

Hunan Integrated Management of Contaminated Agricultural Land

Environmental and Social Assessment Executive Summary

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1. Introduction

1.1 Project background

Hunan produces 6% of the nation's rice from only 3% of its arable land, making a significant contribution to food security in China. However, the safety of agricultural producing area in Hunan has been particularly affected by heavy metal contamination of agricultural soil and water, mainly caused by discharge of flue gas, wastewater, and waste residue from mining, smelting and other industries. The quality of agricultural soil is further affected by overuse of agrochemicals and poor farming practices. In addition, severe air pollution (sulfur dioxide emission from fossil fuel combustion at power plants and other industrial facilities) increases the frequency of acid rain in Hunan, causing soil acidification (reducing soil pH value), which in turn increases the chemical availability of heavy metals to be absorbed by plants.

It has been estimated that about 37% of Hunan's total arable land (2.73 million ha) is contaminated with heavy metals. In 2011, with the support from the Ministry of Agriculture, Hunan Provincial Department of Agriculture (now Hunan Provincial Agriculture Commission (AC)) carried out soil heavy metal monitoring in mining and industrial areas, polluted irrigation areas, and suburbs of large and medium-sized cities of 45 counties and districts along the Xiang River basin. About 12,000 soil samples were collected in a total rice producing area of 120,000 ha, of which was found that 44% was highly-contaminated, 34% medium-contaminated and only 22% uncontaminated.

Hunan Provincial Government issued an Implementation Program for Heavy Metal Pollution Control in Xiang River Basin (2012-2015), a first ever program ratified by the State Council, aiming to address arable land pollution in Hunan. Progress has been made on industrial heavy metal pollution source control and reduction of heavy metal concentration in rice in pilot areas. However, it is recognized that there is an urgent need for improving environmental performance in both industrial and agricultural production operations and promoting an integrated approach - combining environmental management (pollution source control and environmental remediation) and sustainable soil management, in order to fully address agricultural land pollution with heavy metals and other pollutants, contributing to food safety.

Since 2014, a pilot project was launched by the Hunan Government for remediation and adjusting cropping system on the rice-raising area contaminated by heavy metals at the scale of 2.74 million mu. The technical approach employed by this pilot project is proven in effectively reducing the Cd content in the rice while achieving the quality standard in terms of Cd content of the rice, while the physical properties of the soil improved with pH value slightly increased. The lessons learned from this pilot project will be considered in this proposed project.

The central government of China has realized the treat of contaminated agricultural land and the urgency to control the deteriorating trend of soil contamination. On 31 May, 2016, the State Council issued the Soil Contamination Prevention and Control Action Plan. This action plan sets out an ambitious and urgent target for soil contamination control: by year 2020 the trend of soil contamination will be curbed and the safety of soil used for agricultural and construction developments will be basically guaranteed; and by year 2030 the ambient soil quality in the nation-wide will be gradually restored;

by the mid of this century, the ambient soil quality will be thoroughly recovered and the sustainable development of ecological environment will be achieved; while the target for soil quality is by year 2020, over 90% of the contaminated farmland will be used in safe manner; by year 203, the target is over 95% for the contaminated farmland. An integrated approach is promoted and promised by the plan to address the imminent challenge of soil contamination through legislation and standard system development, categorization of agricultural land use, monitoring of pollution sources and strengthening relevant studies and research.

The proposed project is consistent with the national and Hunan's plan on heavy metal pollution prevention and control and will contribute to sustainable agriculture and food safety in Hunan and China.

1.2 Project development objective

The project development objective is to improve environmental management of agricultural land contaminated with heavy metals and other pollutants for safe agricultural production in selected counties in Hunan.

1.3 Project components

The proposed project is the first operation in China to demonstrate the integrated approach to control of agricultural land pollution innovatively through the following carefully designed components:

Component 1: Sustainable Management of Contaminated Agricultural Land. This component aims to categorize the soil safety risk of agricultural land based on the tested content of the heavy metals in the soil and the crops grown on the soil, so as to develop and implement the corresponding risk management measures for the various categories of risks, properties of soil and the common species of rice in the project area. In addition, to cope with the environmental and safety risks associated with the physical works, irrigation water and sediments, physical measures will be developed and implemented. The map of agricultural risks distributed in the whole province of Hunan will be developed to help guide the cropping.

Component 2: Agricultural Environment Monitoring System. This component is designed to establish the early alarming and monitoring system for agricultural environment for the project area, with the further efforts to develop the local legislation and standards, and to provide technical assistance to the industrial enterprises contributing large share of pollution load to the project area.

Component 3: Capacity Building. This component aims to strengthen the capacity of the project management through training plan for government officials and technical staff, training for beneficiary farmers and large cropping partners to raise their awareness of agricultural pollution and technical capacity for sustainable soil management, and studies to develop soil environmental protection action plan.

Component 4: Project management. This component is to enhance the daily management of the project by establishing MIS system, procurement of office equipment and cover the cost associated with the project management.

This proposed project will be initially implemented in the three pioneer counties of Hengyang and Yongxing, and Yongding District of Zhangjiajie City, among the totally 16 candidate counties, which show strong government's commitment and public willingness, and where the pollution sources have been clearly identified and prior

attempts were made to reclaim the land contaminated by heavy metals. The lessons and experiences derived from the three pioneer counties are then expected for scale up in the remaining 13 candidate counties at the follow-up phases of this proposed project.

The location of Hunan Province in China is shown in Figure 1 and the locations of the candidate counties including the three pioneer counties within Hunan Province are shown in Figure 2.

2. Summary of Key Safeguard Issues

2.1 Environmental and Social Impacts.

The project itself is an environmental remediation and risk reduction effort which aims at supporting the Chinese government's efforts to improve its capacity for managing contaminated sites, and demonstrate identification and cleanup of sites contaminated with heavy metals, and thus has significant positive environmental and social benefits.

Most of the environmental and social safeguard issues are directly related to the physical works to be conducted in the farmland, which are only limited to small size facilities, such as the irrigation facilities, rehabilitation and dredging of small farmland reservoirs, farm tracks and small civil works, i.e. waste collection tanks, bio-retention swales, and composting tank.

These environmental impacts include air-borne dust, nuisance odor and tail gas, construction wastewater and solid waste including the dredged sediments, noise and destroy of artificial vegetarian cover. In addition the activities associated with the application of lime and inactivation agents, livestock manure and chemical fertilizers and pesticides, are envisaged to cause impact on soil texture or physical properties, as well as on the health of the people. These impacts, though likely to be site-specific, could be significant to the environment and community health if not well-managed. Therefore, the project is classified as Category A as per OP4.01 Environmental Assessment based on types, locations, sensitivity and scales of the proposed activities as well as the nature and magnitude of positive and negative environmental impacts associated with these project activities.

Although the physical investment of the project is focused on the activities in farmland, the potential impact of the off-site pollution sources need to be taken into account in the assessment, so as to avoid the situation where the contaminated soil is being remediated while the off-site sources are discharging heavy metals into the soil. Such off-site pollution sources may include:

- Industries discharging the wastewater that does not meet the effluent quality standard into the rivers, from which the farmers take water for irrigation purpose; emitting flue gas containing heavy metals that may deposit on farmland; discharging industrial solid waste that is not stored and disposed of in compliance with relevant standard.
- Tailings dam that release heavy metals through filtration into the farmland, even in case of collapse that cause accidental discharge of heavy metals and risk on safety of communities; and
- Legacy issues related to the abandoned industrial residues due to closure of industrial enterprises, which may discharge heavy metals into farmland through rainwater leaching.

One of the criteria for selection of the project site is that these off-site pollution sources should be identified and effectively handled, otherwise such site should be rejected from the candidate counties.

The social impacts are primarily positive. The stakeholders' awareness of safe agricultural products will be promoted through the propaganda program and the techniques of safe products will be promulgated among the farmers; the consensus on the approach to remediating the contaminated agricultural land will be achieved, and the irrigation facilities will be improved which will help sustain the development of agriculture; the management of quality of agricultural products will be enhanced and supported by the environmental and agricultural monitoring program, and the capacity of withstanding the risk and competitiveness of agricultural products of the farmers will be increased through the establishment of farmers' cooperatives.

In addition, the project will help increase the price and additional value of the agricultural products, and improve the efficiency of land use, while decreasing the cost of agricultural production. The project also will lead to the return of the migrant workers and the numerous employment opportunities for women, which can contribute to lifting poor families out of poverty.

The project may have some limited negative social impacts which may cause short-term income reductions due to the change of cropping system. This might be the case of long-term cropping prior to the first harvest time of such a kind of crop or fruit trees and affect the aesthetics of the project area due to the dust, noise and solid waste during the construction phase. However these negative impacts are temporary and can be effectively mitigated or compensated.

2.2 Environmental and Social Instruments.

The project plans to conduct soil remediation exercise for the selected counties sites up to 16 in total during the implementation stage. To address the potential environmental and social impacts envisaged for the soil remediation exercise, an Environmental and Social Management Framework (ESMF) has been prepared to guide the safeguards preparation and implementation for the whole project. The ESMF specifies procedures for the selection of counties and sites, the environmental and social safeguards documents preparation as per requirement of World Bank safeguards policies, the World Bank Group's EHS and national laws/regulations. Given the complexity of the project, Social Assessment, and Resettlement Action Framework also have been prepared and incorporated into the ESMF. Site-specific Environmental and Social Management Plan (ESMP) and Integrated Pest Management Plan (IPMP), as well as resettlement action plan for each county under the proposed project will be prepared during project implementation stage following the ESMF requirements.

Three pioneer counties have been identified and prepared for implementation once the project is approved. ESMP has been prepared, which covers site investigation/monitoring, risk assessment, alternative analysis for selection of sites, remediation plan, monitoring and capacity building, and public consultation and information disclosure.

2.3 Capacity for Preparation and Implementation of Safeguard Instruments.

The project provincial implementing agency will be the Foreign Economic and Technical Cooperation Center of Hunan Agricultural Commission (FETCC). FETCC has been designated as the provincial lead implementing agency for this project and it will engage an expert

panel comprised by environmental and social experts to help screen and select the candidate counties and specific sites under each county to participate in the project.

3. Public Consultation and Information Disclosure

The key stakeholders of the contaminated farmland will include farmers and agricultural cooperation association, government organizations and concerned NGOs, as well as experts. Public consultation and information disclosure is an important part of the soil remediation process. Requirements of consultation with project affected people are incorporated into the ESMF based on the world Bank safeguards policy requirements. For each sub-project, at least two rounds of public consultation will be conducted with participation of project affected people: (i) first round at TORs stage or at the preliminary site investigation stage during which local public shall be informed of the general information of the project (land remediation) and consulted on their concerns; (ii) second round when the site-specific draft ESMP is available in which the key findings of environmental assessment and mitigation measures are provided to public for comments and feedback. The draft and final site ESMP documents will be locally disclosed in the project areas.

The first round of consultation for the TOR of this ESMF was conducted in Sept. 2015 and the representative of the 16 candidate counties and the relevant experts took part in; and the second round of consultation for the draft ESMF was in July through Aug. 2016 with the representatives and experts of the 16 counties. The discussion during the public meetings was focused on the disposal of the rice high in Cd content, monitoring plan, approach to prevent the secondary pollution, disposal of sediment in irrigation ditches, possibility of shifting the cropping system and associated compensation standard. These concerns and suggestions have been recorded in the ESMF and considered in the development of the mitigation measures.

4. Legal, Policy and Management Framework

4.1 Policies of the world Bank Group

- OP/BP4.01: Environmental Assessment;
- OP/BP4.12: Involuntary Resettlement;
- OP/BP4.10: Indigenous People;
- OP/BP 4.09: Pest Management;
- OP/BP 4.37: Safety of Dams;
- World Bank Group Health, Safety and Environment General Guidelines;

- OP/BP 4.11: Physical Cultural Resources, though is not triggered, the Chance Find procedure is required to include in the site-specific ESMP;

4.2 Key National Laws and Regulations

- 1) Environmental Protection Law of the People's Republic of China (2014): Article 32 "China will intensify protection for the air, water, soil and so on, establish and improve the system for investigation, monitoring, evaluation and restoration". Article 42 "the enterprises and other manufacturers discharging pollutants shall take proper actions to prevent and control pollution and hazards to the environment caused by the waste gas, waste water, waste residues, medical waste, dust, foul gas, radioactive substances as well as noise, vibration, optical

radiation, electromagnetic radiation and so on generated during production, construction and other activities. The enterprises discharging pollutants shall establish an environmental protection responsibility system, and define the responsibilities of the person in charge of the enterprise and the personnel related”.

- 2) Environmental Impact Assessment Law of the People's Republic of China (2002): Article 16 “China adopts classified management for environmental impact assessment of construction projects based on their extents of impact on the environment. Article 25 “where the environmental impact assessment documents of a construction project has not been examined by the competent authority defined in applicable laws or fails to pass the examination, the authority in charge of examination and approval of the project shall not approve and make it eligible for construction, and the construction unit may not commence”.
- 3) Land Administration Law of the PRC (2004): Article 27 “The State shall establish land survey system. People's governments at or above the county level in company with relevant departments at the same level shall carry out land investigation. Land owners or users should cooperate with the investigation and provide relevant information”. Article 47 “For land acquisition, compensation should be given according to the land original use”. Article 48 “After the land compensation and resettlement plan is finalized, the local government shall hear the opinions of rural collective economic organizations and farmers through announcement”.
- 4) Agricultural Products Quality Safety Law of the PRC (2006): Article 17 “the activities for producing, collecting and fishing agricultural products or establishment of agricultural products production centers shall be prohibited from the areas where the hazardous and toxic substances exceed the applicable standards”. Article 18 “wastewater, solid waste, waste gas or other hazardous and toxic substances shall be prohibited from discharging into the areas for production of agricultural products

4.3 Relevant National Department Regulations/ Rules and Programs

- Method for Safety Management of Agricultural Products Production Areas, 2006
- Notice on Issuing the Guidelines on Improving Compensation and Resettlement Systems for Land Acquisition (MLR [2004] No.238)
- Regulations of the Ministry of Land and Resources on Public Hearing on Land and Resources
- Decision of the State Council on Deepening the Reform and Rigidly Enforcing Land Administration (SC [2004] No.28)
- Notice of the State Council on Issues Concerning the Strengthening of Land Control and Adjustment (SC [2006] No.31)
- Notice of the General Office of the State Council on Forwarding the Guidelines of the Ministry of Labor and Social Security on Doing a Good Job in the Employment Training and Social Security of Land-expropriated Farmers (SC [2006] No.29)
- Notice on Adjusting Fees for Using Additional Construction Land (CZ [2006] No.48)
- Notice of the Ministry of Labor and Social Security, and Ministry of Land and Resources on Doing a Good Job in Social Security for Land-expropriated Farmers Practically (MLSS [2007] No.14)
- Notice of the Ministry of Land and Resources on Doing a Better Job in LA Management (MLR [2010] No.238)

The Chinese Government issued the following regulations or official documents regarding cleanup of contaminated sites in relation to this proposed project:

- In June 2008, MEP issued an official document entitled “Recommendations on Strengthening Soil Contamination Prevention and Remediation.”
- In 2011, the State Council issued “Opinions on Strengthening Key Tasks on Environmental Protection”, which requires that environmental assessment and environmentally sound management should be carried out for contaminated sites before they can be redeveloped.
- In April 2014, the MEP and Land Resource Ministry jointly issued the Soil Contamination Situation Investigation Communique for the whole Country, which indicate that the overall percentage of sample points exceeding the screening threshold in the country is estimated at 16.1%, involving 19.4% of arable land. More than 80% of the surveyed pollution points result from inorganic toxins, with the top three heavy metal contaminants identified as cadmium (Cd), nickel (Ni) and arsenic (As).
- In January 2013, the State Council further issued “work Arrangement on Soil Protection and Comprehensive Treatment in Near Future”.
- Based on the Integrated Prevention and Control of Heavy Metal Pollution 12th Five Year Plan issued by the Ministry of Environmental Protection in early 2011, an , the first national plan for addressing heavy metal pollution. The key guiding principle of the Plan is to prevent new pollution and remediate contaminated water and land by focusing on top control of pollution sources - cleaner production, and end treatment of soil contamination, a concept of whole- process pollution prevention and control.
- Based on the Soil Contamination Prevention and Control Action Plan, issued by the State Council, 31 May, 2016. This action plant sets out an ambitious and urgent target for soil contamination control: by year 2020 the trend of soil contamination will be curbed and the safety of soil used for agricultural and construction developments will be basically guaranteed; and by year 2030 the ambient soil quality in the nation-wide will be gradually restored; by the mid of this century, the ambient soil quality will be thoroughly recovered and the sustainable development of ecological environment will be achieved; while the target for soil quality is by year 2020, over 90% of the contaminated farmland will be used in safe manner; by year 203, the target is over 95% for the contaminated farmland. An integrated approach is promoted and promised by the plan to address the imminent challenge of soil contamination through legislation and standard system development, categorization of agricultural land use, monitoring of pollution sources and strengthening relevant studies and research.

MEP is also now making great efforts to include a “Soil Pollution Prevention and Control Law” in the legislation plan of the National Congress. The initial draft of the law has been prepared and comments are being widely collected. The Law, when it is finalized, will be submitted directly to the National People’s Congress for approval without a need of going through the Legislative Affairs Office of the State Council, which means that its review and approval process will be much shortened, the year expected to take effect of the law is in 2017 or 2018.

4.4 Relevant Plans in Hunan Province

- Implementation Plan for Heavy Metal Pollution Control in Xiang River Basin, 2012-2015;
- The Twelfth-Fiver Plan for Integrated Control of Heavy Metal Pollution in Hunan Province;

4.5 Relevant National and Local Technical Guidelines and Standards

- Technical Guidelines for Investigation of Site Environment (HJ 25.1-2014);
- Technical Specification for Monitoring of Site Environment (HJ 25.2-2014);
- Technical Guidelines for Risk Assessment of Contaminated Site (HJ 25.3-2014)
- Technical Guidelines for Soil Restoration of Contaminated Site (HJ 25.4-2014)
- Guidelines for Evaluation of Site Environment (DB11/T 656-2009);
- Ambient Soil Quality Standard (GB 15618-1995)
- Food Safety Standard-Pollutants Limits in Food (GB 2762-2012)
- Agricultural Irrigation Water Quality Standard (GB5084-2005)
- Standard for Assessment of Environmental Quality in Edible Agricultural Products Production Place (HJ/T 332-2006)
- Ecological Indicators for As, Cd, Pb, Cr and Hg in fertilizers (GB/T 23349-2009)

The most important standards are those for the soil quality and food quality which are the focus of the assessment. In order to learn the difference of the Chinese standards and the international standards on food quality and soil quality, comparison are made by the EA team to ensure that stringent standards be applied and can be achieved at reasonable cost.

- **Ambient Soil Quality Standard:** Comparison of Chinese standard, the Ambient Soil Quality Standard (GB 15618-1995) versus the corresponding standards in Netherland, EU and Japan indicates that the limit for Cd in the Chinese standard is much stringent than those of Netherland, EU and Japan, where the Chinese standard is 0.3 mg/kg for acid soil while 0.8 mg/kg in Netherland standard and 1-mg/kg in EU standard, and 0.4 mg/kg of Japanese standard. The Chinese standard is adopted for this project.
- **Food Safety Standard:** comparison of Chinese standard, the Food Safety Standard-Pollutants Limits in Food (GB 2762-2012) versus corresponding standards of (CODEX STAN 193-1995)2013 of Codex Alimentarius Commission and the (EU) No 488/2014 of EU indicate that the limit for Cd content in rice of Chinese standard is same with that in the (EU) No 488/2014 of EU as low as 0.2 mg/kg, much stringent than the limit of 0.4 mg/kg provided in the (CODEX STAN 193-1995)2013. Thus the Chinese standard for food safety is applied.

5. Summary of Selection of Candidate Sites

5.1 Site Selection Criteria

A site selection exercise was carried out during project preparation. The purpose of the selection is to identify a list of candidate sites suitable for the project. The site selection criteria is two tiered

at the levels of county and site. The potential 16 counties selection was based on such criteria as:

- Being a major production place of agricultural products;
- Being located within the key area for heavy metal pollution control in the province;
- Being clear in the soil quality and the pollution status of agricultural products;
- Being clear in pollution sources which can be controlled;
- Representing the farmland sites for management of heavy metal pollution and application of sustainable soil management practices, which should have potential for scaling up;
- Having prior experience in heavy metal pollution control and the existing industrial sources have been closed down or controlled effectively.

Based upon the above criteria, totally 16 candidate counties were selected for implementation under the support of the project. These counties are Jihou, Yongshun, Baojing, Huayuan of Xiangxi Prefecture, Yongding, Cili of Zhangjiajie City, Zhongfang of Huaihua City, Anhua County of Yiyang City, Pingjiang County of Yueyang City, Hengyang and Hengnan of Hengyang City, Hanshou County of Changde City, Yizhang, Linwu and Yongxing of Chenzhou City, and Lengshuitan District of Yongzhou City.

The provincial PMO will screen and select the sites within each candidate county based on the principles such as the sites have enough area to be scale-efficient, the pollution information is accurate with the major pollution sources cut off or can be controlled, the site can represent the actual local situation and can be duplicated to other parts of the province. Each candidate county would select 4 to 6 sites for implementation based on the principles.

5.2 Safeguard screening for the candidate sites

Once the Provincial PMO has selected one county and the sites within the county for implementation as the next step of the project, the expert panel of the Provincial PMO will use the screening matrix already agreed with the Bank to screen the Operation Policies one by one, so as to determine what safeguard documents will be required to prepare. The screening matrix is provided in Table 5-1 below:

Table 5-1 Safeguard Screening Matrix

	Description	yes	No	explanation	If yes, trigger the Operational Policy	If yes, document needs to prepare
1	whether the sub-project will involve construction of a new dam, or will rely on an existing dam or a dam under construction?				OP Safety of Dams 4.37	Dam safety report
2	whether there is a tailings dam upstream of the sub-project?				OP Safety of Dams 4.37	Dam safety report

3	whether the sub-project cause adverse impact on physical cultural resources?				OP/BP4. 11 Physical Cultural Resources	If yes, need to prepare Physical Cultural Resource management Plan; if not, need to include the Chance Find Procedure into the ESMP.
4	whether the pesticide or fertilizer applied in the sub-project will cause adverse impact on human or environment?				OP/BP4. 09 Pest Management	If yes, need to prepare Pest Management Plan
5	whether there are industrial enterprise near the sub-project that are discharging heavy metals and such pollution route can be cut off?					If yes, exclude the candidate site from the sub-project
1 6	whether the sub-project need to (i) acquire land (public or private owned, for temporary or permanent), causing (ii) displacement or loss of shelter; (ii) loss of assets or access to assets; or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location.				OP 4.12 Involuntary Resettlement	If yes, need to prepare Resettlement Action Plan
1 7	where there are concentrated settlement of ethnic minorities by the world Bank IP term definition within the project area and the ethnic minorities will be disadvantaged by the sub-project?				OP 4.10 Indigenous People	If yes, need to prepare an Indigenous People Development Plan

In addition, in order to enhance the management of social risks and impacts associated with the project, specific and requirements for further actions during project implementation have been highlighted below to help guide the assessment and handling of social issues. All the social instruments shall be prepared by project owner through support of qualified and experienced social experts. The social instruments should be submitted to the Bank for prior review when each new subproject proposal is submitted for review:

- **Resettlement Policy Framework:** Although the project activities will be mostly implemented within project villages, project civil works may include small irrigation canals and ditches on farm land. As a common practice in China, the use of land for village level public facilities like irrigation canals will be dissolved within the related village with no need for acquiring the land. That's, land is usually voluntarily provided by villagers through consultation and village internal land redistribution or rebalance. If the project might experience very limited changes to the current design in relation to land use. A Resettlement policy Framework is prepared to provide guidance on dealing with the issues of land acquisition and resettlement in case land acquisition and involuntary resettlement emerge during the implementation stage of the project. In doing so, it is to ensure the OP 4.12 Involuntary Resettlement is properly complied with.
- **Resettlement Action Plan:** a full RAP needs to prepare for the sub-project that more than 200 people will be affected by land acquisition and resettlement; otherwise a brief RAP needs to be prepared for sub-projects where less than 200 people will be affected by land acquisition and resettlement while such impact is minor. The minor impact is that the people will not lose all of part of their house which lead to loss of less than 10% of productive materials.
- **Social Assessment:** a social assessment report needs to prepare for sub-projects that will cause significant social impacts, including presence of indigenous people, land acquisition and resettlement, loss of income or access to assets or livelihoods.;
- **Ethnic Minority Development Framework (EMDF):** an EMDF is prepared as part of the ESMF to guide the project in handling issues related to ethnic minority people (i.e. IP by the Bank term definition). The EMDF is prepared for the sub-projects although the ethnic minorities or group of ethnic minorities are not found within the first three project cities or county, and it is very unlikely to have presence of IP by the Bank IP term requirements in the project sites. The impact on ethnic minorities is still uncertain as the rest project sites have yet not been determined; Once presence of IP is confirmed in the future project sites, an ethnic minority development plan will be prepared by following the EMDF requirements.
- **Gender dimension** needs to be considered throughout the project cycle, so as to promote the equal development and fair treatment for both man and woman. The vulnerable groups, particularly women, should be given high attention.

6. Summary of Soil Remediation Approach

Remediation of agricultural soil contaminated with heavy metals is a complex and difficult task. A comprehensive remediation and treatment technical package including pollution source control, remediation approach and technology, engineering measures, remediation management and decision making systems are proposed for the project based on the best practice available internationally. The specific measures will be selected and adopted from the technical package based on risk assessment of soil contamination and alternative analysis for each site for remediation. Addressing agricultural land contamination also requires sustainable soil management practices for restoration and maintenance of soil quality. This means a combination of the technical options for soil remediation and soil quality management will be used in this project.

7. Summary of Environmental and Social Management Framework (ESMF)

7.1 Environmental and Social Safeguard Procedures

For the contaminated sites to be confirmed during project implementation, the following steps of environmental and social impact screening, mitigation and management measures development and implementation will be followed:

- Step 1 - Identification and selection of sub-project according to the selection criteria;
- Step 2 - Identification and selection of contaminated sites according to the selection criteria;
- Step 3 - Alternative analysis;
- Step 4 - Screening for potential environmental and social impacts;
- Step 5 - Development of site-specific TORs for Environmental Assessment (EA) and Social Assessment (SA), Resettlement Action Plan (RAP) and/or Ethnic Minority Development Plan (EMDP); when it is applicable, EA and SA should be integrated as ESA;
- Step 6 - Review of the safeguards screening in view of all world Bank safeguard policies and EA, RAP or SA/EMDP TORs by world Bank;
- Step 7 - Preparation of environmental and social safeguards documents;
- Step 8 - Review and clearance of the safeguard documents by government and the Bank;
- Step 9 - Implementation, supervision, environmental monitoring and reporting.

7.2 Site-specific Environmental and Social Assessment Procedures

The objectives of the site-specific environmental and social assessment are to:

- a) Identify the scope of site contamination through information collection, site investigation and sampling/testing;
- b) Assess risks of the contaminated site and propose remedial technology;
- c) Conduct alternative analysis for site remediation technologies and develop site remediation plan;
- d) Assess the potential impacts and develop environmental and social management plan.

The ESMP will include:

- a) Site investigation. During site investigation, the site area, cropping pattern and system, irrigation water source of the site are confirmed; the social baseline on poverty level, level of women participation, household income structure, cropping cost, and business mode is confirmed; the potential risk receptors are investigated and the public (affected people) consulted, the information on the existing pollution source investigated. Site investigation in general follows multi-phase approach which is an international best practice and also adopted recently in China for many contaminated site management. Phases can be divided in different way, but in general follow the same logic order:
 - (i) phase I preliminary assessment. During phase I site investigation, environmental pollution of the site is analyzed preliminarily and preliminary conceptual site model is established through data collection and analysis, field reconnaissance, public consultation and information disclosure, etc.
 - (ii) phase II field sampling. Phase II site investigation is to screen whether there are risks on the site or not through

- preliminary sampling, including sampling, lab analysis and preliminary risk screening. If a risk is confirmed, detailed sampling shall be conducted.
- (iii) phase III site investigation and additional sampling is needed. Phase III site investigation is to investigate site character parameters, and Due Diligence for industrial sources through data query, field measurement and lab analysis, etc.
- b) Risk Assessment. The Cd content in the rice is the indicator for the risk assessment for farmland contamination. Five categories of risk are established based on the Cd content in rice and corresponding remediation targets and remediation technology recommended. Three models for the risk assessment for soil contamination source, farmland contamination source and farmland management respectively are established to screen out the major risk, for which the mitigation measures are developed;
 - c) Site Remediation Technology Program. The contaminated site remediation technology program should be prepared based on the site investigation and risk assessment. Firstly, refine the conceptual site model, determine the overall remediation goals and develop appropriate remediation strategy; secondly, determine the feasible site remediation technology through remediation technology screening and technical feasibility evaluation finally, establish the potentially feasible remediation technical program through the rational combination of all feasible technologies; then compare the solutions by taking economic, technical, environmental and social indexes into account so as to determine the best remediation technology program.
 - d) Environmental and Social Management Plan. The ESMP is an instrument that will detail (a) the feasible and cost-effective measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental and social impacts, or to reduce them to acceptable levels; (b) the actions needed to implement these measures. The ESMP is an integral part of the ESA. The ESMP for the contaminated site remediation sub-project will include the environmental and social impacts of the site cleanup activity, mitigation measures, environmental supervision plan, resettlement action plan if applicable, remediation validation plan, institutional arrangement and responsibilities, capacity building activities, and implementation schedule and cost estimate.
 - e) Public consultation and information disclosure. The safeguard documents, i.e. ESMP, Resettlement Action Plan and Social Assessment, Ethnic Minority Development Plan where applicable, are subject to public consultation and disclosure in an accessible place, in a timely manner, in a form and language understandable to the project-affected people. Particular attention will be given to ensure project affected persons gets adequate time and ready access to draft documents before consultation takes place. The ESMF has also included a Resettlement Policy Framework and an Ethnic Minority Development Framework to guide preparation of the RAP and EMDP. The ESMF, SA, EA and EMP have been disclosed to the public in Chinese and in English.

8. Alternative Analysis

The two alternatives on with and without Project have been compared. Through the comparison the pros and cons of the project are clearly identified and justified. Although the with Project would cause environmental impacts such as dust, noise and wastewater, such impacts are temporary and site-specific and can be readily mitigated. The with Project will gain tremendous positive social and environmental benefits in reducing health risk and improving living

conditions for people. Such positive benefits are long-term and the benefits largely outweigh the negative impact under the With Project. The With Project is quite urgent and preferred.

9. Summary of Environmental Assessment of the Pioneer Counties

9.1 Description and Baseline

Three counties have been selected as the pioneer sub-projects, they are Hengyang and Yongxing, and Yongding District of Zhangjiajie City. The information on the industrial and agricultural activities and routine environmental quality data were collected to evaluate the overall soil contamination in the three pioneer counties. The description of the three pioneer counties are as follows:

- Yongding District is located in the deep Wuling Mountain, the source for heavy metals that contaminated the agricultural land is mainly the solid waste and wastewater once discharged by the mining enterprises. The application of fertilizers that contain Cd during the past three decades is considered another reason for contamination of farmland. In addition, the natural background of heavy metal content is relatively given that Yongding is rich in minerals. Recently Yongding is centered on the development of tourism, as a result the industrial enterprise involving in heavy metal and mining have been closed down. The legacy issues on the abandoned industrial wastes are being addressed.
- In 2012 and 2015 totally 1549 sampling points were established across the county of Hengyang. The analysis results indicate that the soil contamination risk is generally low; however measures need to be taken to curb the trend of soil contamination. The rice sampling exercise made in 2013 and 2016 respectively confirmed this trend that there is a risk of heavy metal contamination in some samples at certain degree with Cd being the primary concern. The main source for heavy metal pollution is the historic discharge from mining and smelting enterprises which have already been closed down. The application of the sediments dredged from the Zheng River which once received the direct discharge of untreated industrial wastewater is considered another reason. In addition, the application of the fertilizer containing Cd during the past decades may cause the accumulation of the Cd in the soil.
- In 2012 totally 781 sampling points were established across Yongxing. The analysis results show that the risk of soil contamination is moderate with Cd and As being the primary and secondary concern respectively. The rice quality testing result confirmed that the rice is contaminated by Cd. As a famous silver production county, there are numerous smelting enterprises. The historical discharge of untreated industrial waste and flue gas is considered the fundamental source for heavy metal in the soil. In addition, the application of fertilizer high in Cd content in last decades also contributed to the high content of Cd in the soil. Given the background content of heavy metal in the natural soil, the source for heavy metal in the county of Yongxing is complex. The government of Yongxing has prepared the comprehensive industrial development plan and implement the plan to tackle the industrial pollution by restructuring and relocation to the industrial parks where the industries are promoted by cleaner production, while the small enterprises are closed down. The legacy pollution is being treated actively by the government of Yongxing.

The sites for soil remediation have been screened and selected under the three pioneer counties based on the procedure and criteria provided in the ESMF. To further learn the actual situation of soil contamination in the selected sites, additional sampling program for surface water, soil, agricultural products (mainly rice) has been

developed and conducted for each of the site selected. The findings of the sampling program are given as follows:

- The total area of the sites is 15108.9 mu in the six selected townships under Yongding District of Zhangjiakou City eligible for the loan from the project. The irrigation water is from either the surface water reservoir or mountain spring. The water quality sampling results show that the water quality in the reservoirs or mountain spring is good and meets the quality standard for agricultural irrigation.
- The total area of the sites is 15661.05 mu in the four selected townships under Yongxing County. The water source for irrigation is the surface water reservoir or streams. The analysis results show that the water quality is good and meets the standard but the Zhengjiachong reservoir which is highly polluted by Cd discharged from adjacent smeltery. Thus the Zhengjiachong Reservoir is not used as the water source for irrigation in the site of Songbai Township.
- The total area of the sites is 17671.35 mu in the three selected townships under Hengyang County. The water source for irrigation is the Zhengshui River. The analysis results show that the water quality is good and meets the standard for agricultural irrigation.
- The sampling and analysis of the soil quality in the sites have been conducted by the certified laboratory in early 2016 to assess the risk of the soil. The analysis results indicate that the heavy metal of primary concern is Cd while the risk categories of the soil quality ranging from low to medium in the sites under Hengyang, from medium to very high in site under Yongxing, and from medium to very high in the site under Yongding. Additional sampling was made for the sediments in the ditches that convey water to the site for irrigation. The analysis results show that the sediments quality does not exceed the threshold developed under the GEF project, but in the Taiping Village where the Cd content exceeds the threshold by 0.2 times. Thus it is expected that the heavy metals contained in the sediments are unlikely to be the major source for the site contamination.
- The rice samples are collected and analyzed in line with national standard procedures. The analysis results indicate that the categories of risk for the rice ranges from moderate to very high for Yongding, from moderate to very high for Yongxing, and remains moderate for Hengyang.

Conclusion is made from the baseline investigation that the sites selected under the three pioneer counties are not affected by the pollution sources out of the site any longer, and the risk of the rice and soil ranges from moderate to very high.

9.2 Description of subprojects

Component 1: Sustainable Management of Contaminated Agricultural Land. Based on the risk categories of farmland contamination, pollution characteristics, soil physical features and the traditional cropping practice, the remediation technologies are selected from the technical package, including the environmental monitoring, pollution source control, agronomical measures, and soil remediation measures.

The technical options selected by the three pioneer counties consist of a combination of agronomic approaches including application of lime, inactivation agents, and alkaline based fertilizers, planting enrichment vegetation and cover crops, clean water irrigation, removal of crop residues and subsidy for change of cropping system. As part of the irrigation ditches are not lined or damaged, civil works will be involved to line and rehabilitate the linking

ditches under the sub-project of the three counties. Some plots of farmland will be used to support the soil risk evaluation model where the monitoring data on soil, crop, pollutants and fertilizer will be collected for input into the model. This component also provide assistance in drawing the agricultural risk map for the whole county scope.

Component 2: Agricultural Environment Monitoring System. This component will involve procurement of vehicles with the operation platform for sampling and testing and computers to establish the early alarming system at each county. In addition, series of studies will be launched to strengthen or supplement the local regulations and technical standards. Specifically, the studies include:

- 1) study and developing the method for administrating the agricultural input, i.e. organic fertilizer and agricultural chemicals, as well as the industrial source for heavy metal; issuing the discharge standard for the industrial enterprises with a concern of heavy metals. This standard will be applied only in the project county; study pollution control and management in farmland to improve the method for environmental management in the contaminated farmland; developing local regulations and technical guideline for integrated farmland risk control.
- 2) Study and developing the integrated farmland contamination risk management system; developing local regulations and plannings regarding safety of agricultural products.
- 3) Propose the plan for treatment of agricultural products that the heavy metal content exceeds the standard;
- 4) Establishing county-level environmental supervision system to supervise the input of hazardous materials into the farmland.
- 5) Study the ecological compensation mechanism;
- 6) Develop the evaluation methodology for the project .

Component 3: Capacity Building. This component will involve the training and study tours for the staff of the government departments and PMOs; environmental awareness outreach program and technical training for farmers; develop soil environmental protection action plan for each county.

Component 4: Project Management. This component will involve the procurement of office equipment and stationary and establishment of MIS; monitoring and evaluating the outcome of the project.

9.3 Screening of Operational Policies of the World Bank

According to the screening matrix for Operational Policies of the world Bank provided in the ESMF, the following Operational Policies are triggered:

1. OP/BP4.01: Environmental Assessment;
2. OP/BP 4.09: Pest Management;
3. OP/BP 4.37: Safety of Dams;
4. World Bank Group Health, Safety and Environment General Guidelines;
5. OP/BP4.12: Involuntary Resettlement.
6. OP/BP4.10: Indigenous People.

The reasons for not triggering the following policies are:

7. OP/BP 4.11: Physical Cultural Resources: it is confirmed that there are no physical cultural resources in or near the subprojects. Although is not triggered, the Chance Find procedure is required to include in the site-specific ESMP;

9.4 Analysis of Alternatives

The criteria for comparison and selection of the candidate regions, towns and villages for inclusion into the sub-projects in the three pioneer counties have been followed and the local conditions/situations of the area of farmland, rice yield, content of heavy metals in soil, risk of contamination for farmland, Cd content in rice, contamination source and pathway, the current status of soil contamination management, willingness of local government and public, etc. have been surveyed and specific data/information obtained.

- Under Yongxing, Bianjiang and Huangni Towns have been selected which meet all of the criteria among the total 15 candidate towns. And the five villages of Jinli, Tangmen, Wuni, Tielu and Songbai under the selected towns are considered in full compliance with the criteria and recommended to be included into the sub-project from the total 10 candidate villages within the Bianjiang and Huangni Towns;
- Under Yongding, the towns of Fengxianggang, Houping, Luotaping, Wentang, Xixiping, Yanghuping have been selected which meet all of the criteria among the total 27 candidate towns. And the 12 villages of Taiping, Wentang, Wuxi, Bajiahe, Guangyanzui, Qingyutan, Fengxianggang, Darongxi, Dingjiarong, Zhuangjiayu, Wujiazui, and Yangchi under the selected towns are considered in full compliance with the criteria and recommended to be included into the sub-project;
- Under Hengyang, the towns of Taiyuan, Hongshi and Xidu have been selected which meet all of the criteria among the total 24 candidate towns. And the 15 villages of Jiushi, Taijiu, Changqing, Hengxing, Hongshi, Yutian, Gaolu, Qingjiang, Daoshan, Shimen, Qingmu, Meihua, Douling, Xianzhong and Shuangqiao under the selected towns are considered in full compliance with the criteria and recommended to be included into the sub-project.

9.5 Impacts Analysis and Mitigation Measures

The sub-projects will support rehabilitation of small agricultural facilities, i.e. linking ditches. Like other similar projects, the environmental impacts may include wastewater, dust, noise, solid waste and soil erosion during the construction phase. Given that small size of the works, the magnitude of the impacts would be very limited and temporary. Thus these impacts are site specific and can be readily mitigated. Two sets of ECOPs are developed to mitigate the potential impacts, one for small civil works and the other for irrigation facilities.

Investigation on the pollution sources upstream of the selected sites were conducted based on field investigation and public consultation, and information collection. Following are the findings of the investigation:

- Yongding District: it is confirmed that there are neither operating industrial enterprises discharging heavy metals near or upstream of the selected sites nor tailings dams upstream of the sites. However there are still legacy industrial wastes upstream of the sites which may release heavy metals through rainwater leaching into stream and soil.
- Hengyang County: it is confirmed that there are neither operating industrial enterprises discharging heavy metals near or upstream of the selected sites nor legacy industrial wastes upstream of the sites; and there are no tailings dams upstream.
- Yongxing County: the site visit and consultation indicate that there are some industrial sources discharging heavy metals near

the sites. These industrial enterprises have been identified and the inventory of pollutants and pathways has been confirmed. The provincial government has issued the circular to close down these industrial enterprises and the local government made commitments to completing the close-down and site cleaning by the end of 2016. In addition, there are neither legacy industrial waste issues nor tailings dams near the sites.

Thus the mitigation measures are developed to tackle the industrial pollution issues.

- Hengyang: 1) conduct regular monitoring of the water quality in Zhengshui River; 2) rehabilitate the irrigation ditches; 3) enhance law enforcement on the industrial enterprise and the mining activities upstream of the sites to prevent these operations from being reactive.
- Yongxing: 1) local government authorities need to enhance cooperation to close down the industrial operations by the end of 2016 and supervise the whole process of the site cleaning to remove the heavy metal pollution sources; the industrial waste piled in the enterprises should be disposed of by certified companies so as to ensure that new heavy metal pollution would not be generated; 2) prior to the dismantle of the industrial facilities, the owner should report to the local government authorities for appropriate measures; and the whole process of dismantle should be supervised by the government authorities; 3) the hazardous waste deposited in the facilities should be cleaned and disposed of by certified companies before dismantle; 4) the construction waste, i.e. bricks and steel bars, should be reused or recycled and the remaining waste should be disposed in construction solid waste facility; 5) the Zhengjiachong reservoir should not be used to provide water for irrigation in this project and the pathway of effluent from Zhengjiachong reservoir should avoid the project area. The ditches convey the water discharged from Zhengjiachong should be closely supervised by local government authorities to ensure that no overflow or runoff from the ditches into the project area. 6) construct new irrigation pumping stations to introduce the water from the Xi River into the project farmland. 7) suggest to launch the remediation plan for the Zhengjiachong Reservoir to ensure the water quality in the reservoir meet the water Quality for Agricultural Irrigation (GB 5084-2005) to eradicate the risk of Cd pollution. 8) set up front settling tank for residence time more than 2 hours at the end of the link ditches. The settling tanks should be managed by the county PMO and dredged each year. The dredged sediments will be transported and disposed by certified companies.
- Yongding: 1) enhance law enforcement on the industrial enterprise and the mining activities upstream of the sites to prevent these operations from being reactive. 2) set up front settling tank at the end of the link ditches to remove the silts containing heavy metals. 3) the settling tanks should be dredged regularly and disposed by certified companies. 4) the legacy mining wastes should be collected and transported to the certified disposal facility and the timing should be scheduled to avoid rainy days and nighttime.

During the operation of the subprojects, the potential environmental impacts are mainly associated with the activities of application of lime, fertilizers and pesticides, etc. and these impacts may cause risk on human health or soil quality. Following are the summary of the analysis of the impacts in operation phase:

- Impact by application of lime: the water to be used for irrigation in the is slightly acid, thus application of lime at a proper rate would be helpful to adjust the pH value of the water. The application rate has been carefully calculated based on the pH value of soil and the soil texture, so as to avoid the hardness

of the soil. The composition of lime is prepared to ensure the percentage of CaO is at 30%, so as to avoid scorching to crops and people. During the application of lime, the fine powder of lime would cause air-borne dust which will affect the health of the operation staff. Thus protective gear should be provided to the staff before the operating the application of lime.

- Impact of application inactivation agent: the inactivation agents to be applied are those permitted by the agricultural departments, thus additional load of heavy metals will not be brought to the soil through the application of inactivation agents. However application of the inactivation agents at excessive amount may affect the physical property of the soil. Thus the rate should be carefully calculated based on the instructions of the producers and close monitoring on the soil properties, and the quality and yield of agricultural products should be maintained.
- Impact of application of organic fertilizers: the raw materials for composting may be diversified in the project area, including crop residues, livestock manure, waste food and river sediments, etc.. These raw materials may contain high content of heavy metals, which may add new load of heavy metals to the soil through application of the compost products. It is required that the content of heavy metals contained in the organic fertilizers be less than the limits provided in the Organic Fertilizer (NY 525-2012). In addition, the county PMO should take close supervision on the use of livestock manure in the composting. The livestock manure contains excessive heavy metals should be prohibited from composting.
- Impact of application of chemical fertilizers: application of chemical fertilizer may provide a pathway for heavy metals (mainly Cd) to enter the soil. Particularly the application of phosphatic fertilizer may contribute larger share of heavy metal load than other fertilizers. The chemical fertilizers low in Cd should be preferred for application.
- Impact of application of pesticides: the impact of pesticide is widely known. The integrated pest management approach will be extensively promoted across the project area. In the case of application of pesticide, the staff designated by local agricultural department will provide training and guidance on the selection and preparation, and application, of the pesticide. An Integrated Pest Management Plan has been prepared for this project which will be helpful to protect the health and safety of the people and crops.
- Impact of agricultural solid waste: the agricultural solid waste include wasted agricultural films and packing materials. Such solid waste should be collected otherwise the soil texture would be affected. Thus the awareness of the agricultural solid waste management should be enhanced for the farmers as a part of the environmental awareness outreach campaign.

9.5 Safety of Dams

Through site survey, totally 13 reservoirs are identified to trigger the OP 4.37 Safety of Dams in the pioneer counties. Among them, there are 7 in Yongding District of Zhangjiajie City and 6 in Yongxing County of Chenzhou City. The height of the dams ranges from 33 m to 12 m, and the volume of the reservoirs ranges from 6.74 million m³ to 0.18 million m³. All of these 13 reservoirs have been enhanced recently.

These reservoirs have been evaluated through the Dam Safety Evaluation Report for the project prepared by an independent dam safety expert. The report confirms the operational safety of the dams and suggests some actions to enhance the maintenance and operation of the reservoirs, e.g. construction of seepage measuring facilities in downstream dam to monitor dam seepage; strengthening daily monitoring and normal maintenance, and providing official review and

acceptance report for the dam strengthening works. To strengthen the dam safety management and ensure the sustainable safety operation of the dams, an action plan to reflect the recommendations will be prepared and submitted to the Bank for review before project appraisal.

9.6 Summary of Social Impact Assessment

In general the project is socially positive as it will 1) improve the soil quality and increase the yield and quality of crops; 2) improve the infrastructure such as irrigation facilities and the ecological environment; 3) stimulate the socio-economic growth; 4) raise the knowledge and skill of farmers as well as reduce adverse impacts on health of local residents, so as to help disseminate the advanced agronomic technologies and enhance the awareness of heavy metal pollution. However, the project may cause some negative social impacts, in terms of short term of income loss due to adjusting cropping system and land use adjustment. Other impacts may come from the negative impacts can be effectively mitigated by proper compensation and other assistance.

Involuntary Resettlement: the first three subprojects will not involve resettlement of people or land acquisition. But some project areas may lead to change to new crops, such as fruit trees or others which may cause non-land economic displacement. This will not be on big scale, but still it may affect a small number of farmers in income loss for a short period of time before the new crops can be harvested. In some seriously contaminated areas in the project, farmers will not be able to access for cropping in their contracted land, in this case they will receive government subsidies according to local government policies and the project tailored subsidy measures. In case there is any land acquisition or resettlement, a resettlement policy framework has been prepared.

Indigenous People: although there are some ethnic minorities of Tujia and Bai people by the Chinese ethnic criteria in the western part of Hunan, like Yongding district, yet they are well integrated with the majority Han people and do not fit the definition of the Bank IP term according to a detailed social assessment. Thus the Bank OP/BP4.10: Indigenous People is not triggered for the first three pilot counties. Yet the impact on ethnic minorities is still uncertain as the rest subproject sites have not been determined. To take a cautious approach, this policy is deemed triggered. An Ethnic Minority Development Framework (EMDF) has been prepared. Once presence of IP is confirmed in the future project sites, an ethnic minority development plan will be prepared by following the EMDF requirements.

The corresponding mitigation measures have been developed and consulted with the affected people as mentioned above. Other measures are also incorporated into the ESMP of the sub-projects which include the following:

- The local tradition and custom should be respected;
- The policy and standard for compensation and subsidies for those affected by reduced yield and income should be applied during project implementation, through the public consultation with the agricultural departments, environmental protection agencies, affected villages and farmers.
- The plan for training and subsidies should be developed;
- Detailed technical specifications should be developed;
- Institutional capacity for supervision and implementation of the project should be enhanced;
- Environmental awareness of farmers should be enhanced by launching comprehensive awareness outreach plans.

In addition, this project has prepared a compensation mechanism for farmer's non-land economic displacement, such as some cases of short term reduced income due to the adjustment of cropping system, and A RAP will be prepared to tackle the issues related to land acquisition if it occurs.

As a concern, the management of rice containing high content of Cd become a focus of soil remediation approach. If the content of Cd in the rice is less than 0.5 mg/kg, the rice will be purchased by the enterprises where the rice will be used as raw materials for industrial purpose or for producing fodders; if the Cd content is more than 0.5 mg/kg, the rice should be limited to be used solely for industrial purpose, such as for producing aginomoto, alcohol or starch.

To prevent the heavy metals from returning to soil through crop residues which may be remained in soil after harvesting. If the Cd content more than 1.5 mg/kg, the crop residue should be removed from farmland. Incentives should be paid to the farmers or the harvesting companies to change the traditional harvesting mode which uses combine harvester to destroy the crop residues into small chips.

9.6 Land Use and Resettlement Issues

The civil works under the project are mainly limited to the rehabilitation of existing irrigation ditches, small canals and construction of irrigation water pumping stations within project villages. Similarly the land occupation of other civil works such as irrigation water pumping stations is also quite limited. Typically one machine port would occupy only 4 m² of collectively owned land within a project village, while one irrigation water pumping station would occupy 3 m² collectively owned land, thus there is no need to change the land ownership as this kind of land use is traditionally provided by villagers voluntarily as village public facilities in China. In addition, the first three determined subprojects will not involve relocation of any people. But they may be non-land economic impacts on a short term when the farm land is used to grow new crops or no more crops. Local government has regulations to provide subsidies which will subsidize increased costs for new crop seedlings, labour or early stage of lower yield. Other government subsidies include those for increased production inputs, market risk and other risks.

9.7 Environmental and social management plan

9.7.1 Institutional arrangements

According to remediation demands, the institutional arrangement is established with management, supervision, consultation, and implementation entities which are cooperating with each other, and the corresponding responsibilities of these entities are defined as well.

(1) Provincial Joint coordinating Committee: providing overall and general guidance on the relevant policies, implementation and coordination as well as tricky issues; supervising the implementation of the project; review and clear the project proposal and seek counterpart fund and coordinate inter-institutional cooperation for the project.

(2) Provincial PMO: will be responsible for overall management of the project to ensure the successful implementation of ESMP. It is explicitly responsible for:

- Examining and coordinating the local EPB;
- Arranging the site visit for world Bank missions;
- Summarizing the report and submitting to the world Bank;
- Reporting to the world Bank regularly.

(3) County PMO: will be responsible for implementation of the ESMP, by:

- Supervising the measures to be included in the contract;
- Supervising the mitigation measures to be performed by contractors;
- Preparing implementation report for ESMP;
- Reporting the Provincial PMO on the progress of the ESMP.

(4) Environmental Protection Bureau (EPB): Responsible for the whole-process environmental supervision including:

- Examination and approval of site investigation, risk assessment, technical scheme and acceptance inspection reports for remediation of the sites;
- Disclose the information on the cleanup sub-project for the sites, and handle the public comments and complaints.

(5) Township MIUs with support of villages: will be responsible for implementation of the Mitigation measures.

(6) Environmental and Social Monitoring Institutes: will be responsible for carrying out the environmental and social monitoring plans;

(7) Environmental and social consultants: will be responsible for providing technical support to the Provincial PMO on the screening and selection of the sub-projects, as well as other technical services. **(8) Land Resource Bureau** will be responsible for review and approval of land acquisition if needed for the civil works associated with the project;

9.7.2 Mitigation of environmental and social impacts

The potential impacts have been identified and analyzed, these impacts have been addressed and corresponding mitigation measures have been developed as shown in the environmental and social instruments (see Table 9-1).

9.7.3 Environmental and social monitoring Plan

A comprehensive monitoring plan is prepared to cover all of the primary concerns, i.e. water quality, soil, agricultural products, organic fertilizer, pesticide, land acquisition and resettlement, ethnic minorities if any, etc. the national relevant protocols for sampling and analysis have been considered in the preparation of the monitoring plan, and the applicable standards to evaluate the analysis results have been confirmed.

9.7.4 Cost Estimation for both Mitigation Actions and Supervision

9 The total cost of mitigation actions will be included in winner bidder's bid. The funding sources will come from the loan and counterpart funds. Budget for site remediation including supervision cost will be included in Annual work Plans and also procurement plan of the project. Selection of remediation contractors will be carried out through a comparative bidding process to make sure cost-effectiveness.

9.7.5 Reporting and Grievance Redress Mechanism

The requirements for environmental and social supervision and monitoring, as well as the reporting system has been clearly specified. A mechanism has been established for grievance redress for affected people and environment. Grievances can be filed both orally and in writing. Starting at village and neighborhood committee level, the grievances can be elevated to PMOs at county/district, city and provincial levels if they are not satisfied with the resolution at the lower level. The affected people could also file their cases in

court if they are not happy with the resolution by the project authority. All grievances and their resolution will be recorded. This mechanism has been disclosed to the local population and will be further disseminated through the Resettlement Information Booklet. The grievance Redress mechanism will be maintained throughout the project life-cycle to deal with any public concerns in environmental and social management.

Table 9-1. Environmental and social impacts and mitigation measures

Environmental elements	Mitigation Measures	Implemented by	Supervised by
noise	<ul style="list-style-type: none"> • No-horn sign shall be set up in sensitive spots and measures shall be adopted to reduce noise, such as using low-noise equipment, control noise source, transmission and traffic noise. • Schedule construction activities to avoid noon and night; • Cushion devises should be provided to the equipment making high noise; • All of equipment should be maintained regularly to reduce the noise; 	County PMO	Hunan Provincial EPB and County EPB
Air	<ul style="list-style-type: none"> • The earth excavated should be used for grad filling in other contracts of the project; • Such activities as excavation and filling should be banned in windy and raining days; • The powder materials such as sand, cement and lime, should be carefully stockpiled and covered, water spray will be applied whereas necessary; • The construction works should be divided into several sections to reduce dust. Water spray should be applied on the site; • Mixing stations should be enclosed; • Equipment and vehicles should be maintained to good conditions; • The construction vehicles should be inspected and maintained regularly. 	County PMO	Hunan Provincial EPB and County EPB
Water	<ul style="list-style-type: none"> • Rehabilitation or construction of irrigation ditches should be scheduled to avoid the irrigation season, and temporary pass-by ditches should be provided as necessary; • Settling tanks should be set up at construction sites to treat the construction wastewater for reuse on site; • Temporary lavatories should be provided within the construction site and the wastes should be cleaned regularly; • Construction management should be enhanced to avoid the leakage of fuel from equipment; the drainage system should be established in the spoil stockpile area; • Contractors should carry out the mitigation measures for construction wastewater and domestic wastewater; • The contractor works should be trained on the environmental protection. 	County PMO	Hunan Provincial EPB and County EPB

Environmental elements	Mitigation Measures	Implemented by	Supervised by
Solid waste	<ul style="list-style-type: none"> • Domestic solid waste on construction site should be collected and transported out of the site to local landfill facility for landfill; • The heavy metal content in the sediments should be sampled and analyzed, and corresponding measures should be taken to dispose of the sediments properly; • 	County PMO	Hunan Provincial EPB and County EPB
Physical cultural resources	<ul style="list-style-type: none"> • Once physical cultural objects are found during construction, the local cultural department should be informed immediately; the site should be protected by contractors; the construction should not be resumed before the permit issued by the cultural department. 	County PMO	Provincial PMO
Social	<ul style="list-style-type: none"> • The local tradition and custom should be respected, especially in ethnic minority communities; The ethnic and other vulnerable people should be protected by providing adequate opportunities, compensation and assistance as applicable. • The policy and standard for compensation for those affected by land loss, reduced yield and income loss should be applied, through the public consultation with the agricultural departments. Environmental protection agency, affected villages and farmers. • The plan for training and subsidies should be implemented; • Detailed technical specifications should be developed; • Institutional capacity for supervision and implementation of the project should be enhanced; • Environmental awareness of farmers should be enhanced by launching comprehensive awareness outreach plans. 	County PMO	Provincial PMO

9.8 Public consultation and information disclosure

In accordance with the requirements of the China's EA Law and the world Bank, two rounds of public consultation were conducted by the EIA team. The first round focused on environmental screening to define public concerns, to assist identification of key environmental issues and to draw public response and comments on the initially developed mitigation measures for the potential adverse impacts identified before EA TOR finalization. The second round was designed to ensure public awareness of the EA effort and final project definition and mitigation by presenting a draft EA document to the public through information disclosure procedures. Details of the two rounds of public consultation undertaken are presented in Table 9-2.

Table 9-2 Implementation of the Public Consultation

Subproject	Round	Timing	Participants	Form	Organizer
Hengyang	1	Sept.-Nov. 2015	Local residents, farmers and concerned agencies ¹	Interview and public meeting	Hengyang County Agricultural Bureau, and EA team
	2	Jan. 2016	Affected local residents, concerned agencies	Questionnaires, interview	
Yongxing	1	Sept. 2015	Local residents affected and of interest, concerned agencies	Questionnaires, interview and public meeting	Yongxing County Agricultural Bureau, and EA team
	2	Jan. 2016	Affected residents, concerned agencies	Questionnaires, interview	
Yongding	1	Sept.-Nov. 2015	Affected residents, sensitive receptors, concerned agencies	Interview and public meeting	Yongding County Agricultural Bureau, and EA team
	2	Jan. 2016	Affected residents, sensitive receptors, concerned agencies	Questionnaires, interview and public meeting	

During the consultation, the public expressed several concerns on the solid waste, quality of irrigation water, occupational health due to spray of lime, the actual effect of the project, for which due attention has been given in the ESMP. These concerns have been responded in the public meetings and considered in the EA. Through the consultation, it is learned that the public strongly support the project as they think it would be a good approach to improving their living conditions. During the consultation, all of the people think that the impacts of primary concern are effectively mitigated to an acceptable level.

Consultation on social impacts and risks have also been broadly conducted. In preparation stage of the project, community consultation mainly adopted the three basic forms of group workshops with PMOs, field survey at village level and household questionnaire survey. County and city project management office of the project invited related county governor/ mayor, Agricultural Development Office, Environmental Protection Bureau, Civil Affairs and Religious Bureau,

¹ The concerned government agencies include agricultural bureau, water conservancy bureau, EPB, quality supervision bureau, production safety bureau

Water Conservancy Bureau, Agricultural Bureau, Poverty Alleviation Office, Women's Federation and other relevant departments involved with the project as well as township leaders in charge and business backbone to participate in the group meetings. The social assessment team totally held 18 villager meetings in the first three project counties. In addition, a total of 632 household questionnaires were done returned with 604 valid questionnaires. Of which there are 199 questionnaires from Hengyang County, 209 questionnaires from Yongxing County and 196 questionnaires from Yongding District.

9.9 Information Disclosure

Information on the project EA and SA has been disclosed to the public throughout the public consultation. Bulletins have been pasted in the villages to be affected informing the place to access the project information at the first round of consultation and the place to access the draft EA document at the second round of consultation. The EMP in Chinese has been disclosed since Oct. 2016 and in English since Nov. 2016.

Figure 1 Geographical Location of Hunan Province

(the area in red is Hunan Province)



Figure 2 Locations of candidate counties and pioneer counties in Hunan Province

