# Handbook



# Handbook

Of Environmental Risk Identification and Obviation in Post Earthquake Reconstruction in Poor Villages

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### Preface

With collective support and coordination from and among the United Nations Development Programme (UNDP), the Department for International Development (DFID), the State Council Poverty Alleviation Office and the Ministry of Environmental Protection, Guidelines on Environmental Risk Identification and Obviation in Post-Earthquake Reconstruction in Poor Villages and Practical Handbook of Environmental Risk Identification and Obviation in Post-Earthquake Reconstruction in Poor Villages were compiled. Based upon research and analysis conducted in 5 Post-Wenchuan Earthquake Reconstruction Project villages throughout Sichuan, Gansu and Shaanxi provinces, the two publications were formed. Participating experts contributed knowledge and expertise in the following areas: poverty alleviation, rural economics, community development, natural disaster management, and biological diversity protection. Ultimately, the creation of these publications were realized through several steps: conducting field investigations on post-earthquake reconstruction projects and their impact on the

environment; defining the purpose and outline of the handbook; allocating tasks among experts; determining content and format; compiling guidelines; organizing training seminars for postearthquake reconstruction project managers and village representatives; guidelines; finally, testing various and, modifying/finalizing the handbook.

This publication aims to serve as a reference for government officials, community members, and aid agency staff members to help identify and obviate environmental risks during post-disaster reconstruction. Elaborating on basic post-disaster theories, the handbook highlights different tools and application protocols which may be used in solving problems. Real case scenarios are provided to help readers quickly identify proper methods, processes and starting points in handling various challenges.

This publication may be used as training material for government officials or aid agencies charged with designing post-disaster reconstruction programs. Similarly, it may be a guidebook for residents living in disaster prone regions. This resource also provides reference tools in evaluating a reconstruction program's impact on the environment.

This *handbook* is composed of seven chapters and four appendices. Chapters 1 through 3 introduce the concept of environmental risks and their impact; Chapters 4 and 5 introduce the identification of environmental risks and sensitive areas; Chapter 6 elaborates on

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the steps in identifying environmental risks; Chapter 7 gives proposals about improving environmental risk management for decision makers.

### Maintaining the right outlook and approach while applying the Handbook

The objective of the Handbook is to assist practitioners of various reconstruction programs in designing reconstruction protocols while managing environmental risks. The articulated methods, tools and techniques are simple, however the right outlook and approach towards communities is crucial. Users of the Handbook should act as students, who are willing to learn, when approaching and entering communities. The goal should be to enhance communication and understanding with residents by applying the methods, tools and techniques introduced in this publication, thereby building a mutually-trusting environment. Without the right outlook and approach, the following methods, tools and techniques are merely a formality--no actual or valuable information can be used towards a practical solution.

#### Knowledge required in applying the Handbook

Users of this *Handbook* should have a basic understanding of the concepts and processes of community participation and in-depth knowledge of the concepts and manifestation of a poor community. In addition, understanding of the various types of community

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participation is an important prerequisite for effective use of this Handbook. Users of this publication must have knowledge of village program management in areas including: agriculture, forestry, animal husbandry, rural water, health, education, biology, sociology, and environmental science. Participants should also understand or be familiar with state policies and legal frameworks on land use, agriculture, animal husbandry, forestry, population, and environmental protection in rural China. Readers should also possess basic knowledge of the concepts and principles behind sustainable community development, as well as indicators and standards of community sustainability.

#### Skills required in applying the Handbook

Users of the Handbook should have good communication and interpersonal skills, as this resource is intended to guide people in identifying and reducing environmental risks. They should be proficient at both spoken and written communication. Users should be able to use illustrations, body language and local resources to enhance understanding. Readers should have acumen for differing scenarios and environments, and the ability to integrate phenomenon with tangible subjects. Moreover, they should be able to effectively listen and ask brief questions. In sum, users cannot simply carry out the Handbook, but must interact with target groups, understand community needs, formulate a common understanding of particular phenomena and their causes, and reach a final consensus on necessary actions.

This publication is the outcome of a collective effort from experts, community residents, and government officials. At this time, we would like to extend our admiration for those who participated in post-disaster reconstruction and our sincere gratitude to community residents and cadres who have supported and facilitated the compilation of this *Handbook*.

Editor

October, 2010

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### Handbook of Environmental Risk Identification and Obviation in Post-Earthquake Reconstruction in Poor Villages

### I. Scope of application

This *Guideline* aims to assist villagers residing in poor areas to identify and obviate environmental risks in post-earthquake reconstruction. It is also a reference for managers who are charged with developing post-earthquake reconstruction plans.

# II. Environmental risks impacting the community

Disasters affect vulnerable groups (the poor, women, children and the elderly), who are most susceptible to the devastation associated with such destruction. The poorest communities

typically live and work in high risk regions, their livelihoods depend on the climate and natural resources, and they often lack knowledge to properly combat potential disasters.

After an earthquake strikes, residents must conduct a series of activities including: disaster relief. resettlement, reconstruction. production restoration, and livelihood development—all within a condensed time period. In implementing these efforts, villagers often attach heightened attention on livelihood issues (such as housing, production recovery, and debt relief), while ignoring the impact of these activities on the environment.

If post-earthquake reconstruction is inappropriately executed, additional harm affecting the health of residents as well as local production may arise. This theory holds especially true for the poorest segments of the population who are also the most vulnerable. These negative influences and their harmful effects on the environment are articulated throughout this guidebook. Targeting environmental risks which may arise during post-disaster reconstruction, the following guidelines

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propose measures to prevent environmental disasters, launch sustainable livelihoods, reduce poverty, and adapt to climate change.

# III. Influence of environmental risks on the community

### Environmental risks and health

Example: Particles in factory emissions may cause respiratory diseases like chronic bronchitis, bronchial asthma and emphysema. Drinking water contaminated with heavy metals may damage organs, bones and nervous systems.

#### Environmental risks and income

Example: For villages or villagers dependent on farm tourism, the deterioration of sanitation standards and the environment caused by pollution and the depletion of ecological resources will inevitably decrease the sustainability of tourism activities, consequently negatively impacting income levels.

### Environmental risks and agricultural products

Example: Excessive pesticide use is retained in fruits and vegetables. Heavy metals in crops grown out of contaminated soil will fail safety standards, thereby reducing the quality of agricultural products.

#### Environmental risks and quality of life

Example: Filthy living standards and polluted environments will be detrimental to the happiness and quality of life of local villagers.

#### Environmental risks and the surrounding environment

Example: Daily sewage and garbage that is discharged into the river by concentrated populations will not only pollute local environments, but will also negatively impact the drinking water and fishing activities of communities living further downstream.

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# IV. Identify environmentally sensitive areas within the community

Environmentally sensitive areas can be easily affected by environmental pollution or ecological damage caused by reconstruction activities.

### Box: Common environmentally sensitive areas within the community

- Useable water resources:
  - Drinking water: reservoirs, underground water outlets, waterway sources, storage ponds, and drinking water channels;
  - Industrial water: reservoirs, ponds, and rivers;
- Geological disaster areas:

Regions susceptible to landslides, soil erosion areas, mudslideprone valleys;

Areas with sensitive crops:

Mulberry or vegetable planting areas;

Garbage dumping sites:

Garbage pits, garbage ditches;

Industrial and mining enterprises:

For instance, drinking water within villages is susceptible to pollutants caused by garbage and livestock/poultry fecal matter. Mulberry tree growth may be hindered if surrounding soil and water supplies are contaminated with emissions and sewage discharged by nearby factories and mines.

## V. How to map the environmentally sensitive areas within villages

 Draw out a border, include major roads, designate group/community locations, indicate the type of settlement (concentrated or scattered);

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 Mark the location of drinking water resources, including artificial water intake,

#### Tips:

- Based on the existing map of the village, if available, refer to remote sensing or aerial photos.
- Based on the handpaintings of villagers, highlight the relative positions of environmentally sensitive areas. Other factors can be later modified.



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reservoirs for domestic water use, mountain spring water;

- Mark the locations and types of sensitive crops, such as mulberry bushes and vegetables;
- Mark the locations of reservoirs and rivers within the village, identify the direction of drainage and underground water sources, as well as the relative positions of resident settlements in relation to water resources;
- Mark the location of possible geological disasters, including landslides, soil erosion, mudslides and ground subsidence;
- 6) Mark current daily garbage dump sites within the village;
- Mark the location of factories, mines and construction sites in the village;
- 8) Mark other special or sensitive locations.



#### Box: Draw "Village Event" Trees

**Trunk:** Divide the post-quake reconstruction activities into three phases -- "relief and resettlement", "reconstruction" and "restoration and livelihood development".

Branches: List the types of village activities within each phase.

Fruit: Specific village activities (see "Environmental Risks Checklist")

**Note:** indicates environmental risks, environmental risks

indicates no



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### VI. Steps to identify environmental risks

- Invite village representatives from different groups/communities to identify environmentally sensitive areas around homes and communities;
- Invite village representatives to map environmentally sensitive areas within the village;
- Representatives should draw "Village Event" Trees according to their own reconstruction activities;
- Villagers should identify environmental risks by crosschecking "Village Event" Trees with "Environmental Risk Checklists";
- Village cadres should complete the environmental risk checklist for the entire community based on "Village Event" Trees prepared by village representatives.

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### VII. Proposals For Improving Environmental Risk Management During Post-Wenchuan Earthquake Reconstruction In Poor Villages

As an integral part of post-Wenchuan Earthquake reconstruction and in accordance with the principle of combining post-disaster reconstruction efforts with poverty reduction initiatives (as set by the CPC Central Committee), poor village reconstruction lays the foundation for post-disaster poverty eradication and sustainable development. After two years of reconstruction, livelihood and living conditions throughout poor villages have substantially improved--thereby remarkably raising overall sustainability.

The earthquake's disastrous impact exacerbated vulnerabilities of ecosystems and of the poor among poverty-stricken villages. Therefore, the primary objective behind recovery and rebuilding initiatives is to diminish such vulnerabilities through a series of relevant activities which involve the interaction of humanity and the environment. Positive outcomes include: the amelioration of surrounding environments and the reduction of ecological vulnerabilities. Negative consequences involve the increase of new environmental risks, which pose an adverse impact on a village's environment (including environmental pollution and ecological destruction, etc.). Ultimately, such negative effects may

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lead to new injuries and mortalities, impaired health, property loss, decreased incomes, worsening living standards and other consequences. Therefore, it is necessary to analyze environmental risks and their causes in order to improve overall environmental risk management throughout reconstruction, enhance outcomes, and lay a solid foundation for the sustainable development of poor villages and their people.

Environmental risk management refers to the minimizing of environmental risks via various means at our disposal--in light of actual conditions present in varying poor villages, including reduction of the loss occurrence rate, which may be accomplished by taking precautionary environment-friendly measures, such as drawing up environment protection plans for reconstruction and production; and reduction of the loss level, which may be accomplished by implementing an emergency response act so that prompt and effective remedies can be available in case of an environmental disaster.

Based on the systematic examination and comprehensive analysis of environmental risks during post-Wenchuan Earthquake reconstruction efforts in poor villages, occurrences and consequences of environmental risks primarily fall into the following categories:

a. Likely environmental risks at the disaster relief stage, such as those directly caused by an epidemic, the use of



disinfectants meant to curb the spread of an epidemic, and geological risks posed by earthquakes;

b. Likely environmental risks during initial reconstruction, such as those accompanied by the unreasonable choice of construction sites, layouts and designs of reconstruction projects, inadequate water supply and drainage systems, improper execution of reconstruction projects, lack of environmental protection and energy efficient materials, reconstruction waste, remaining dilapidated and makeshift homes, and daily waste generated in centralized communities;

c. Likely environmental risks caused by production activities during reconstruction, such as production pollution, energy and fossil oil use, poverty alleviation efforts, introduction and use of new species in agriculture, lower thresholds for project assessments and programme choosing, a lack of environment protection facilities, over exploitation of eco-tourism and natural resources, unhealthy water conservancy and hydropower projects, blind production expansion, and the nonexistence of relevant poverty alleviation policies, etc.

For further details on the environment risk phenomena and consequences, please refer to the attached table.

The following proposals aim to strengthen post-earthquake risk management in poor villages in an impactful, orderly and effective manner:

# **1.** In the **12<sup>th</sup>** Five-Year Plan, integrate poverty alleviation with livelihood improvement and disaster prevention/reduction.

Throughout the two year period after the Wenchuan Earthquake, reconstruction of infrastructure, public service facilities, residential housing etc. have been well implemented in compliance with Post-Wenchuan Earthquake Reconstruction Regulations. A significant portion of reconstruction funding has been pooled by governments at various levels, province-to-county corresponding aided reconstruction regions and civil society. However, the majority of quake victims in rural areas, especially the poor, bear the burden of loan repayment (for funds borrowed to rebuild their homes).

Currently, various departments and regions are at a critical juncture in compiling the 12<sup>th</sup> Five-Year Plan. It would be beneficial to incorporate rural area disaster prevention and reduction protocols into national and regional development programs, including: comprehensive disaster prevention and reduction education campaigns, human resource development initiatives, clarification of primary tasks and goals for poverty alleviation and development, and the implementation of guarantee measures/adequate support.

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### 2. Raise the quality and awareness of environmental risk management in rural areas.

Historically, poor regions face challenging ecological environments, low economic development, and a lack of preventative knowledge. To properly target this obstacle, we should enhance public awareness of natural disasters and environmental risks; second, we should develop a post-earthquake rural community team. The Outline of National Mid-and-Long Term Human Resource Development Program (2010-2020) states that policies should be put in place to encourage talented service within rural grassroots communities. Talent development, disaster prevention and reduction policies are currently being formulated. It is advisable to articulate expectations such as primary tasks, major projects and guarantee measures so as to efficiently develop a pool of talented high quality candidates to draw from.

# 3. Continue to improve upon existing environmental risk management mechanisms in earthquake-affected rural areas.

A fundamental and multi-layered environmental risk management mechanism needs to be established to cope with possible environmental risks and consequences which may be brought upon by reconstruction efforts in earthquake-affected poor villages: 1) improve legal recourse relating to pollution compensation,

strengthen law enforcement, restrict misconduct; 2) articulate clear categories and conditions with respect to environmental insurance and government relief, put in place a highly efficient and reasonable environmental risk management mechanism (taking into consideration environmental risks, the degree of environment loss, compensation amounts, etc.); 3) introduce enterprises to environmental risks prevention measures, i.e. via the compulsory establishment of insurance systems within an enterprise likely to pollute. This way, pollution risks may be shifted to insurance companies and compensation for victims are then guaranteed.

### 4. Establish a state level environmental risk assessment and supervisory system in poor villages.

Wenchuan Earthquake zones primarily encompass poor populations, and have an important role in ecology protection, economic development, and culture preservation. Prone to natural disasters and faced with challenging geographical conditions, these regions are confronted with huge environmental risks. The establishment of a state level environmental risk assessment and not only conducive to supervisory system is mastering environmental risks present within such areas, but also encourages the integration of environmental protection, poverty alleviation and disaster prevention and reduction.

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It is advisable, under the joint leadership of the Ministry of Environmental Protection, Leading Group of Poverty Alleviation and other relevant departments, to establish a national environmental risk assessment system in order to cope with pollution issues, and natural disasters. In addition, corresponding reports should then be submitted to provincial governments and the State Council. At the same time, efforts should be made to educate the public on varying risk levels, warn citizens of potential risks, and to accept public supervision. Next, it is critical to establish a disadvantaged village environmental risk supervisory system throughout quake zones and to carry out real-time supervision efforts targeting environmental risks in poor villages so as to provide important references for the reduction of life and property loss caused by natural disasters and environmental risks.

### 5. Establish An Environmental Risk Prevention Organization At The Village Level

Establishing an environmental risk prevention organization at the village level is of vital significance to the success of any reconstruction programme and to the efficient management of natural resources.

We suggest that environmental risk prevention organizations be responsible for the following: plan-making, monitoring and



assessing environmental protection under the guidance of a village committee and other groups (including private enterprises), organizing training programs for villagers, evaluating and supervising recovery and reconstruction initiatives, encouraging women's participation in agriculture and business, engaging in the protection of natural resources, promoting openness and fairness throughout recovery and reconstruction efforts. In addition, capacity building for environmental risk prevention organizations should include: identifying environmental risks and map-making, developing local rules and regulations for environmental protection, and improving villager awareness for environmental protection.

6. Vigorously Enhance Environmental Risk Management Related To Recovery Production Activities And Daily Life In Poor Villages

We suggest the following measures to enhance environmental risk management related to recovery production activities in poor villages:

First, promote the sustainability of poverty alleviation projects. Communities should adopt the concept of modern agriculture when selecting projects; communities should increase economic return via modern agricultural technologies; and communities should avert environmental risks through the use of low-carbon approaches.



**China** Second, endeavor to avert environmental pollution by achieving industrial circulation in plant and livestock breeding. Detailed measures include: targeting planting as the lead industry while promoting food production and livestock breeding; focusing on livestock breeding which will generate large quantities of organic fertilizer, increasing the output of planting, and boosting the fertilizer processing industry; making energy exploitation a priority, exploring energies like bio-gas, so as to advance the industrial circulation of planting, livestock breeding and processing.

Third, try to avoid environmental risks by developing eco-tourism. Detailed measures include: safeguarding local resident who participate in eco-tourism, for instance, by signing contracts; establishing management mechanisms that are efficient and value villager interests; and encouraging industry associations to serve as advocator, educator and supervisor in promoting business concepts and awareness, and in ensuring the sound development of eco-tourism.

### Enhancing Environmental Risk Management Related To Daily Life In Poor Villages:

First, strengthen efforts in handling domestic waste. Domestic waste should be treated differently according to their classification as recyclable or non-recyclable. Rural domestic refuse should be classified into three kinds, according to their source, as commodity refuse, excrement waste or plant residue. Different types of waste utilize



different recycling modes. Harmful waste must be properly handled; in particular, they should not be randomly dumped or mixed with other varieties of waste. Waste treatment centers should be established for the purpose of gathering waste for centralized treatment. Those villages with available resources can transfer harmful waste to cities offering professional treatment; those without such options can bury waste in remote or closed sites.

Qualifying villages should apply for special state funding intended for environmental protection. Money should then be used to establish domestic refuse treatment protocols focused on "household classification, village gathering, town transferring and county or city treatment". Non-qualifying villages, under the guidance of technical personnel, should properly bury waste at selected sites, so as to ensure non-contamination of water, rivers and fields.

Second, enhance the initial treatment of domestic sewage. Reduce domestic sewage by saving water and by making full use of reclaimed water (e.g. water for washing vegetables and showering can be used to flush out toilets).

Use daily life chemicals properly. For instance, educate villagers on how to better use phosphorus-free washing powder, prevent domestic sewage from directly seeping into rivers, and make full use of soil filtering and absorption functions. Qualifying villages should apply for special state funding intended for environmental 21



protection. Villages with a high density of residents can implement centralized sewage treatment facilities, while villages with scattered populations can utilize household-based or collective treatment facilities (i.e. small artificial wetland treatment facilities or oxidation ponds).

Third, improve the use of energy. Household bio-gas and clean solar energy can notably reduce negative effects on health and air quality caused by traditional energy utilization.

7. Encourage NGOs Both At Home And Abroad To Initiate Activities Aimed At Preventing Environmental And Natural Disaster Risks In Poor Villages.

Throughout the Wenchuan Earthquake relief efforts, NGOs from home and abroad played an active role in saving lives, preventing diseases, providing psychological assistance, educating children, rebuilding residences, constructing infrastructure, and restoring livelihood. We suggest that departments at various levels establish guidelines and related policies regarding NGO participation in recovery and reconstruction efforts, so as to make full use of their active impact in promoting environmental risk control and prevention and in boosting social and economic development.

8. Launch A Comprehensive Pilot Programme On Disaster Risk Management, Environmental Risk Management And Sustainable Development In Poor Villages.

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> A large number of depressed areas and neighborhoods suffer from ecological vulnerabilities. As a result, the combination of poverty alleviation, disaster risk and environment management is critical. It is suggested that approximately 100 ecologically-fragile villages listed in the 12th 5-year plan be selected for village extension programs. Each of the selected villages will be provided with an investment of RMB300-500 to launch a comprehensive pilot programme aimed at disaster risk management, environmental risk management and sustainable development. It will take three years to explore and select the proper mechanism and mode. Once completed, such initiatives can be a sustainable development reference for other poor villages.

> Annex: A Brief Table on the Problems, Phenomena and Consequences of Environmental Risks in the Recovery and Reconstruction of Poor Villages after the Wenchuan Earthquake

UNDP-DFID Expert Panel for Environmental Rehabilitation Project in Poor Villages

November, 2010

DFID Department for International Development



### Appendix 1: Environmental risks checklist (1) —Rescuing and

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### Settlement

Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environmental risks	Potential hazards	Obviation methods
Life-rescue	Medical workers use medical equipment to rescue the affected people	Available water resources Sensitive crop areas Garbage dumping sites	If (1) medical waste is thrown away.	May contaminate soil and water, and cause infectious diseases.	Dispose properly: Under the supervision by health authorities, village clinics assign specialist to recycle medical waste.
Post- earthquake epidemic prevention	Epidemic prevention workers disinfect rotten bodies of plants, animals, and collapsed houses.	Available water resources; Garbage dumping sites Residents' settlements	If (1) disinfectant is overused	May contaminate surface water and shallow underground water, thereby affect daily drinking water.	Control the usage: use appropriate amount of disinfectant Monitor regularly: regularly monitor daily drinking water

Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environmental risks	Potential hazards	Obviation methods		
	Villagers deal with animal bodies		If (1) animal bodies are thrown into storage ponds	May contaminate the water source and result in the spread of infectious disease.	Dispose properly: Prohibit unauthorized disposal of animal bodies. All dead bodies must be buried away from waters under the supervision by the village authorities.		
Detect geological hazard sites	Villagers detect landslide and mudslide sites and other potential geological hazard sites after the earthquake.	Residents' settlements Drinking water source	If (1)potential geological hazards are unclear, or (2)corresponding measures are not taken	In case of aftershocks, and bad weathers like continuous rainfall, secondary geological hazard may occur, threatening villagers' life and property as well as the ecological system.	Professional guidance: Under the professionals' directions, detect all potential geological hazard sites, including landslides and mudslide-prone valleys. Emergency plan: Every village should make emergency plan, set warning		
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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environmental risks	Potential hazards	Q Obviation methods		
Temporary housing afflicted people	Villagers build board rooms, quake-proof sheds and other temporary shelters	Available source of water Residents settlements	If (1) temporary shelters are too close to potential geological hazard sites;	Aftershock and bad weather like continuous rainfall may threaten villagers' life security;	signs and send people to survey geological hazard, so that they can respond timely and orderly to any danger. Choose proper temporary		
			If (2) temporary shelters are near to rivers, ponds and drinking water source.	May contaminate water source and result in the spread of infectious disease.	settlement sites: The tents and temporary settlements should be away from potential geological hazard sites and drinking water source; construction department and village committee should direct and supervise the site selection.		
					Prohibit disposing domestic garbage into ponds and rivers.		

## Appendix 2: Environmental risks checklist (2) -- Reconstruction

Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
supply of drinking water	villagers get drinking water	sources of drinking water	If (1) drinking water is directly from	the quality of water is liable to pollutions by pesticides and chemical factilizers from the	Prevention: Water resource department should set up protection facilities and warping sizes
		water intake Storage ponds	spring or shallow underground water	surrounding farmland, forests and garbage dumping sites	around drinking water resource and intake; villagers clean the garbages around water intake;

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods	
			If there is no protection facility at (2) the water intake	animal and human activities may pollute drinking water	Strick regulation: water resource department should monitor the water quality regularly; village committee assigns villagers to monitor the drinking water provision; educate villagers to have the consciousness to monitor water quality and drink boiled	
			If plastic tube of poor quality is used in (3) the impounding reservoir	poor plastic tube may release toxic substance which harms people's health	water; restrict farming and animal husbandry and other agricultural activities around the water source.	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
Civil construction	The construction team exploit and dispose earth	Geological hazards sites Residents' settlements	If (1) the earth fetching and disposing area is close to geological hazard sites or residential area If (2) no measure is taken to recover the vegetation	New landslide may occur The damage of vegetation may lead to water losses and soil erosion, which may increase the chance of secondary geological hazards	Standardize construction management: Experts direct the selection o earth exploition and disposing sites; Constructors choose the proper way to exploit and dispose earth; Authorities in the village monitor the construction process

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activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods	<i>輙</i> 一
	Construction team transport construction materials(like sandstone)	Residents' settlements	If (1) large amount of dust was raised during the transportation	It may cause respiratory diseases	Construction gangs use closed transportation; residents undertake dust prevention measures	贫困村恢复重
louse econstruct- on and epairs	The house layout	Available water resources Arable land	If (1) villagers live in concentration, (2)without facilities for domestic sewage and garbage disposal if (3) villagers live far from their contracted	The waste would be concentrated in a small area, causing heavy pollution to surrounding ponds, rivers, arable lands and so on. It may restrain the villagers' enthusiasm to use manure as organic fertilizer in farmland	The village builds up domestic sewage and garbage disposal facilities	建过程中环境风险识别与规避

Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			farmland		
	The house site selection	Residents' settlements Available water resources	If (1) located in areas in danger of collapse or in the way of potential mudslides	Villagers' safety would be threatened by secondary geological disasters	Professionals help villagers select residential sites as far from traffic arteries, rivers and potential geological disaster stricken areas as possible; Relevant sectors conduct safety trainings (including
			If (2) located near traffic arteries	Villagers' health may be harmed by vehicle noise, automobile exhaust, dust pollution, increased traffic accidents and pollutants carried by passing vehicles.	traffic safety, geological safety, environmental safety, etc.) for villagers; Set up warning signs in settlements along traffic arteries; and plant trees and grass to decrease dusts and noises; Strengthen management and

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods	Ĩ
			If (3) located near rivers or reservoirs	Domestic sewage and waste may pollute water of the river or the reservoir.	control of domestic waste in settlements near waters.	
	The house planning and design	Indoor environment	If (1) indoor ventilation and daylight are bad	It would increase residents' consumption of electricity and fuel; thus bad indoor ventilation may induce respiratory diseases by increasing the concentration of particles and harmful gases produced by the burning of conventional fuels.	Professionals provide guidance to villagers for residential function and space planning and relevant facilities construction according to the area of the residential house.	

震后贫困村恢复重建过程中环境风险识别与规避实用手册

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			If (2) methane tanks have been constructed, but there is not enough space for stock- breeding	Inadequate manure results in inadequate methane production	
			If (3) the drainage system is in disorder, or no sewage outlet is preset.	Domestic sewage disposal is ineffecient, and pollut the surrounding environment	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods	
	Villagers prepare stone, wood, bricks and tiles for construction	Arable land Forest land	If (1) villagers use stone materials from drainage ditch, irrigation channel, roadbed and other infrastruc-tures as house construction materials	It would damage the drainage system, probably causing floods in flood seasons; it would also damage the road, causing bad traffic and bring inconvenience to people's daily life.	Encourage villagers to make full use of construction materials from abandoned houses; Encourage villagers to choose environment friendly construction materials, like hollow bricks, etc.	
			If (2) villagers overuse earth- made bricks and wood	It may cause over- exploitation of clay and wood, damaging forest and arable lands and hindering the development of		

**浜用手册** 

Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
				agriculture.	
	House interior decoration	Residents' settlements	If (1) residents move in immediately after interior decoration, (2) ventilation is bad	Decoration materials release formaldehyde and other toxic substances, which may cause respiratory diseases.	Choose environment friendly decoration materials; After decoration, ventilate the house for several months before moving in.
	Villagers deal with wastes produced during construction (such as discarded	Arable land Available water resources	If (1) construction wastes are discarded in ditches along the road	It may cause obstruction of the ditch	Recycle discarded construction materials to repair roads

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods		憲
	building materials from dismantled houses)		If (2) construction wastes are discarded near water resources	Pollutants may be washed down into the drinking water by the rain			贫困村恢复重建
		-	If (3) building wastes and household garbage were mixed together	Increase the difficulty and cost to disposal and transport domestic garbage, which may take up spaces in farmlands, river beds, roads, etc., and become long-term household pollutant sources.			过程中环境风险识别

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
Villagers move into newly built houses	Villagers recycle temporary boardrooms and quake-proof shed set up during rescue phase	Available water resources Arable land	If (1) the temporary building was close to wells or rivers, (2) use temporary house as pigsty, toilet or warehouse If (3) newly constructed buildings take up too much arable land	It will harm the village environment; if the temporary building is far from residents' settlements and the infrastructure is poor, manure and other wastes are likely to pollute the waters, affecting residents' water supply and aquiculture As for the villages lack of arable lands, the land temporary building and discarded old houses take up is a big waste	The village supervises dismantle of temporary buildings and reclamation of lands

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods			寰
Reconstruc- tion of village communal facilities	Refer to "drinkinį	g water supply, civi	il construction, da	aily life energy" and some	other activities			贫困村恢复

## Appendix 3: Environmental risks checklist (3) --Recovery and livelihood development

Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
Energy utilization in daily life	Consumption of conventional fuel such as straw, firewood, coal, etc. in daily cooking, boiling and warming	Indoor environment in residents' settlement;	If (1) a large number of trees are cut down,	Vegetation and eco- environment will be destroyed and geologic disaster such as water loss soil erosion, landslide, etc. will be more likely to happen.	Guide the villagers to restrict cutting down trees for firewood; Encourage the villagers to use

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
		forest	If (2) straw, firewood and coal is consumed as living fuel in long term,	The concentration of particulate and carbon monoxide due to incomplete combustion will increase, which will cause the respiratory disease.	energy-efficient cooking stove; Keep good indoor ventilation; Encourage the villagers to use solar energy, straw gasification, biogas, ect.
	New energy that villagers choose such as biogas, solar energy, straw gasification installment, ect.	Indoor environment in residents' settlement; forest	If the utilization of new energy is limited by space, knowledge of technology, material supply and other conditions,	The villagers will stop using new energy, leave equipment idle and waste capital; human and livestock manure will lack of innocent treatment	Technical assistance: Technicians from the management station( e.g. agriculture bureau) should go to villages for technical guidance, follow up actual use, and solve the problems in

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			(1) Bathing and laundry water is discharged into biogas digesters	The liquid for fermentation in methane-generating pits will be diluted, thereby decreases gas output.	application of new technology; Reasonable planning: The utilization of new energy should fit in with the actual



Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			<ul> <li>(2) There is not enough space for villagers for poultry and livestock breeding, or not enough alternative materials (e.g. straw)</li> <li>Difficult to ignite the straw stem gasification stove.</li> </ul>	In this case, the input quantity is not enough and thus gas output is insufficient. Release too much smoke and villagers will be reluctant to use it.	situation in local residents.

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
Waste disposal in daily life	Disposal of waste in villagers' daily life	Available water resource (including drinking water sources, rivers, ponds, reservoirs); Farmland; Residents' settlement	If (1) household garbage is discarded into ditches, ponds, rivers, etc. ,	Household garbage will flow into rivers and reservoirs and pollute water, which can jeopardize the safety of drinking water and agriculture products (e.g. it is impossible to develop cage culture due to water pollution.); Waste metal and glass may hurt farmers working in farmland and water.	Reinforce management: Set fixed dustbins and temporary disposal area and send cleaners for periodic cleaning; Ensure that the dumping sites should be far away from water sources, rivers and farmland under the guidance of environmental experts; Waste classification: Villagers conduct rough



Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			If (2) hazardous and noxious waste (e.g. outdated drugs, used batteries, waste lamps) is willfully discarded into farmland and rivers	Heavy metal such as cadmium and mercury along with noxious substance in outdated drugs may contaminate soil and water. These toxic substances will be concentrated in corps and fish threaten people through food chain.	classification of garbage and cleaners undertake fine classification while collecting garbage; Hazardous and noxious waste should be collected and then transferred to hazardous waste disposal center; Reuse and sell recycled parbage as much as possible;
	Collection and deposition of household refuse within the village		If (1) household garbage is not cleaned in time in residency and the dustbins are open,	Flies, mosquitoes and mice will pervade and spread bacteria threatening villagers' health.	Kitchen garbage can be used as food for livestock or manure; Combustible waste(e.g. leaves

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			If (2) hazardous and noxious waste is put together with household waste and construction garbage.	Accumulated garbage will occupy a large amount of land.	and papers) can be burnt with living fuel or down the wind away from the houses.
				Garbage piled up together cannot be easily disposed and will pollute the villages and neighborhoods.	_
			If (3) landfill is close to drinking water sources,	Poisonous fluid in landfill will penetrate into soil, underground water, threatening the	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			farmland, drainage channels, rivers and reservoirs	safety of drinking water sources and agriculture products.	
Discharge domestic sewage	Discharge domestic sewage	Available water resource (including potable water sources, rivers, ponds, roconveire)	If (1) domestic sewage is discharged directly into the channels and roads,	It may be plagued by flies and mosquitoes and become an eyesore.	Guide and encourage the villagers to enhance the recycling of water resource; Encourage the villagers to use environment-friendly
		Farmland Residents' settlements	If (2) feces and sewage from toilets and folds is discharged into channels, roads and farmlands without any treatment	Flies, mosquitoes and mice will pervade and spread bacteria threatening villagers' health.	detergents (e.g. phosphate- free laundry detergent power); Excrement should be disposed into biogas digester or manure. Scattered households should

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
		farmland	If (3) there are not sewage treatment facilities in reconstruction sites and washing water is discharged continuously into drainages, farmland, rivers and reservoirs,	Surface water (e.g. rivers, ditches, pools, reservoirs, etc.) will degenerate, which may pollute shallow ground water and result in poor water quality. Chemicals in detergents will concentrate in soil and result in poor soil quality.	adopt disposal for single residence with three-chamber toilet and artificial wet land; Concentrated settlement should build centralized wastewater treatment stations.
			If (4) washing water is discharged into biogas digesters along with excrement,	Liquids for fermentation will be diluted and thus biogas production will be decreased.	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
	Sewage disposal facilities in villages		If (1) sewage pipe network is not air-tight or rainwater and sewage confluences into pipes.	Liquids for fermentation will be diluted and thus biogas production will be decreased.	
Launch traditional livelihood program	Traditional grain crops cultivation	Farmland, available water sources, geological disaster spots	If (1) reconstruct-tion after earthquake occupies too much farmland and reclamation of dangerous buildings and temporary houses is too slow, the villagers will	The reclamation of sloping field over 15 degrees will cause water loss and soil erosion, degradation and other ecological problems.	Encourage reclamation of farmland and build terrace; Provide advices to the villagers to plant scientifically and test soil to formulate fertilizer; Recycle pesticides bottles, mulching films and other garbage.

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			open up steep land to increase cultivated land.		
			If (2) the villagers use excessive fertilizers and pesticides to increase grain output,	The nutrient elements in fertilizers will gather and cause soil to pack together and decrease fertility; noxious substance will gather in grain and pollute water.	
			If (3) pesticides bottles and mulching films are littered carelessly,	The residues of mulching films will reduce soil fertility and cause soil desertification; poisons from pesticides bottles	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
				will pollute water.	
	Breed livestock and poultry (e.g. pigs, rabbits, chicken, etc.)	Available water sources residence farmland	If (1) breed outdoors, (2)livestock houses are close to rivers, ponds, reservoirs and wastewater is discharged directly, (3) excrement from livestock is disposed into farmland without innocent	It will stink, pollute water and spread infectious diseases.	Encourage villager to keep livestock in breeding house; Guide and monitor villagers to choose livestock houses; Guide and monitor villagers to conduct innocent treatment on livestock waste.

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			treatment.		
	Exploit natural resources (e.g. herbs, sand, rocks, minerals, coal, gold, etc.)	Forest land Arable land Geological hazards sites	If (1) wild herbs and food are overexploited (e.g. Cordyceps Sinensis, bracken fern, etc.)	Vegetation is destroyed. Water loss and soil erosion together with desertification lead to serious ecological problems, which directly affect the production and livelihood of local villagers.	Guide villagers to exploit reasonably; Propagate environmental protection knowledge and raise villagers' awareness of environmental protection; The experts guide and make exploitation and reclamation plan;
			If (2) mines are overexploited (e.g. rock, sand, coal)	Vegetation is destroyed. Water loss and soil erosion together with desertification lead to	Villagers and relevant departments should strengthen the supervision.

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
				serious ecological problems, which directly affect the production and livelihood of local villagers.	
Develop- ment of new livelihood program	Develop rural tourism	Overall environment of the village	If (1) domestic pollution brought by tourists cannot be disposed effectively,	Garbage and domestic sewage harm the village's environment and decrease its attraction. Eventually tourists become less and incomes of villagers are decreased.	The village should organize the residents to build facilities to dispose domestic sewage and garbage. Strictly limit the daily number of tourists and regulate their behaviors.
			If (2) ecological resources of the village is overexploited ( e.g. fruits and	Ecological damage makes it impossible to develop rural tourism in long term, thus decreas the income of	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			vegetable picking, natural beauty)	villages.	
	Development of cage culture in areas rich in water resource	Available water resource	If (1) breeding density is too high or spread too much bait	The concentration of certain nutrient elements and dissolved oxygen content will kill shrimp and fish and cause economical loss to the villagers.	Determine the quantity of cages according to the water surface area, and spread bait appropriately; Address industrial and domestic pollution around
		If (2) industrial wastewater or domestic sewage flows into the caged- culture waters,	Certain heavy metal or other toxic substances in the water will kill shrimp and fish or remain in their bodies, eventually threatening human beings.	caged-culture waters.	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods	灠
	Cultivation of fruits, vegetation and other economical crops	Please refer to " (	cultivation of trad	itional grain crops"		后贫困村恢:
Operation of industrial and mining enterprises	The village attracts investment in order to get rid of poverty as soon as possible.	Available water resource Residents' settlement farmland, forest land	If (1) the village introduces small enterprises such as small steelworks, small cement works, small chemical plant, small paper mill, small heat- engine plant, etc.	Small industries prohibited by national industrial policy waste resources, yield poor products, pollute environment and destroy ecology.	Administrative department should strictly supervise and instruct the process in poor villages and completely eradicate the industries with high pollution and high energy consumption. Relative organization should implement training courses of environment protection and raise the villagers' awareness of environment conservation.	复重建过程中环境风险识别与
			If (2) waste disposal	Air pollutants, waste water and solid waste		·规避 9

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			facilities cannot work successfully in existing factories and mining plants (e.g. brick fields, smelting plants, copper mines, etc.)	are emitted directly into the environment, which will severely pollute water source and farmland, decrease crops' quality and production and increase the prevalence of cancer. For example, waste water with high concentration of heavy metal ion discharged from smelting plants flows into the rivers. Waste gas with a large amount of inhalable particulates is directly emitted into the atmosphere.	

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Activities	Behaviors that may incur environmental risks	Environmental- ly sensitive spots	Conditions incur environment- tal risks	Potential hazards	Obviation methods
			If (3) industrial and mining plants lack work safety conditions and labor protection measures,	They will threaten personal safety of villagers and may increase the villagers' vulnerability of occupational diseases (e.g. pneumoconiosis).	

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Appendix 4: Problems, Phenomena and Consequences of Environmental Risks in post-Wenchuan Earthquake Reconstruction of Poor Villages

No.	Problems	Phenomena	Consequences
1	Direct environmental risks following epidemic outbreaks	Massive mortalities of animals and plants; the collapsing of livestock sties and human houses lead to the littering of production and household waste ( including medical waste)causing an epidemic;	Threatens villager health and the production of safe agricultural products ( livestock products and crops)
2	Environmental risks caused by the use of disinfectants for controlling an epidemic	In post-earthquake epidemic prevention, large quantities of disinfectants were applied to decomposed bodies of animals and plants, livestock sties and collapsed houses.	Pollutes surface water and shallow groundwater, increasing safety risks for drinking water; polluting the soil, increasing the safety risks of agricultural products



No.	Problems	Phenomena	Consequences
3	Increased risks of geologic hazards caused by the earthquake	Forestland and grassland damaged by the earthquake; low livability of vegetation in some areas; Loose and unstable geologic structures after the earthquake; Possible formation of barrier lakes due to changed geological structures after the earthquake	Geological hazards such as landslides, earth cavings, and cracked foundations are prone to occur due to serious soil erosion, endangering personal safety, resulting in property loss and undermining the ecological environment; Changes in the geological structure undermine the foundation of reservoirs, resulting in droughts caused by secondary floods and river diversion;
4	Environmental risks caused by improper site/layout selection for construction projects	Inappropriate site selection for construction projects including: houses, livestock sties, water and irrigation facilities, roads, bridges, water tanks, waste landfills, and sewage treatment facilities; in proximity of ecologically vulnerable regions( areas likely to suffer from geologic hazards and pollution) and environmentally sensitive areas	Threatening personal safety of villagers; Causing noise pollution, atmospheric pollution (mainly dust and vehicle exhaust) and accidents ( explosions, fires, and radiation caused by the leakage of pollutants and energy from transit vehicles); threatening personal and property safety and the ecological environment
5	Environmental risks caused by unsatisfactory design	Inappropriate construction design, which fails to adapt to local conditions	Polluting indoor environments and the whole village; affecting daily life

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No.	Problems	Phenomena	Consequences
6	Environmental risks caused by imperfect drainage systems	Villagers in many poor villages have no access to running water, often retrieving water from mountain streams, shallow underground water, etc.; Due to lack of funding and technology, drainage and sewage systems in poor villages are extremely weak;	The quality and volume of water cannot be guaranteed, which seriousl threatens the safety of drinking wate for people and animals; Untreated disposal of sewage causes pollution to surrounding environments; sewage discharged into bio-gas pits decreases the concentration of nutrients in the pits, resulting in ineffective functioning of the pits;
7	Environmental risks caused by unsound engineering construction	The earthquake impairs roads, and increased traffic volume during the reconstruction period further impairs the roads; Construction and solid waste occupies road space. The sewage flows over and vegetation surrounding the roads are damaged; Civil construction and transportation of building materials for reconstruction produce a large amount of dust; Some staff may take away stones in gutters, irrigation channels, and roadbeds as building materials for their own homes;	Landslides and roadbed settlement occur in some sections of the roads, causing a serious hindrance to villager and the transportation of farm and sideline products. This ultimately hinders economic development; Dust, if not prevented, will affect air quality; Noise pollution affects daily life and harms physical and mental health; Seriously damaged pipelines, roads and rivers with inefficient drainage



No.	Problems	Phenomena	Consequences
		For convenience, the rivers are also filled and used as roads;	functions are very likely to cause floods, threatening personal safety, property, and transportation.
8	Environmental risks caused by non- environmentally friendly building materials	Bricks, cement, stones and wood are still widely used in rural construction, and the majority of finishing materials (i.e. coatings and paints) are not environmentally friendly.	Excessive exploitation of clay and wood leads to a waste of resources and damages the environment. Non- environmentally friendly finishing materials bring about indoor air pollution, damaging the health of the villagers ( women, children and the aged)
9	Environmental risks caused by reconstruction waste	Construction waste ( discarded building materials) and production and household waste from short-term workers are randomly disposed of and stacked; Unordered treatment of sewage, household waste, human and animal waste, medical waste, as well as other pollutants from temporary shelters results in area-source pollution;	Construction waste occupies farmland and rivers, polluting the soil, agricultural products and surrounding water environment; waste discarded into the ditches and rivers leads to blockage, poor drainage and eutrophication of water sources; waste discarded into rivers, ponds, and groundwater systems directly threatens the safety of drinking and irrigation water; waste stacked for long periods easily

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No.	Problems	Phenomena	Consequences
			breeds flies, mosquitoes and roaches, which will disseminate disease; household waste, after decomposing, releases odors, posing potential dangers to the health of villagers;
10	Environmental risks caused by decrepit houses yet to be dismantled and temporary buildings	Temporary houses, livestock sties and toilets exist in each village during the reconstruction period	Affecting the outlook and appearance of villages, and causing hidden trouble for the safety of villagers as well as livestock; Unordered livestock sties and temporary toilets affect the surrounding environment, polluting surface water and shallow groundwater, which threatens villager health and reduces living standards;
11	Environmental risks caused by domestic pollution produced in concentrated settlements	After the earthquake, many villages choose to rebuild on new sites, but the concentrated settlements lack environmental planning. Houses and other related facilities are concentrated in certain areas, causing serious pollution to the surrounding environment.	Randomly discharged sewage threatens drinking water. Odors and pests harm villager health, exerting a negative impact on people's lives, the surrounding atmosphere,etc.; Randomly littered hazardous waste brings about potential environmental risks to villagers and the natural


No.	Problems	Phenomena	Consequences
			environment; Organic waste that cannot be returned to farmland pollutes the living environment. The pollution spreads to surrounding farmland, threatening the appearance of villages, surface water, groundwater, the safe production of agricultural products and overall hygiene.
12	Environmental risks caused by production pollution	Difficulty in completely separating living areas and production areas; Agricultural acreage decreases by a large margin due to the earthquake and reconstruction. In order to increase productivity, villagers extensively use chemical fertilizers, farming chemicals and plastic films	Breeding bacteria, mosquitoes and flies, which threaten the health of villagers; Polluting surrounding air, water sources and soil ( the pollution of water sources, the water eutrophication of ponds, and the pollution of groundwater after seepage)
13	Environmental risks caused by energy and fuel use	Core woods and coals are widely used as fuels, but the popularization of bio-gas pits and energy-saving stoves is restricted.	Resources are wasted and the atmosphere is polluted, endangering people's health; improperly cut core woods lead to declining forest coverage, which bring about geologic hazards such as soil erosion, landslides; threatening

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No.	Problems	Phenomena	Consequences
			personal safety, property and the ecological environment;
14	Environmental risks caused by poverty alleviation through production recovery	Arable land acreage decreases after the earthquake because of damaged farmland. Reconstruction on new sites takes up a large amount of farmland. Decrepit houses on the original sites and temporary buildings yet to be dismantled for reclamation after relocation add to the shortage of arable land; The earthquake causes massive economic loss to some villages, which then fall back into poverty after the earthquake. People in these villages have a strong incentive for production recovery to shake off poverty	Causing various risks for ecological damage, such as soil erosion and land deterioration; Untreated waste and sewage exerts a negative impact on the surrounding environment, villager health, and quality of agricultural products;
15	Environmental risks caused by the introduction and use of new technologies and species	Income decreases sharply after the earthquake. In order to change the status quo, villagers are in urgent need to increase the output of crops and livestock; Application of genetic technology and biotechnology to agricultural production, and rapid introduction of alien species can break the balance of agricultural ecological systems;	Leading to reduced quality of food and food security issues, endangering people's health; Breaking local ecological balances and undermining biodiversity; Toxins contained in some GM food result in acute and chronic poisoning as well as allergies in human beings;



No.	Problems	Phenomena	Consequences
			Changed nutrient content in GM food might cause imbalanced nutrient structures and endanger people's health;
16	Environmental risks caused by low-standard assessments, selection and introduction of projects	Governments and villagers are so eager to shake off poverty that they introduce enterprises with high pollution and high consumption rates	Environmental pollution and ecological damage result in environmental risks, hampering long-term development and sustainable development
17	Environmental risks caused by the unsound support for facilities	Environment protection facilities are unsound or they are just intended for inspections, not in regular operation;	Generating gaseous pollutants, industrial sewage, solid waste, animal excrement, and sewage that pollute the environment and threaten villager health
18	Environmental risks caused by poverty alleviation projects	Poverty alleviation projects are faced with risks of loss. Improper implementation of these projects fails to help villagers shake off poverty, and even generates economic loss for poor villages, making villagers poorer; forming a vicious circle;	Risks caused by poverty alleviation projects lead to property loss, a waste of resources, and abandonment of resources, which give rise to environmental risks
19	Environmental risks caused by the excessive development of eco-tourism	As an environmentally friendly way to shed poverty, eco-tourism with little pollution and high profit is increasingly accepted and valued	Excessive development of tourism resources causes environmental pollution and ecological damage,

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No.	Problems	Phenomena	Consequences
		by villagers in regions with picturesque landscapes, ethnic minorities and characteristic cultures;	which are not conducive to sustainable development;
20	Environmental risks caused by excessive exploitation of mineral resources	In mountain areas and areas rich with resourcessand excavation, quarrying, panning, mining, and coal extraction are quite popular;	Causing various ecological problems such as landslides, soil erosion, land destruction, and changed hydrologic conditions; environmental problems such as dust, noise, and heavy metal pollution; Environmental risks deprive the villages of sustainable development potential;
21	Environmental risks caused by the construction of water conservancy and water power projects	Excessive development of water resources and blind construction of water conservancy and water power projects might generate eco- migration; The projects flood land, cultural and historic relics, mineral resources and other facilities, leading to more evaporation; Sediment accumulation reduces flood control standards and changes geological structures;	Causing geological hazards like earthquakes and land collapse, which change regional microclimate and break the ecological balance; leading to a sharp reduction of biodiversity and serious threats to regions in the lower reaches;

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No.	Problems	Phenomena	Consequences
22	Environmental risks caused by blind expansion and reproduction	The earthquake damages farmland, and reconstruction also requires land, so villagers wish to expand arable land by cultivating sloping fields and building terraces; excessive development of fishery (e.g. cage culture) and over fishing;	Efforts to shed poverty by blind reproduction brings about various environmental risks such as environmental pollution, ecological damage, and imbalanced ecological systems;
23	Environmental risks caused by relevant poverty alleviation policies	Due to poor management, some policies are formulated at the expense of the environment. Predatory exploitation becomes the choice for the sake of short-term benefits;	Causing ecological damage and environmental pollution, which makes it more difficult to shed poverty and become rich;
		Poverty alleviation through relief makes villagers completely dependent on social relief and aid, without enthusiasm for labor. This notion hinders local development, making it difficult for villagers to shed poverty.	Inability to build and strengthen environmental awareness make it very hard to improve daily habits, threatening the local environment.

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