In the next step, MRLSD should make a good arrangement and schedule for the training course.

Requirement investigation from Sri Lanka and India

- RO Plant, the core technology of which is membrane filtering technique (Sri Lanka)
- Water purify technique (Sri Lanka)
- Small-scared centralized water supply system (India)
- Village-level wastewater treatment (India)

Technology investigation from Jiangxi province

- Cooperation with Litree enterprise, which is one of top enterprise for producing membrane filter and is able to construct RO plant for any scale and any requirements.
- Cooperation with Water Resource Department of Jiangxi Province, which constructed thousands of village-level and town-level centralized drinking water supply plant. The water purify techniques, and effective management methods and experience are also worth for sharing.
- Wastewater treatment technologies, especially constructed wetland, which is very spread applied in rural are of China, and with the advantages of low-cost, small-scare, easy management. MRLSD choose to invite Dr. Qian Haiyan to make a brief introduction for the training course participants.

Table 2. Investigation results

3.2 Activity - II: A training course on drinking water safety held in Nanchang city, China

During 18-24 of November, 2014, 3 managers and technicians from Sri Lanka and India have participated in the training course on drinking water safety.

3.2.1 General aspects

The objective of training course on drinking water safety with emphasized on wastewater treatment is to improve the institutional capacities of water treatment and international cooperation. One project proposal on drinking water safety and one governmental policy suggestion should be developed by the selected organization from Sri Lanka and Indonesia respectively. The training course is also an opportunity for China (esp. for Jiangxi) to spread patented technologies and effective management experience to promote the technology aid and business exchange.

3.2.2 Participants

Two participants³ are from EMACE Sir Lanka and one participants is from CReNIEO India. As same as MRLSD, EMACE Sir Lanka and CReNIEO India are the members of the GNF⁴-Living Lakes. A marketing manger and technical manager from Litree Enterprise took their products to present. Dr. Qian Haiyan who specializes in wastewater treatment, and two MRLSD project manager joined the training course. The participants' information was presented in the Annex I.

3.2.3 The course

The training course was made of two sections: one section was lesson-learning and experience-sharing in the MRLSD building at 21st of November; the other section was taken most of the training activities, which is field trip on the pilot models of constructed wetland and drinking water supply plant.

In the section 1, two participants from each country presented the situations and issues about drink water safety and wastewater treatment. Then, marketing manager and technical manager introduced Litree Enterprise and the technical advantage of their products, especially the membrane filter. They brought some samples of membrane filter to make a clear statement. The products attracted participants' attention, and an interesting discussion and questions pushed the course into an open, relax, brainstormed state. In the end, Dr. Qian Haiyan demonstrated the wastewater treatment technology, especially introduced the constructed wetland. (the agenda of training course see Annex II)

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³ According to the plan of the training course, 6 managers and technicians from Sir Lanka and Indonesia should be invited to be as trainees. But only 3 of them are available to come.

⁴ GNF, Global Nature Fund, whose headquarter is in Germany, is a non-profit, private, independent international foundation for the protection of environment and nature. The sub-network – Living Lakes is a global network for lake protection. MRLDO represented Poyang Lake of China is one of the members of the Network.



Fig 1. Training course

In the section 2, 2 pilot models were introduced to the participants. The first one (see Fig 2) is Jiangxi Shanghai Water Supply Co., Ltd, which is a state-owned enterprise, managed by Water Resource Department of Jiangxi Province. At present, the main customers of Shanghai water supply company are the neighboring villages, residents, schools and some enterprises. Daily water supply around 8000 tons, the annual quantity of water supply is nearly 2.9 million tons, the company with users about 7500 households.

With the Drinking Water Improving Programme of national wide, Shanghai Water Supply Company is one of quiet small-scaled company in the whole Jiangxi Province. For Jiangxi Province has good water quality and plentiful rainfall, add to large population, small-scaled centralized water supply system is the most appropriate solution for the county-level, clustered village-level drinking water safety. The model has advantages of stability, low-cost (compared to RO Plant) and easy management.

Jiangxi Water Resource Department emphases on conservation and protection of water sources by setting water source conservation zone, stopping all the pollution enterprise and livelihood around the water source, etc.. The measurements keep the inlet water clear for the water supply plants, which will only do a few and simple purifying process. So, compared to RO plant, the maintenance cost would not be large.

The second demonstration site is a three-layered constructed wetland, located on Xingzi County around Poyang Lake. (See fig 3). Unfortunately, due to the plants in constructed wetland are not flourish during autumn, so it is hard to observation the effects of the constructed wetland on the pictures.

Constructed wetland is a good technology for waste water treatment of rural area. In Jiangxi province, some farmland and village community are polluted due to modern detergent, pesticide and organic matters, which jeopardize the drinkable groundwater and surface water. So waste water treatment measurements are also very important to protect the whole water environment and keep water sustainability and cyclic utilization.



Fig 2. Visiting drinking water plant



Fig 3. Visiting the there-layer constructed wetland

3.2.4 Course Evaluation

The course was evaluated by the participants and by the mean of written assessment form. The form was designed to capture the opinions of trainees on the following issues: training contents, management, and suggestions to improve the course. According to the Assessment Forms, the

participants are all content with the course and they rate "very good" or "good" basically. The Assessment Forms are available in Annex III.

3.2.5 Outputs and Next step

The training course successfully exchanged the requirements and needs for each parties. The two organizations (EMACE Sri Lanka and CReNIEO India) should develop project proposal and policy suggestion on drinking water safety respectively, and MRLSD should provide the consultants and technical supports during the consultation mission to the two countries.

3.3 Activity – III: Consultation mission to partner's countries

In the task, a consultation mission made up of 3 experts and 1 project managers was sent to Sir Lanka from Sept. 23 to 27, 2015.

3.3.1 General aspects

The main goal of the consultation mission is to help the local NGOs to identify the major environmental problems about drinking water safety. These experts will investigate the environmental situation and key-stakeholders' livelihood of partner courtiers and find out the reasons for the environmental problems. One feasible and potential solutions of drinking water safety will be proposed based on these experts' knowledge and experiences. Then, project proposal and policy suggestion on drinking water safety should be developed jointly with MRLSD and submitted to relevant donors and governmental organization.

An extra goal of the consultation mission is to make a contact with Technology Ministry of Sri Lanka and try to form a technological cooperation about agriculture and environment protection, which could be supported by both of Science and Technology Ministry of China and Sri Lanka.

3.3.2 Participants

The Consultation mission includes 3 experts on integrated watershed management, international GO-NGO cooperation and NGO capacity development respectively (See table 4) and one project managers from relevant institutions of China.

NO.	Name	specialty	Organization
1	Pro. FAN Zhewen	Integrated Watershed	Office of Mountain-River-Lake Regional
	PIO. FAIN ZHEWEH	Management, water purification	Development Committee of Jiangxi Province
2	NAs IIIINA/sesivere	Technology-based GO-NGO	Science and Technology Department of
	Ms. LIU Wenjuan	International cooperation	Jiangxi Province
3	Mr. LIAO Guochao	NGO capacity development	Promotion Association for Mountain-River-
			Lake Regional Sustainable Development of

			Jiangxi Province
4	Ms. MAO Yuting	Project management	Promotion Association for Mountain-River- Lake Regional Sustainable Development of Jiangxi Province

Table 3. Members of consultation mission



Fig 4. Consultant visiting in Sri Lanka

3.3.3 The problems and Solutions

Two million people living in the North Central province in Sri Lanka depend on agriculture for their livelihood. In 1950's traditional agricultural methods saw a rapid change as a result of the Green Revolution. High yielding rice varieties and vegetables were introduced to these traditional farming lands with chemical fertilizers, pesticides, fungicides to ensure fast growth. This excessive application of chemicals has caused bodily harm and wide spread of Chronical Kidney Disease (CKDu) among farming families.

Approximately 300 to 600 deaths are reported annually in hospitals due to CKDu in Sri Lanka. It is estimated that 250,000 people, mainly the middle aged farmers, may die of CKDu during next 30 years. Current statistics show that the CKDu deaths have already outnumbered the human loses attributed to the 2004 tsunami.

The etiology of CKDu in Sri Lanka is yet unknown and attributed to a range of causes. On key cause is drinking water from shallow and deep ground water. And it is surprisingly to detect abnormally high amounts of Arsenic and mercury in the drinking water. The content observed Arsenics in drinking water of CKDu patents in Mahawilacchiya and Padaviya areas is around 20-20ug/L, which is much higher than the maximum permissible content (10ug/L) specified by WHO. And the amount of Arsenic reach to 100 – 260 micro grams (ug) in rice that have been collected from CKDu endemic regions.

It is also observed that the number of CKDu patients had a marked positive relationship to the extent of ground water hardness. Higher the ground water hardness, more the number of patients encountered

in those areas. Arsenic was present in higher concentrations in the hard water of a certain type of soil in that part of the country which are reported to have a high heavy metal retention capacity due to their chemical unique properties.

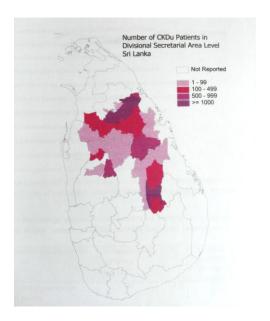


Fig 5. Number of CKDu Patients in Divisional Secretarial Area Level Sri Lanka

The solutions:

In the long terms, it is no doubt that the provision of centrally purified, pipe-borne water is the best, safest, and most cost-effective solution. Additionally, it is very important to carry out a long-term strategies and environmentally friendly agricultural methods. So the methods contains two aspects. First is essentially to train all farmers the correct and safe ways to use pesticides, herbicides and fertilizer and take precautions on preventing exposure to concentrated doses of these chemicals. In parallel, it is necessary to provide a disincentive to prevent farmers' over-using agrochemicals by gradual removal of the agrochemical subsidies. Secondly, applying water purification facilities to help the family getting safety drinking water. The fact is that none of the domestic water purification units currently sold in Sri Lanka are efficient in removing all potential contaminants to a meaningful level. Thus, membrane filtering is very effective technique should be introduced to Sri Lanka. And the it is very expectant to build RO plants in the CKDu endemic area. The disadvantages is that the cost of construction and maintenance of RO plant is rather high, the domestic membrane filtering facility is high cost as well.

3.3.4 Outputs And Next Step

A project proposal and policy suggestion in drinking water safety was developed by EMACE, and submitted to relevant donors and governmental institution, MRLSD provides technical supports in the project proposal, see Annex IV.

In the next step, MRLSD and EMACE Sri Lanka will try to make a working group on technical cooperation among China and Sri lanka, with the help of two Science and Technology Ministry from each country.

4. Finance

The bellowed table lists the actual expenses for the funding from PGTF (\$320,000 USD). The exchange rate of the RMB against the US dollar is 6.3.

expenditures	Actual	budget
Training	US\$ 8,130	US\$10,000
International consultants	US\$1,050	US\$2,680
International travel	US\$ 16,500	US\$13,000
National consultant	US\$2,000	US\$2,000
Reporting costs	US\$4,000	US\$4,000
Execution fee (1%)	U\$\$320	US\$320
In total	US\$32,000	US\$32,000

Annex I. The participants of training course

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	Basic information
	Mrs. Dromaniali Dao
	Mrs. Premanjali Rao
(a a)	Nationality: India
	Director, Finance and Administration
	Centre for Research On New International Economic Order (CReNIEO)
6 6	Mr. Neil Perera
	Nationality: Sir Lanka
	Consultant, Director-Training, EMACE Sri Lanka
	Mr. Alahakoon Mudiyanselage Ananda Alahakoon
100	Nationality: Sri Lanka
	Project executive of EMACE Sri Lanka
Dai Xingzhao	Director of MRLDO
Dr. Qian Haiyan	PHD Doctor of Institute of Soil Science, Chinese Academy of Sciences
Ms. Mao Yuting	Project Manager of MRLSD

会议代表注册表 Registration

姓名 Name	单位 Organization	职务 Title	电子邮箱 Email	电话 Phone	是否参加考察 Whether to join the expedition	房间号 Room NO.	签名 Signature
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Ananda Alahakoon	Emace Foundation SRI Lanka	Program Divector	aalahakansi@gmail.co	DM			Spant
Neil Perera	Emace Fundation Syi Lanka	Consultant Director Training	neilsddagmail.com Emace tundation a gmail.com	9411†2823779			Many
载器	Un [248] A						342B
Premarjali Rac	CRENIEO	Director Admin & Finance	Crenieo Q quail.	9841040051			Pumayorli Ras
毛衣对	MRLSD						mas Enting

Annex II. The Agenda of training course

	Agenda				
Date and Time	Activities				
Section 1					
21/11, Friday	Training course				
9:00-9:10	Opening Speech				
9:10-11:00	Requirements presentation by				
11:00-12:30	Presentation title: Application of constructed wetlands for rural domestic sewage treatment in China, by Dr. Qian Haiyan				
12:30-14:30	Lunch time and break time				
14:30-16:00	Presentation for the technology of Water purification and membrane filter, plus products exhibition, by managers of Litree Enterprise.				
16:00-17:00	Discussion				
Section 2					
22-24/11, Saturday	Field trip and participate the 14 th Living Lakes Conference				

Annex III. Assessment Forms for the training course

Assessment Form of Training Course on Integrated solutions to drinking water safety issues of rural area

Location: Nanchang City of Jiangxi Province

Duration: 19-23 November, 2014

Thank you for your participation and cooperation. Please answer the questions bellowed for

reference.

Subject	No.	Question Selection				
	1.	If the training contents are integrated and systemic?	d			
			Very Helpfyl	Helpful	Less Helpful	No Help
Training	2.	If the project helpful for your future work?	Ø	V		
	3.	If the project helpful for promoting the cooperation between China and your country in the related area?	N			
			Very Good	Good	Just Ok	Poor
	4.	Management of training organization				
Management	5.	Accommodation condition				
	6.	Food arrangement				
	7.	Vehicle arrangement	0			
Your Comments	35.00	ue Socellent Services ven my the organizations of and the organizations	S evnd Ling	Curr	ting h	

Assessment Form of Training Course on Integrated solutions to drinking water safety issues of rural area

Location: Nanchang City of Jiangxi Province

Duration: 19-23 November, 2014

Thank you for your participation and cooperation. Please answer the questions bellowed for

reference. Selection Subject No. Question If the training contents are integrated and Yes □No systemic? No Very Less Helpful Helpful Help Helpful **Training** 4 If the project helpful for your future work? 2. V If the project helpful for promoting the 3. cooperation between China and your country in the related area? Just Ok Poor Very Good Good 4. Management of training organization D. W Accommodation condition Management Food arrangement W Vehicle arrangement Excellent. Thanks you for your hospitality and your warm welcome. Alt tru best withes.

Signature: Phenocyali Ras Your Comments

21-11-2014

Assessment Form of Training Course on Integrated solutions to drinking water safety issues of rural area

Location: Nanchang City of Jiangxi Province

Duration: 19-23 November, 2014

Thank you for your participation and cooperation. Please answer the questions bellowed for

reference.

Subject	No.	Question Selection				
	1.	If the training contents are integrated and systemic?	⊠Yes □No			
			Very Helpful	Helpful	Less Helpful	No Help
Training	2.	If the project helpful for your future work?				
	3.	If the project helpful for promoting the cooperation between China and your country in the related area?				
			Very Good	Good	Just Ok	Poor
	4.	Management of training organization	' 1			
Vlanagement	5.	Accommodation condition	V	₩1		
	6.	Food arrangement	Y			
lanagement	7.	Vehicle arrangement				
			×			

Annex IV. Project Proposals

Project proposal of EMACE Sir Lanka