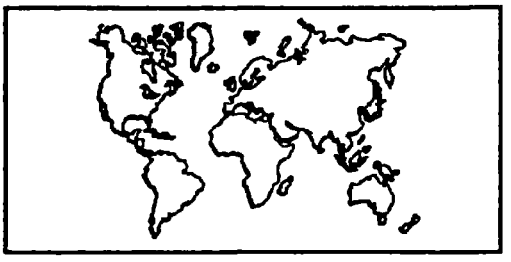
Environmental Assessment/Analysis Reports



Report E0056

China - Yangtze Basin Water Resources Project

EA Category A

1 of 2

Summary Environmental Impact Assessment For Water Resources Project in Hunan and Hubei Provinces

Excerpts From Comprehensive Resettlement Plan For the Jiangya Reservoir in Hunan

May 1994

This report has been prepared by the Borrower or its Consultant

CHINA

YANGTZE BASIN WATER RESOURCES PROJECT

SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

FOR

WATER RESOURCES PROJECT

IN HUNAN AND HUBEI PROVINCES

Prepared by:
Yangtze Water Resources Protection Bureau
May 1994

and

EXCERPTS FROM

COMPREHENSIVE RESETTLEMENT PLAN FOR

THE JIANGYA RESERVOIR IN HUNAN

Prepared by:
Wuhan University of Hydraulic and Electrical Engineering
Wuhan, China
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Chang Jiang Water Resources Commission
Hunan Hydropower Design Institute
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July 1994

Environment Impact Assessment
for
Water Resources Project
in

Hunan and Hubei Provinces

(Summary)

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Contents

ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCES PROJECT IN HUNAN AND HUBEI PROVINCES

(SUMMARY)

1. INTRODUCTION

1.1 The water resources project in Hunan and Hubei provinces of China consists of a number of subprojects, including Jiangya reservoir subproject, North Tieshan and Liuduzhai irrigation subprojects in Hunan province, Four-lake drainage subproject, Danjiangkou, Wenxia, Zhanghe reservoir No. 3 trunk canal and Dongfeng irrigation subprojects in Hubei province, as well as a flood early warning and forecasting system. Among these subprojects, Jiangya reservoir subproject is the one to be newly constructed; both North Tieshan and Liuduzhai irrigation subprojects are to be completed and the others are to be reformed, enlarged or supplemented.

1.2 The project may exert significant adverse effects on environment because the Jiangya reservoir subproject will create relocatees. Therefore, the EIA for the project is classified as category A.

1.3 The EIA has been carried out by working on single EIA as required by the World Bank for each subproject respectively because the independent subprojects basically have no superposed impacts on environment.

1.4 The Research Institute of Water Resources Protection for the Yangtze, possessing the first class certificate for working on EIA issued by the National Environmental Protection Agency of China and broad experience in conducting EIA of water resources projects applying for loan from the World Bank, is responsible for conducting the EIA for the project, and a number of experts were organized for the purpose. Working on EIA of the project began in February, 1993 and have successively undergone the review of both the preparative mission and the pre-evaluation mission from the Bank. Meanwhile, internal EIA procedures have also been performed. Working on EIA of Jiangya reservoir subproject began in 1984 and eleven special reports have been compiled.

1.5 This summary provides an overall picture of the key findings of the EIA for the project.

2. OBJECTIVES AND DESCRIPTION OF THE PROJECT

Objectives and Background

2.1 The primary objectives of the project are: (1) enhancing the capability against flood damage in the project area and protecting the lives and properties of the local residents; (2) relieving the damage caused by natural disasters, such as flood, waterlogging, high water table and drought, so as to improve the local environment for production and living and promote the coincide development of social economy with protection of natural environment; (3) promoting the overall agricultural productivity and raising the outputs of rice, cotton, oil crops, etc., with the aim of raising the living standard of the local residents and making the area get rid of poverty. In addition, the project also aims at eradicating oncomelania in combination with construction of water conservancy project, protecting the health of the local people, improving the quality of supply water for cities and towns and promoting aquaculture in this area.

2.2 Lishui river basin where Jiangya reservoir subproject is situated is in the famous Wufeng-Hefeng storm zone of the midstream region of the Yangtze basin. Disastrous floods often occur and damage the lives and properties of the people in the downstream region. For example, in 1935 a major flood happened in Lishui river basin, with 118,000 hectares of farmland inundated, 1,440,000 people affected and 33,145 people drowned. Thereafter, major floods also happened in 1954, 1964, 1980, 1983 and 1991, respectively.

2.3 The area where Four-lake drainage subproject is situated is a low-lying region surrounded by three rivers (the Yangtze river, the Hanjiang river and Dongjinghe river). Due to the annual uneven distribution of the rainfall and lacking of suitable facilities, drainage capacity has been insufficient and waterlogging often happens in the area. The heavy waterlogging occured in 1980, 1983 and 1991 caused decreases of agricultural outputs significantly.

2.4 All the irrigation subproject areas are rich in farmland resources, besides, climate in those areas is moderate, which provide a great potential for developing agricultural economy. However, spring and fall droughts often take place in those areas because of the annual uneven distribution of rainfall. Continuous major drought years have been recorded in the history, which have hindered the sustainable development of agricultural production in those areas.

2.5 It is inferred that schistosomiasis has prevailed in Four- lake area for more than 2,100 years. Although obvious achievement has been gained in eradicating oncomelania and preventing schistosomiasis through many year's effort, the disease still prevails in some areas.

A plan for schistosomiasis control has been made in Hubei province and construction of the Four-lake subproject will promote the control and eradication of this disease.

Project Characters

2.6 The project is a component of the Yangtze basin comprehensive utilizatior planning. On the basis of river basin planning in combination with the harnessing of the nation's territory, both the nation's and the local's objectives are cooperatively met and water resources can be rationally allocated among the different regions.

2.7 The project is a large scale of water resources project, which includes reservoir subproject, drainage subproject and irrigation subproject. The funds needed will be raised both at home and from the World Bank.

Location of the Project Area

2.8 The project area is situated in Eastern China and on the both sides of the midstream reaches of the Yangtze river inside both Hunan and Hubei provinces, between 26° 58'--32° 53' N and 110° 54'--114° 02' E.

Project Components

2.9 Jiangya Reservoir Subproject. It is a new multipurpose water resources project, located on the middle reach of Loushui river in Cili county, northwest of Hunan province, with prior functions of flood control as well as power generation, irrigation, navigation and water supply.

2.10 North Tieshan Irrigation Subproject. This subproject, located on the northern side of Xinqianghe river in Yueyang city of northern Hunan province, is a successive one. Its water source project, Tieshan reservoir, and the southern irrigated area (on the southern side of Xinqianghe river) of the reservoir have already been completed.

2.11 Linduzhai Irrigation Subproject. This subproject is situated on the east bank of Chenshui river in Longhui, Xinshao and Shaoyang counties and its water source project has also already been completed. But the irrigation area, which is already in planning, needs to be constructed.

2.12 Danjiangkou Irrigation Subproject. This subproject lies in the northern part of Jianghan plain of Hubei province, below Danjiangkou reservoir, on the eastern bank of the Hanjiang river. All of the water source project, canal headwork and the canal system have already been constructed. The task of this subproject is perfecting the existing

canal system and its accessory works according to the original design standards.

2.13 Wenxia Irrigation Subproject. This subproject is situated on both sides of Aoshui river in the central part of Hubei province. Its water source project has already been constructed and the canal system has preliminarily formed. The task of this subproject is also perfecting the existing canal system and its accessory works according to the design standards, so as to increase the assurance coefficient of irrigation.

2.14 Dongfeng Irrigation Subproject. This subproject lies in the southeast part of Yichang city of Hubei province and between Huangbaihe river and Zhuzhanghe river. Its water source project has been constructed and the skeleton of the canal system has also preliminarily been formed. This subproject aims at perfecting the canal system and reforming the aged equipments.

2.15 Zhanghe Reservoir No. 3 Trunk Canal Irrigation Subproject. This subproject is situated in the southeast of Jingmen city in Hubei province. Its water source project and irrigation network with functions of storing, diverting and pumping water has basically been formed. The objective of this subproject is perfecting the existing canal system and structures.

2.16 Four-lake Drainage Subproject. This subproject is located in the central part of Jianghan plain in Hubei province. A project system against flood, waterlogging, high water table and drought has been preliminarily formed. The funds increased this time will be used for extension, reconstruction, completion and renewal of the existing project.

Investment and Construction Period of the Project

2.17 The total investment is 2.83 billion Yuan RMB, in which 0.898 billion Yuan (0.158 billion USD) is to be applied for as loan from the World Bank and 1.93 billion Yuan is to be raised at home.

2.18 Except for Liuduzhai irrigation subproject whose construction period is 6 years, all the other subprojects will need 5 years to complete the construction.

Project Management

2.19 The Ministry of Water Resources of the People's Republic of China is in charge of the project. Hunan and Hubei Provincial Governments have set up respective Project Leading Groups and their executive agencies----Project Management Offices, with the following duties: making project plan; assuring the funds; organizing project design and construction; monitoring progress and quality of the

construction; organizing scientific research and technical training.

2.20 After completion, a management agency for each subproject will be set up to perform unified management, regulation, maintenance in cooperation with relevant administrative agencies.

3. PROJECT BENEFITS

3.1 The flood control standard in the lower reaches of Lishui river will be raised from existing 4 year frequency up to 17 year one, and threats of frequent floods will be relieved.

3.2 By means of perfecting drainage facilities, extending irrigated areas and transforming waterlogged low-yield farmlands, outputs of grain, cotton, oil and so on will be greatly increased in the project area.

3.3 814 million kwh of electricity will be provided for the regions where electricity is urgently needed.

3.4 Water resources conforming with demands will be provided for regions where water quality and/or quantity do not meet the demands.

3.5 Regulation, control and utilization of water resources will be more rational and loss of water resources will be decreased.

3.6 The public health level of the local residents will be improved through regulating rivers and watercourses, extricating the local residents from poverty and curing patients infected with schistosomiasis, as well as eradicating oncomelania combined with construction of water conservancy project.

4. PROJECT ALTERNATIVES

4.1 The project alternatives have been considered on the following three aspects of Jiangya reservoir: damsite, normal pool level and the bottom elevation of the irrigation intake tube.

4.2 Four damsites within 11 km of a reach have been compared. Considering the rational planning, symmetrical landscape, fresh and unaltered rock mass with a high mechanical strength and good anti -seepage condition, Jiangya damsite is finally selected.

4.3 Five NPL scenarios, including 232, 234, 236, 238 and 240 m, have been compared. Based on the technical and economic indexes of multipurpose development of flood control, irrigation, water supply, power generation, navigation, as well as regional economic development,

236 m scenario is ultimately selected.

4.4 According to Jiangya reservoir planning, the storage level during flood period (April to August) should never be higher than 210.6 m. After comparison of all the indexes for different elevations of the irrigation intake tube and corresponding irrigable areas among the three scenarios: 190, 200, 210 m, the medium one has been selected.

5. BASELINE DATA

5.1 The project is situated in the midstream region of the Yangtze river, the central part of China. The project affected area mainly covers the Dongting lake alluvial plain and the hilly land around the lake in the north, Loushao drought corridor in the centre, Cili county in the northwest of Hunan province, as well as Jianghan plain in Hubei province.

5.2 Topography. The topography in China can be divided into three steps according to the obvious variation of elevation, and the project affected area belongs to the third step with the features of low elevation, a galaxy of lakes and alternate plains and hilly areas. The elevations of the Dongting lake basin is between 23- 40 m; On its periphery are hills with elevations of 50-200 m. The elevations of Jianghan plain is 22-60 m and they are 60-130 m on its periphery.

5.3 Structure and Geology. The area lies on the western part of the second depression zone and on the eastern part of the third upheaval zone of Neocathaysian structure. Earthquakes in this area are characterized by low frequency, small scale and scattered distribution of epicenters. The Quaternary period alluvial and lacustrine accumulation are widely distributed in the plain regions; Marine carbonate deposit and coastal debris deposit are widely distributed in the hilly regions.

5.4 Soil. Affected by organisms and climate, the area is abundant in water and warmth, and biological pedogenesis is active. The zonal soil is Krasnozem which is usually acid and contains lots of oxides of ferrum and aluminium. The main soil types are red clay, acid purple soil, calcareous red soil, yellow-brown soil, paddy soil, etc..

5.5 Climate. According to China's climate division, the project area is situated in Jiangbei subregion of the north subtropic humid climatic region. The general characteristics of the climate is relatively humid, with distinct differences among the four seasons of the year. It is usually hot and rainy in summer, but cold and dry in winter. The annual precipitation is approximately 800 mm in the northern part and gradually increases to 1,400 mm in the southern part. The mean annual air temperature is 15 degree centigrades in the north

and increases to 17 degree centigrades in the south. The frost- free period is 236 days in the north and 277 days in the south each year, respectively.

5.6 Surface Water. Both the runoff formed by precipitation and the passing water are rather abundant in the area. The annual runoff flowing into the Dongting lake in Hunan province is 168.4 billion cu.m.; that of Hanjiang river flowing into the Yangtze river is 56. 0 billion cu.m.; and that of the Yangtze river pouring from its upper reaches into its middle reaches is 452.0 billion cu.m.. Water quality of the rivers and lakes in the area is generally in quite good condition. However, it fails to meet the relevant surface water quality standard locally and periodically.

5.7 Groundwater. Groundwater resources in the area is rather abundant. Their main types are: loose rock pore water; debris rock crevasse pore water; bed rock crevasse pore water and carbonatite karst water.

5.8 Aquatic Biota. The Dongting lake and Honghu lake involved in the project are the important components of the four famous bases for fresh water fish culture in the Yangtze basin. The main fished and cultivated species are black carp, grass carp, silver carp, variegated carp, carp, crucian carp, bream, etc. Moreover, artificial cultivation of crab, lotus seed and root, pearl has attracted much attention.

5.9 Wetland. The Dongting lake region and Honghu lake region involved in the project belong to the Yellow and the Yangtze's middle and lower reaches wetland zone with the wetland category of fresh lake and neighboring swamp. They are important places for migration water birds such as egrets, storks, ducks, cranes and gulls to live through the winter.

5.10 Terrestrial Biota. The zonal vegetation in the area is evergreen broadleaf forest predominated by evergreen chinquapin and nanmu phoebe. Due to intensive interfering by human activities, vegetation types extensively distributed in the area are masson pine forest, cypress forest, etc. at present. Most land suitable for agricultural use has been reclaimed as farmland. The main crops include rice, yam, maize, beans, wheat, cotton, fiber crops, sugarcane, rape, peanut, tobacco, tea tree, etc. . According to animal geographical division of China, the project area is situated in central China zone of Oriental. Histrically, there were a great variety of wild animals with a complex community structure. However, because of the decrease of forest resources, the animals used to live in forest has been replaced by those used to live in farmland, brush -wood and grassland. At present, the commonly found species are small -sized ones such as snakes, birds, hares, rats and frogs, etc..

5.11 Administrative areas and Population. The area covers seven

prefectures (cities) including ninteen counties in Hunan and Hubei provinces, with the total area of 42,700 sq. km. The total population amounts to 11.057 million, of which 8.782 million is in agricultural status. Most of the people living in the area belong to Han nationality, only some people of Tujia nationality inhabit Jiangya reservoir area, but their custom is quite the same as that of the Han nationality.

5.12 Social Economy. The social economy in this area has been developing rapidly and playing an important role in Hunan and Hubei provinces in recent years.

5.13 Communication. Communication is rather convenient in the area. The national highways and local roads leading to almost every local town (township), plus the railways, waterways and airways, have formed a transportation network.

5.14 Land Use. According to their area order, the major land use patterns in the area are: farmland; forest land; water surface; land for villages, towns , factories and mines; roads; grassland; gardens and so on.

5.15 Living Quality. According to the following indexes: income, consumption, living space, savings per capita; number of TV sets and pieces of newspapers per 100 residents; education ratio of children; numbers of university students, hospital beds and doctors per 10,000 residents, etc. the living quality of the local residents in the area is in the nation's average level in general, however in some areas, it is poorer.

5.16 Public Health. The main epidemic diseases in the area are hepatitis and dysentery. In the surrounding areas of lakes there is also prevailence of schistosomiasis. However, the public health-care system and anti-epidemic system are well organized.

5.17 Tourism and Archaeological Values. Human activities have been existing in this area for a long history and left many cultural heritages, moreover, there are many very beautiful landscapes. They provide this area with important values for tourism and archaeology.

6. ENVIRONMENTAL IMPACTS

6.1 Based on the characteristics of each subproject and the present environmental situation of the affected area, the environmental impact scope, time period and key factors for each subproject are determined after identification of affected factors and screening of factors to be assessed.

6.2 Impacts on Topography. After Jiangya reservoir is built and impounded, the canyon shape near the damsite will be changed and not look so great as before. Meanwhile, the water level will be raised and the water surface will become 2-3 times wider, and, in the wide valley sections of the reservoir, some islands and peninsulas will be formed. These will not only provide new scenic spots but also convenient communication condition for developing the tourism. Quarrying during the construction will possibly damage the local landscape below the damsite. Thus, it is suggested that reforesting on the quarrying sites should be made to recover the natural landscape after completion of this subproject.

6.3 Impacts on Land Use. The reservoir impoundment will inundate some farmland, garden and forest land. In addition, relocation of towns, reconstruction of houses and infrastructures will also occupy some farmland. Moreover, resettlement will change the land use pattern from simple agricultural cultivation to comprehensive development of forestry, animal husbandry and aquaculture. Requirements for exploiting and utilizing land resources according to the principle of ecological economy as well as conservation of water and soil by engineering and biological measures should be considered.

6.4 Impacts on Local Climate. After impoundment of the reservoir, it is estimated that the air temperature in the reservoir area will possibly be increased by 0.3-0.6 degree centigrade in winter; whereas decreased by 0.3-0.5 degree centigrade in summer, and basically remain no changes in spring and fall. The relative humidity is estimated to be 1% lower in winter but about 4% higher in the other seasons. There are also some changes in wind speed, fogday, etc..Generally speaking, all these changes will be beneficial.to growth of vegetation.

6.5 Impacts on Hydrologic Regime and Sedimentation. After the reservoir is constructed and put into operation, the downstream mean discharge will be increased by about 183% during dry seasons and decreased by about 38% during flood seasons, which will be very beneficial to control of flood and waterlogging and water use in downstream region. During the 5th to the 50th year after the reservoir is put into operation, it is expected that, 95.4-93.8 percent of the sediment will be trapped in the reservoir, but it will not have a significant effect on the active capacity of the reservoir, and will reduce downstream sedimentation.

6.6 Impacts on Water Temperature and Quality. Considering the inflow, Jiangya reservoir belongs to a large one with a high dam, and stratification of water temperature in the reservoir will be formed. Based on the storage level, water intake elevation and the calculation results of water temperature distribution in front of the dam, it is predicted that the outflow temperature will be lower than the inflow

temperature in summer, with the maximum difference of 14. 7 degree centigrade, however, higher in winter, with the maximum difference of 1 degree centigrade. Because the water for irrigation will be diverted from the elevation of about 200 m in the surface layer where the water temperature will be basically equal to the inflow temperature, no adverse effect on the irrigated crops will be expected. Monitoring results show that water quality in the river is in quite good condition and no major pollution sources has been found in the reservoir area. The wastewater of the reservoir mainly comes from the seat of Hefeng county, about 80 km upstream of the reservoir's tail-end and the main pollutants are F^-, COD, BOD_5 and SS. It is predicted that there will be no significant changes in wastewater quantity and kinds of pollutants in the reservoir area by 2010 and 2020, neither will be the obvious change in water quality.

6.7 Impacts on Mineral Resources. According to an investigation carried out by Department of Geology and Mineral Resources of Hunan Province, there is no commercially valuable deposits in the inundated area, thus no major impact of the Jiangya reservoir on the mineral resources will be expected.

6.8 Impacts on Terrestrial Flora. There are five rare and endangered plant species, i.e. Emmenopterys henryi oliv, Eucommia ulmoides oliv, Glycine soja sieb et zucc, Tapiscia sinensis oliv and Preroceltis tatarino will Maxim, in the reservoir area. In addition, seven big or old trees including six species have been found in this area. However, this area is not a nature preserve, moreover these plants can also be found in the no- inundated area or outside the subproject area, there is no fear of their extinction.

6.9 Impacts on Terrestrial Fauna. There are some wild terrestrial animal species state specially protected in the surrounding area of the reservoir. However, most of them live in forest region with high elevation and will generally not be affected by the inundation. However, 'The Law of Protection of Wild Animals' should be propagandized to teach the relocatees and the constructors not to hunt the wild vertebrates such as Giant Salamander and golden pheasant, etc..

6.10 Impacts on Aquatic Biota. Reservoir environment will be beneficial to the growth and propagation of plankton, leading to an obvious increase of plankton population. The existing fishes addicted to stream environment in the reservoir section will move upstream to the reaches above the reservoir tail-end or to the tributaries and fishes addicted to low flow rate will predominate the reservoir fish community, which will provide a good condition for fishery production. In the downstream of the damsite, due to the low temperature of the discharged water from the reservoir, fishes addicted to warm environment will move downstream, and fishes addicted to cold environment should be introduced.

6.11 Impacts on Public Health. Malaria and encephalitis B have basically been under control in the reservoir area. However, some vector insects may reproduce again in the construction waterslash. Thus, monitoring should be carried out to find and control these diseases. Dysentery and hapatitis are the main types of epidemic and infectious diseases in the reservoir area with higher morbidities, therefore, there exists a risk of increase of morbidities of thses diseases if hygiene of drinking water and foods are not taken enough care of. Much attention should be paid to hygienical propagation and management, and morbidities should be kept at a low level from the beginning of construction. Flu is also another possible infectious disease once infectious source coming into this area from outside places. Preventive measures such as taking medicines should be taken into consideration.

6.12 Resettlement. As to resettlement, according to division some other agencies are specially responsible for carrying out the feasibility study on resettlement, drawing up and organizing to implement the planning for resettlement.

6.13 Dam Safety. Also according to division of feasibility study, some other agencies and experts are responsible for the dam safety assessment and will provide the countermeasures to guarantee the dam safety.

Environmental Impacts of Four-lake Drainage Subproject

6.14 Impact of the Increased Drainage Capacity on Flood Control. After implementation of this subproject, the total increased drainage capacity will reach 280 million cu.m.. In the ordinary years, flood in the outside rivers and waterlogging in the embanked areas usually occur at different time and the increased drainage capacity will have no effect on flood control of the Yangtze River and Dongjing river. However, in the worst situation when flood and waterlogging occur at the same time, the increased drainage capacity will probably raise the water level of the Yangtze River by 0.1 m and that of Dongjing river by 1.3-1.5 m, causing in-negligible effects. In order to guarantee the safety of the important protected zones, flood control and waterlogging drainage will be taken into consideration at the same time on the principle of rational regulation, usually waterlogging drainage should been restricted. According to a statistics of the hydrological data from 1950 till now, only in the case of 1983, waterlogging drainage would need to be restricted for 4-7 days, which would have little adverse effect on waterlogging drainage benefits.

6.15 Impacts on Epidemic of Schistosomiasis. The Four-lake region, being low-lying with a dense river network, is one of the regions with serious prevailence of schistosomiasis in Hubei province. If this subproject is to be implemented, the dredged soil can be used to bury

the reproduction sites of oncomelania, moreover, eradication of oncomelania can be carried out in combination with transformation of the 23 thousand Mu waterlogged low- yielding farmland, which will benefit the public health. However, oncomelania can be found in the upstream regions of some construction sites. If measures for prevention and eradication are not taken timely, oncomelania may be spread downstream and increase the schistosomiasis morbidity. Thus, it has been suggested that eradicating oncomelania should be carried out before the construction is formally started.

6.16 Resettlement. Totally 5,234 people have to be relocated and 48,618 trees have to be cut down. As all of these people and trees are sparsely distributed along the canals, they are easy to be relocated or replanted. Moreover, all of the relocatees will be benefited a lot from the subproject, they are looking forward to the construction of the subproject. As they are not compulsory relocatees, resettlement should be easily implemented.

Environmental Impacts of the Irrigation Subprojects.

6.17 Environmental Impacts of the Water Source Projects. All the water source projects (reservoirs) for the six irrigation subprojects have been completed and their environmental impacts are not included in the EIA of the six subprojects.

6.18 Environmental Impacts of the Water Way Projects. As all the water way projects of the six irrigation subprojects are located inside the irrigation area, their EIA are implemented as parts of the irrigation areas.

6.19 Environmental Impacts of the Irrigation Regions. The four irrigation regions of the four irrigation subprojects in Hubei province have already be constructed. However, the engineering works have a low standard and are aged, moreover, the canal's leaking is serious and management method is backward, which have caused adverse effects on society, economy and environment. After implementation of these subprojects, their benefits to local society, economy and environment will be further exerted. The irrigation regions for the two irrigation subprojects in Hunan province are ones to be successively constructed. After implementation, the utilization value of the existing farmland will be raised due to more reliable irrigation capability, and some of the wild land on which the biological community structure is simple with inferior functions could possibly be reclaimed for plantation.

6.20 Environmental Impacts of the Downstream Regions. After completion of the four irrigation subprojects in Hubei province, the downstream environment of the water sources will be improved to some extents because the irrigation water utilization factors are raised and more water will be discharged to downstream. However, after completion

of the two irrigation subprojects in Hunan province, certain quantities of water will be diverted from the water sources for irrigation, thus less water will be discharged to downstream reach. According to the analysis of downstream water use situation, no major impacts would be expected.

7. ENVIRONMENTAL MANAGEMENT

7.1 Environmental Management Agencies. It is stipulated that the environmental management system for the project consists of the Ministry of Water Resources, the National Environmental Protection Agency, the respective Provincial Departments of Water Resources, Environmental Protection Bureau, the Basin Water Resources Protection Agency, the Project Environmental Protection Offices and the Subproject Environmental Protection Divisions, with the last two units as the executive management agencies.

7.2 Duties of the Project Environmental Protection Office. The offices are responsible for: setting up regulations and stipulations for environmental protection in the project affected area; formulating environmental protection plan and supervising its implementation; mastering the environmental issues arising in the process of construction and operation; organizing environmental monitoring in the project area; conducting regular education and technical training in environmental protection.

7.3 Duties of the Subproject Environmental Protection Division. The division is in charge of: setting up respective regulations and stipulations for environmental protection of the subproject; formulating and implementing the environmental plan for the phases of construction and operation of the subproject; providing reports on environmental protection periodically and arranging for personnel training.

8. OVERALL ASSESSMENT

8.1 The EIA of the project is gradationally implemented. Firstly, EIA of each subproject is implemented on the following aspects: physical environment, ecological environment, social environment and living quality. Based on these results, EIA of the project is then conudcted.

8.2 As construcrion of most of the subprojects have been partly completed, only the loan supported construction items are considered in EIA of each subproject. Therefore, the scope of EIA for Jiangya reservoir subproject includes construction region, inundation region,

resettled region and downstream region of the dam; that for drainage subproject includes drained region and water receiving region; that for irrigation subproject includes irrigated region and lower reachs below water source

8.3 The result of EIA of the project shows that the project will have huge economic, social and environmental benefits. Among the adverse effects, some can be mitigated by taking proper measures and the others are acceptable to the environment. There is no environmental issues which would restrict the feasibility for construction of the project.

CHINA

YANGTZE BASIN WATER RESOURCES PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT SUMMARY

Addendum on Environmental Management and Monitoring Program

1. The following describes current plans for the Environmental Management and Monitoring Program (EMMP) under the proposed project. The EMMP would cover the two components with significant or potential environmental impacts, the Jiangya Dam subproject and the Sihu (Four Lakes) subproject. The EMMP would be finalized during appraisal.

Jiangya Dam Subproject

2. The Jiangya EMMP consists of providing environmental protection during: (a) project construction for areas affected in resettlement; land area submerged by the reservoir; wastewater treatment from the construction camp and from the sand and rock processing facilities; noise and dust control through equipment control; solid waste handling through collection and disposal; and public health control and prevention through clinics, exams and maintenance procedures; and (b) project operation by collecting water samples above and below the dam to periodically monitor targeted water quality parameters and water quality and by periodically monitoring changes and trends in land use for the Lishui River Basin. Costs for implementing Part (b) of the EMMP can be divided between capital goods, training and institution-building costs funded under the loan during construction and operating or recurring costs, which are funded by the Lishui Hydro Power Corporation (LHPC) from operating revenues after year five of this project. The principal responsible party for the EMMP is LHPC. The role of the LHPC in EMMP during implementation construction is administration, coordination and management, such as reviewing progress, consulting with authorities, arranging for services, providing payments, monitoring operations, negotiating agreements and coordinating with responsible technical agencies such as the Bureau of Environmental Protection and Departments of Forestry, Agriculture, Water Resources, and/or Public Health at the township, county and provincial levels. The Contractor may also be made the responsible entity for selected tasks. The role of LHPC in EMMP implementation during operation is one of designing, funding and undertaking or arranging the specified activities.

Sihu (Four Lakes)

3. The Sihu EMMP consists of providing environmental protection during: (a) construction, for areas affected by Schistosomiasis (through clinics and a control program); wood conservation and soil stabilization; farmer education through extension services; limited monitoring of selected parameters in waste discharges, run-off, toxics and Oncomelania; special studies in aquaculture, eco-agriculture, biodiversity and Schistosomiasis: and preparation of an Environmental Management Plan; and (b) operation of the project implementation of the Environmental Management Plan, which includes elements for pollution control, species management, an eco-agriculture program, a budget, and proposed tools for enforcement. Capital costs for the EMMP incurred during construction may be covered under the loan, and costs incurred after year five, during project operation, will be funded by the appropriate Government agency. The overall environmental management during construction will be the responsibility of the Hubei Provincial Bureau of Environmental Protection. They will also coordinate with the Hubei Provincial Project Management Office in the Provincial Water Resources Bureau and with the Sihu Project Management Authority (SPMA) with two to three persons assigned to SPMA for coordination and implementation of environmental protection activities concerned with drainage and irrigation. They coordinate with the Prefecture and County Bureaus of Environmental Protection, the relevant Monitoring Stations and

other prefecture and county agencies, as needed. Special studies during construction will be the responsibility of the Hubei Bureau of Environmental Protection. They will coordinate with appropriate research institutes and the SPMA. At the end of five years, the Hubei Provincial Bureau of Environmental Protection will implement an overall environmental management plan for the Sihu region, based upon the periodically-collected monitoring data and special study results and recommendations.

CHINA

YANGTZE BASIN WATER RESOURCES PROJECT

EXCERPTS FROM

COMPREHENSIVE RESETTLEMENT PLAN FOR

THE JIANGYA RESERVOIR IN HUNAN

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PREFACE

This is a comprehensive report of the Resettlement Plans for Jiangya Reservoir. This was requested by the World Bank's resettlement pre-appraisal mission during July 1994. This report therefore includes all pertinent information of all previous resettlement documents and consolidates the revisions and additions in one document. Further details of the chronology of planning work, documentation and World Bank review is described in Section 1.4. This document focuses primarily on reservoir resettlement because the damsite area resettlement is virtually complete. Nonetheless, certain sections include damsite resettlement information to maintain consistency with previous documents.

The document has been prepared under the direction of the Wuhan University of Hydraulic and Electric Engineering (WUHEE) based in Wuhan. WUHEE was responsible for the previous two resettlement documents submitted to the World Bank. The consolidation of this report also required considerable input from the Planning Department of the Changjiang Water Resources Commission (CWRC) based in Wuhan and the Hunan Hydropower Design Institute (HHDI) based in Changsha. CWRC has been closely involved with detailed planning for Hefeng County in Hubei Province while HHDI has been closely involved with detailed implementation planning in Cili County and Sangzhi County of Hunan Province. The assembly of the report in Wuhan was completed with assistance from a foreign consultant of the Canadian International Project Managers (CIPM).

Sincere appreciation is owed to the Lishui Hydro and Power Corporation (LHPC) and the Hunan Water Resources Project Management Office for their assistance, cooperation and financial support of the resettlement planning. Also, special appreciation is owed to the Hunan Provincial Resettlement Bureau, the County Resettlement Offices of Cili, Sangzhi and Hefeng and other local staff and village leaders who have contributed great efforts over the last two years to ensure the success of the Jiangya resettlement.

ABBREVIATIONS

CRO	County Resettlement Office
CIPM	Canadian International Project Managers
CWRC	Changjiang (Yangtze) Water Resources Commission
EIA	Environmental Impact Assessment
El	Elevation above sea level (meters)
FSL	Flood Supply Level
HHDI	Hunan Hydropower Design Institute
HWRPMO	Hunan Water Resource Projects Management Office
LHPC	Lishui Hydro and Power Corporation
m	meters
mu	Unit of land area equal to 1/15 of a hectare
MWR	Chinese Ministry of Water Resources
MWRRO	MWR Resettlement Office
NPL	Normal pool level of reservoir
PRB	Provincial Resettlement Bureau
RCC	Roller compacted concrete
WUHEE	Wuhan University of Hydraulic & Electric Engineering

5. RESETTLEMENT PLANS

5.1 Reservoir Resettlement Schedule

The displacement program and expenditures will be carried out according to inundation indices at the three stages of reservoir impoundment (refer to Table 2.4 in Chapter 2) and in line with the dam construction scheduling. Section 1.2 presented the dam construction schedule and Section 1.3 described the implications for resettlement phasing. Figure 1.2 shows the dam construction schedule and timing of reservoir impoundment at each of the three stages. These key dates and number people to be moved can be summarized as follows:

1st Stage (< 160 m)	- 3995 people moved by April 1994
2nd Stage (160-200 m)	- 5413 people moved by December 1996
3rd Stage (200-236 m)	- 3179 people moved by December 1997.

Figure 5.1 shows are more detailed resettlement schedule by time period and by county. The numbers of people refer to the housing population in the moving year, which totals 12,587 people by the end of the project. Table 5.1 provides details of the resettlement displacement program for each affected township.

The rest of this chapter describes the plans for overall reservoir resettlement to El 236 m. Details for the 1st Stage reservoir resettlement are provided in Chapter 8.

5.2 Agricultural Production Arrangements

The key strategies and principles for rehabilitation of agricultural livelihoods were stated in Sections 3.3 and 3.4.1. The application of these principles means that resettlers are (i) mostly moving back between elevation 236 and 600 m and up to 1200 m for some medicinal tree crops and tea; or (ii) moving people from Longtanwan to Huancheng township near Cili county seat due to lack of remaining arable land.

5.2.1 Production and Livelihood Options for Resettlers

Various means of production development were investigated according to the number of people, quality, education status, ages of resettlers and the exploitable resources. These were identified by detailed field investigations of land resources by local technicians at the county, township and village levels. The possible channels for the Jiangya reservoir resettlement are as follows:

(1) Based on the standard of 2.0 mu per capita for cash crops, about 1000 people could be resettled by improving existing cultivated lands and changing crop patterns, such as by improving irrigation conditions, terracing slopeland into paddy field, developing cash crops, etc. There are about 1500 mu (100 ha) of existing upland that could be improved.

(2) About 1500 people could be resettled by growing fruit trees around reservoir where the elevation is between 240 to 430 m, and the area is about 3000 mu (200 ha).

(3) About 11000 people could be resettled by planting tea in a relatively wide region where the elevation is between 240 to 1300 m, and the area is about 22,000 mu (1470 ha).

(4) About 9000 people could be resettled by developing Chinese medicinal herbs 18,000 mu (1200 ha) because the region has a very suitable climate and good soil characteristics. Eucommia, phellodendron and magnolia can be grown at elevations up to 1200 m and cape jasmine can be grown up to 600 m.

(5) Based on a standard of 30 mu per capita, about 700 people could be resettled by managing afforestation programs in regions with steep slopes. The area is about 21,000 mu (1400 ha).

(6) Based on a standard of 5 mu per capita, about 1000 people could be resettled by developing aquatic breeding in suitable reservoir coves. These areas would be maintained by small weirs during reservoir drawdown. The potential water area would be 5000 mu (330 ha). Fish cages could also be utilized.

(7) Embarking on enterprises, such as navigation, catering trade, limekiln, brick works and farm product processing.

In addition, there will be 1570 mu (105 ha) of flood land between the flood control level (El 210.6 m) and the NPL. During drier years, this area may be planted with winter crops. However, when the reservoir remains full through the winter, it would be risky to plant crops in the spring drawdown period because there is high chance of flooding. A better option would be to use the area for livestock grazing. This land is excluded in the plan, but it can be another income source for resettlers.

5.2.2 Agricultural Production Plans

There will be two kinds of crops to be planted according to the growth periods of the crops. One kind is the long growth cycle crops, such as eucommia ulmoides, magnolia officinalis and phellodendron trees, and another is the short growth cycle crops, such as orange, tea and cape jasmine. The farmlands in which the short growth cycle crops are planted will be contracted to

households, and the collective management with the system of production responsibility at township or village level should be adopted in growing the long growth cycle crops. To ensure that every family has stable income sources, the short growth cycle crops and the long growth cycle crops will be allotted to households in proper proportions. In addition, aquatic breeding and timber forestry will be developed to provide a diversified income generation base. Economic and income analyses are described separately in Chapter 10.

Of 7227 agricultural resettlers requiring new livelihoods in Cili County, all belong to Longtanwan township and of which 5878 people (81%) will be engaged in cultivation. They will plant tea (2778 mu), oranges (2300 mu), eucommia (978 mu), magnolia (1500 mu), phellodendron (500 mu) and cape jasmine (2600 mu). Of these people, 1500 will be moved near the Cili county seat to cultivate 1900 mu of existing orange orchards that will be purchased from the host villages (refer to Map 2). The rest of the people and production areas will be located backward around the reservoir area (refer to Map 3).

Of 5930 agricultural resettlers requiring new livelihoods in Sangzhi County, 5386 people (91%) will be engaged in cultivation, fishing or forestry. They will plant tea (2344 mu), oranges (2510 mu), pomelo (494 mu), eucommia (2852 mu), magnolia (500 mu), cape jasmine (534 mu), aquatic breeding (910 mu) and Chinese fir (10,320 mu). Table 5.2 shows the amounts of each production area and number of livelihoods by township. All the people and production areas will be located backward around the reservoir area (refer to Map 3).

Of 2112 agricultural resettlers requiring new livelihoods in Hefeng County, 1702 people (81%) will be engaged in cultivation. They will plant tea (100 mu), oranges (1100 mu), eucommia (1000 mu), paddy fields (1004 mu), aquatic breeding (125 mu) and Chinese fir (1500 mu). All the people and production areas will be located backward around the reservoir area (refer to Map 3).

Table 5.3 shows the production arrangement schedule by village of origin and destination. It also compares the agricultural characteristics of villages before and after resettlement.

5.2.3 Modifications to Previous Production Plans

The area for developing Chinese medicinal herbs was reduced to from the original plan because of their long maturation periods. In their place, more county level enterprises owned by the resettlement offices, town level enterprises and aquatic breeding items were added. Each enterprise was selected based on a feasibility study. More employment opportunities can be provided to relocatees study. Better employment opportunities can be provided to relocatees by transferring some close to the county seat or forming more concentrated residential areas in the reservoir region.

Compared with the Draft Plan, the number of resettlers who will depend on the incomes from enterprises and service trades has been increased from 400 to 1344 in Cili County. 1500 resettlers will be engaged in fruit growing and enterprises in non-agricultural districts near the county seat in Cili county. In Sangzhi County , the land area for developing Chinese medicinal herbs has been reduced because of the long maturation periods, and the area for growing orange and citrus increased accordingly.

In Hefeng County, the alternatives focus on adjusting cultivated lands in the original

villages, improving the barren land by irrigating and other measures and investing in new enterprises which can support 500 resettlers. The originally planned area where the elevation is about 1300 m has been excluded. Further revisions to plans were made in July 1994 to satisfy the requests of local leaders. The numbers of people requiring new livelihoods was increased by 120 people, orange orchards were increased by 900 mu, eucommia by 700 mu and other options were deduced slightly (paddy fields, magnolia, aquatic breeding and enterprise employment). This plan is now acceptable to the Hefeng County Resettlement Office.

5.2.4 Issues Considered for Rehabilitating Livelihoods

One of the key concerns is the impact of switching to long growth cycle crops for resettlers incomes. Cultivators will be able to get some benefit from long growth cycle crops during their built-up periods. For example, the eucommia leaves can be picked several times a year. Also, significant benefits can be obtained by interplanting with cash crops such as maize, peanuts and vegetables. Depending upon the tree crop, interplanting can be maintained for 3 to 5 years.

The original farmlands above the normal pool level of Jiangya reservoir will not be re-distributed and still belong to the current landholders. After the farmlands are submerged or acquired, resettlers incomes and living standard will be unchanged or improved by just growing fruits, tea and Chinese medicinal herbs. This provides an economic safety net in most of the townships with the exception of Longtanwan, hence the need to move 2500 people (35% of the livelihood population) out of the township and onto existing orchard land and into new enterprises.

In China, the basic national policy about the agricultural system is taking the varied systems of production responsibility and laying stress on the household contracted yield of crops within the overall frame of collective economy. It is this system that will be pursued in affected regions. For the sake of convenient production management, the current administrative divisions and the names at village level will be adjusted or changed because of the change of production modes and crops pattern. The system of management responsibility under the leadership of village committee will be used only for growing timber forest and the three xylophyta medicinal herbs. In brief, the production development system in affected regions is the same as that throughout the country.

As mentioned above, the collective management system should be used for growing the long growth cycle crops in their built-up periods (5 to 10 years), but this does not mean that resettlers will always produce on a collective basis at township or village level. The contracted yield system of household production responsibility will still be used, and the land growing the long growth cycle crops will be allocated to each household. However, township or village will be held responsible for risks for these crops production. In this period, the governments and resettlement offices at province and county levels will give aid to resettles and affected regions to ensure their incomes and living standards are unchanged or improved. After the built-up periods of crops, the relocatee households will reach self-sufficiency, and their incomes and living standard will catch up with or overtake those of non-relocatee households in this region.

Most resettlers will be not used to growing tea, fruits, Chinese medicinal herbs and timber forest; therefore, the resettlers training has been considered to improve their ability. Section 5.4

describes the livelihood training programs developed for relocatees. Also, to ensure the economic incomes of families who will depend on growing tea, relevant tea processing works are planned in the large producing areas (refer to Section 5.3).

5.2.5 Production Development Scheduling

In order to restore and improve relocatees incomes and living standards from their actual moving year, the preparation for production development including land levelling and preparation, tree planting, support infrastructure (tractor roads and irrigation systems and agricultural extension assistance will be started as soon as possible. Table 5.4 summarizes the annual schedule for agricultural production development by county. However, the starting time and scale of each subproject must be optimized in line with labour requirements and available funds. The timing is particularly critical for the 1st Stage resettlement.

The optimum time for constructing new houses and relocating is during the winter season when labour requirements for farming are minimal. The optimum time for transplanting planting tree crops is early spring. Since the labour requirements for land preparation would overlap with the construction of houses and infrastructure, it has been decided to develop new lands in the winter prior one year prior to moving. This will provide a better balance of labour requirements and will advance the growing stage of tree crops before relocation. This is not possible for the 1st Stage resettlement due to the decision to complete the cofferdam one year earlier. Fortunately, there resettlers can be arranged onto new lands developed under pilot projects schemes since the end of 1992. Refer to Section 4.2 on pilot projects and Chapter 8 on the 1st Stage resettlement implementation plan.

5.2.6 Costs of Land Development for Agricultural Schemes

The capital investment for agricultural production schemes includes (i) compensation of requisitioned host lands (only for relocation out of the township which requires a change of land rights), (ii) the cost for land preparation, (iii) planting costs, (iv) soil improvement (fertilizer), (v) maintenance of tree crops in the build-up years (labour, pesticides and tools) and (vi) irrigation facilities. The cost of land requisition in the case of Cili County depends upon the type of land purchased and the number od scattered trees. An average of ¥5500 per mu for all compensation items has been estimated for the existing orchard land near Cili.

Based on feasibility studies, local experience and experience gained from pilot projects, the costs per mu for items ii to v for different crops are as follows: tea ¥1713; cape jasmine ¥1187; phellodendron ¥1313; magnolia ¥1498; eucommia ¥1420; pomelo ¥1485; and oranges ¥2289. The detailed cost inputs and calculations are shown in Table 5.5. The cost of irrigation facilities ranges from ¥400 to 500 per mu. This assumes fixed sprinkler irrigation systems drawing water from the reservoir with one or two stage pumping stations. Some areas can also get water supply from natural springs. All the above costs are based on 1992 prices.

Of course, the costs for land improvement are just average values, and the actual cost will vary according to land quality, environment, transport facilities, etc. Land requisition costs are

determined by negotiation among concerned parties.

The estimated costs of irrigation schemes for new production areas range from ¥400 to ¥500 per mu and the total investment required is ¥4.69 million. It is estimated that ¥5.02 million of funds will be available from the compensation of inundated irrigation facilities. These figures are based on 1992 prices. The following amounts of irrigated land will be developed in each county.

County	Total New Land	Irrigated Land	Share
Cili	10,656	5,078	47.7 %
Sangzhi	9,234	5,348	57.9 %
Hefeng	2,229	1,769	79.4 %

5.2.7 Investments for Agricultural Relocatees Resettlement

The total investment for agricultural production arrangements amount to ¥59.47 million. The investments and expenditures for production development are shown in Appendix A. Of this investment, ¥26.89 million is for Cili County, ¥23.58 million is for Sangzhi County and ¥9.00 million is for Hefeng County. There are additional costs for relocatee training, unforeseen expenses and survey and design. Orange orchards comprise 41% of the cost (half of which is for acquiring existing orchards near Cili), Chinese medicinal herbs are 24%, tea plantations are 19%, paddy fields are 6%, forestry is 5% and aquatic breeding is 5%. The average investment cost per capita is ¥4586 and the highest average is in Hefeng at ¥5290 per capita. All the above costs are based on 1992 prices.

5.3 New Enterprises

New enterprises have been proposed to support 2298 agricultural people that will transfer to industrial and commercial employment. The number of relocatee jobs to be created are 1045 of which 600 are in Cili County, 260 in Sangzhi County and 185 in Hefeng County. New enterprises were identified based on the analysis and forecasting of the exploitable resources around Jiangya reservoir region, education status and ages of the resettlers, the market prices and products demand. There are 16 enterprises proposed at a total investment cost of ¥22.36 million based on 1992 prices. The average investment per job is ¥21,400. The proposed new enterprises and the investment costs for each is shown in Table 5.6.

The enterprises include four tea processing works, one flaxen fabrics mill, four transport and handling teams, two food processing mills, a bamboo articles works, a handicraft articles works, one sulphur mine, one timber processing mill, one chemical factory and one construction company. A brief introduction to several of these enterprises follows.

5.3.1 Tea Processing Works

The planned annual processing capacity of each works is 300 tonnes. There will be 50 employees in one works. The annual total output value, expenditures including wages and tax (the same below) and net benefit of each works will be ¥4500 thousand, ¥3171 thousand and ¥329 thousand respectively. The main raw materials are the coarse green tea for this enterprise. At present, the annual output of the course green tea is about 800 tonnes in Sangzhi County. The planned area for growing tea is 4720 mu, and the annual output of the coarse green tea in this area will add another 760 tonnes. Therefore, the raw material will be sufficient for processing tea. China exports tea to more than eighty foreign countries. In last decade, the export of tea went up by 81%. In 1990, the actual output of tea in China was 525 thousand tonnes; however, the demands of overseas and domestic markets for tea was 700 thousand tonnes. The supply of tea always falls short of demand. Therefore, it is profitable and feasible to set up the tea processing works.

5.3.2 Company of Construction and Building Materials

There will be 300 employees in this company. The planned annual building area is 22500 m^2. The annual gross incomes, expenditures and net benefit will be ¥9000 thousand, ¥8640 thousand and ¥360 thousand respectively. In China, the architectural industry develops rapidly, and the architectural market will be brisk for a long time. Moreover, the company will be able to contract for many building projects because of the construction of the Jiangya dam, the relocation of the market towns and the displacement of the relocatees.

5.3.3 Flaxen Fabrics Mill

The planned annual processing capacity is 1000 tonnes. There will be 200 employees in this mill which will be located in the suburbs of Cili county seat. The annual total output value, expenditures and net benefit will be ¥4500 thousand, ¥4281 thousand and ¥219 thousand respectively. The main raw materials for this mill are the bluish dogbane and jute. The sources of raw materials is in Dongting lake plain and Jianghan plain and only about 100 km from the mill. The major products will be sackcloth and gunny-bag which are the main packing materials of seeds, medicinal herbs and tobacco leaf. The products will be mainly sold to some cigarette factories in Yunnan and Guizhou provinces which have good business relationships with Cili County.

5.3.4 Bamboo Articles Processing Works

The planned annual output is 3000 bamboo beds. There will be 20 employees in this works. The annual gross output value, expenditures and net benefit will be ¥372 thousand, ¥288 thousand and ¥84 thousand respectively. Reservoir region is rich in bamboo. There will be no problem with the raw material. The bamboo bed is a traditional article in the reservoir region. The supply of high quality bamboo beds always falls short of demand.

5.3.5 Sulphur Mine Works

The planned annual output of sulphur is 30,000 tonnes in Changtanping Sulphur Mine Works. There will be 40 employees. The annual gross output value, expenditures and net benefit will be ¥3000 thousand, ¥180 thousand and ¥1190 thousand. The exploitable reserves of sulphur ore in this mining area is about 1070 thousand tonnes according to survey. The grade of the ore is 20%. Sangzhi County has business agreements with the Zhouma Chemical Plant in Hubei Province and the Shimen Chemical Plant in Hunan Province that need all the products.

5.3.6 Timber Processing Mill

The planned annual processing capacity is 5400 m^3 timber. There will be 70 employees in Linxihe Timber Processing Mill. The annual gross output value, expenditures and net benefit will be ¥9200 thousand, ¥750 thousand and ¥1700 thousand respectively. Linxihe Town is the main timber producing area in reservoir region and has more than 150,000 m^3 timber laid up at present. The neighbouring towns area also rich in timber. In China, the timber and related products always sell well.

5.3.7 Feed Processing Plant

The planned annual processing capacity of the feed for stock raising and aquatic breeding is 80,000 tonnes in Renchaoxi Feed Processing Plant. There will be 65 employees in the plant. The annual gross output value, expenditures and net benefit will be ¥8000 thousand, ¥6060 thousand and ¥1940 thousand. The major raw materials are maize and other grains which can be got easily around the region. This plant is a necessary enterprise for the aquatic breeding and stock raising in the same region, and the feed will not be sold in other regions.

5.3.8 Handicraft Articles Processing Works

The planned works will be able to process 40,000 stone carving articles and 55,000 brocade articles a year. There will be 20 employees in the works. The annual gross output value, expenditures and net benefit will be separately ¥2550 thousand, ¥1340 thousand and ¥1210 thousand. This works will draw on local resources. As the reservoir region is the centre of the state natural parks the Wulingyuan and the Mengdonghe, there are about 1000 thousand tourists a year at present, and it has been a pressing matter of the moment for Sangzhi and Cili counties to develop the handicraft articles processing trades and the tourist service. After the Jiangya reservoir is built, there will be many more tourists to this region; therefore, the market demand for the handicraft articles will increase.

In short, the enterprises as mentioned above will be set up at the places with good electricity and water supply service, easy communications and transport. These enterprises were chosen based on the feasibility study of more than twenty enterprises, and each has separate feasibility study report

and implementation schedule.

5.4 Training Program for Relocatees

The training for relocatees will be necessary because of the change of their livelihood production modes and living environment. The training courses can be divided into long term and short term courses. Forty young relocatees who have achieved senior middle school education will be sent to agricultural technical schools for one to two years of training. A total of 320 relocatees will be trained in the county with 10 days of short courses according to their management responsibility and production arrangement. The short courses will mainly be held at the pilot schemes or on study tours. Two separate training sessions will be held in each county. The trainees will pass on the their skills and knowledge to other relocatees in their own village. In addition, local agricultural extension experts will visit the resettlement areas regularly during a five year period to assess progress and deliver more skill training and technical advice. A listing of the training courses and the program schedule are shown in Table 5.7. The costs of relocatee training and extension services are estimated to be ¥1.17 million based on 1992 prices.

5.5 Relocation of Villages

There will be 12,587 agricultural relocatees that will have to relocate their houses out of the Jiangya reservoir submerged area. There are 2956 agricultural households that require relocation to new areas above El 236 m. Land acquisition for residential area is calculated according to 210 m^2 per family or 55 m^2 per head. The existing housing area of 425,391 m^2 will be completely rebuilt or relocated with similar or improved standards. A minimum standard of ¥100 per m^2 will be given as compensation for the main houses.

The following principles were considered in the residential area planning. Firstly, the intention of staying in their original homeland should be sufficiently considered by resettling them backwards near by and moving off the village or township in case without backwards moving condition. Secondly, the habits and customs of the relocatees will be respected, and both concentrated and scattered residential areas will be chosen according to the topographic condition and other environments. Thirdly, the residential area will be selected in the place with fine conditions of water source, geography and geologic and accompanied with the plans of production development, roads, posts and telecommunications for improving the transport, production and living conditions. Fourthly, the concentrated residential areas will be constructed as soon as possible to improve the conditions of relocatees children education, medical care, business and agricultural and sideline products trade. In addition, the transporting distance and environment will be considered in planning.

The 29 concentrated residential areas have been arranged after field surveys by technicians, local government officials and relocatee representatives. Table 5.8 provides details for the 29 new sites. The locations of the concentrated residential areas are indicated on the resettlement planning Map 3 of the Jiangya reservoir. Figures 5.2 (a, b and c) show the origins and destinations of agricultural relocatees by village for each of the 3 affected counties.

5.5.1 Alternative Resettlement Sites

In addition to the residential areas listed in Table 5.8, technicians and relocatees representatives also surveyed and analyzed the topographic, geologic and water source conditions of Hexin forest zone, Tiankengpo, Gongjiaya, Liaojiabao, Simaota, Jinjiyan school, Wanjiabao etc. The elevations of these areas are between 250 to 400 m and scattered along the reservoir banks in Cili County with a resettlement capacity of 4143 persons. Among the areas, the topographic condition of Simaota is the best one with a resettlement capacity of 2416 persons. These areas are not listed in the planned residential areas because they are far away from the proposed production developing regions; however, they can be considered as the reserve options for residential areas because of ease of resettling and fine transport and topographic conditions. The Hexin forest zone, Tiankengpo and Gongjiaya are located in Hexin village nearby a planned road and are reserved for residents of Hexin village that will be moving to Shuiyuan residential area. In addition, the survey team also investigated the possible scattered resettlement places of Sangzhi and Hefeng counties. The topographic, geologic and living conditions of those places are pretty good.

There are also some sites shown in Map 2 that were considered at earlier stages but have since been rejected because they would require people to move to other townships. This means that land rights must be readjusted which would add to the cost of production arrangement schemes. These sites could still be utilized as safety nets if there is difficulty implementing the proposed program.

5.5.2 Relocation Plans for Cili County

In the reservoir submerged region, the most residents of Longtanwan township in Cili County live in concentrated villages close to the valley floor between elevations 140 to 220 m. They are accustomed to the concentrated living. Therefore, the relocatees will be resettled in concentrated residential areas. The relocatees in Sangzhi and Hefeng counties are used to scattered living and will be resettled in scattering. Some concentrated villages are planned along the river and for people willing to move into the concentrated residential area. Otherwise, most relocatees will be resettled in scattered clusters as they are accustomed.

There are 2644 persons in Longtanwan township of Cili County who will be relocated in suburbs of Cili County seat in order to minimize the number of herbal farmers and people moving to high mountain areas. Three concentrated residential areas of Sunjiawan, Tianwan and Laomiao have been planned 3 km from the county seat (see Map 2). The relocatees in the three new areas will receive 1.3 mu of orange orchard per capita and there will be at least one person in each family who will be employed in new enterprises. In spite of long distance move and large number of relocatees, the resettlement will not be difficult because there is convenient transport and good production and livelihood development schemes.

In summary, most relocatees will be resettled in their original villages and those from Fengya, Jinji and Hexin villages will be resettled in a suitable residential area with a minimum moving distance. Except for the 792 people moving to Shuiyuan residential area at an elevation of

1200 m. most of the relocatees will be living below El 370 m and the elevation difference of residential areas before and after displacement is less than 200 m. A large tea planting area is located nearby Shuiyuan residential area and a tea processing mill is planned; therefore, a significant number of relocatees have to be resettled to this higher elevation to manage the tea plantations. These relocatees also own reserved residential area at low elevation.

5.5.3 Relocation Plans for Sangzhi County

The relocatees in Sangzhi County are accustomed to living in scattered settlements. There will be 2595 people moving back up the slopes in scattered residential areas according to their preferences. Another 991 people will be resettled in 10 concentrated residential areas which will be along the reservoir shores between El 300 to 400 m (see Table 5.8). The distance between residential areas and agricultural production areas will be less than 2.0 km. The topography, geology, transport, environment and living conditions of both concentrated and scattered residential areas are quite good (refer to Map 3).

5.5.4 Relocation Plans for Hefeng County

There will be two concentrated residential areas which will be situated in Mayatou and Chenjiahe villages of Hefeng County (refer to Map 3). There will be 700 people resettled at Mayatou where the elevation is about 500 m and 500 people resettled at Chenjiahe where the elevation is about 400 m (see Table 5.8). There will be virtually no scattered residential areas.

5.5.5 Displacement Schedule

For both concentrated residential area construction and scattered backward resettlement, the date line of displacement should be in line with the reservoir construction schedule. Generally, the relocatees whose houses and cultivated lands are located below El 160 m will be moved out before the end of April 1995. The relocatees whose houses and cultivated lands are located between El 160 to 200 m will be moved out before the end of December 1996. The relocatees whose houses and cultivated lands are located between El 200 to 236.5 m will moved out before the end of December 1997. Some relocatees will be moved out ahead of the schedule to large numbers moving in a certain stage.

5.5.6 Investments for Rural Residential Reconstruction

The investments for displacement of agricultural relocatees consist of compensation costs for houses, accessories, wire to houses and voltage network, allowance for transporting assets, damages, lost working time and the construction drains, water supply, house base levelling and land acquisition (only for sites in other townships). The investments for rural residential reconstruction total ¥59.10 million excluding indirect costs for survey and design, administrative costs, and unforseen expenses.

Of the investments, ¥34.13 million is for 16 concentrated villages and scattered clusters in Cili County, ¥15.65 million is for 10 concentrated villages and scattered clusters in Sangzhi County, and ¥9.31 million is for 3 concentrated villages and scattered clusters in Hefeng County (see Table 5.9). All costs are based on 1992 prices.

5.6 Relocation of Market Towns

There are six market towns in reservoir region, they are Longtanwan, Linxihe, Changtanping, Renchaoxi, Jiangkou and Tielu towns. Of them, Tielu town will be part submerged, and the others should be relocated wholly.

Longtanwan market town in Cili county is near by the Jiangya damsite. There are 235 people and 10955 m^2 of houses in the market town. The current location is around El 160 m but most of the main structures and facilities are not affected at the 1st Stage reservoir impoundment. Some people will be relocated in the 1st Stage but the new market town does not have to be built until the 2nd Stage (by December 1996).

Renchaoxi, Changtanping and Linxihe three market towns in Sangzhi County need to be relocated. There are 554 people, 35292 m^2 of houses, 46 institutions, 8 enterprises and 80 individual businesses in the three market towns. Renchaoxi and Changtanping will be relocated in the 2nd Stage and Linxihe will be relocated in the 3rd Stage (by December 1997).

Jiangkou and Tielu two market towns in Hefeng County are also affected by the project. The current location of Jiangkou market town is between El 210 to 220 m. There are 177 people and 11453 m^2 of houses in Jiangkou market town. There are only 159 people and 7147 m^2 of houses affected by the project in Tielu market town. Both market towns will be relocated in the 3rd Stage.

The market towns should be rehabilitated based on the current scale, facilities and service items to meet the resettlers' daily life and production development; moreover, the space and facilities in new towns should be able to satisfy the demands for development in future.

5.6.1 The New Sites

Based on survey on the spot, feasibility study and opinion of local competent authorities, the new sites of market towns are as follows:

(1) Longtanwan: Zhuojiapo in Bijia village 4.75 ha (71.3 mu). The elevation is between 240 to 280 m.

(2) Renchaoxi: Xinlongping, 6.45 ha (96.8 mu). The elevation is between 237 to 240 m.

(3) Changtanping: Luojiatai, 2.48 ha (37.2 mu). The elevation is between 237 to 250 m.

(4) Linxihe: further up from original place, 3.22 ha (48.3 mu). The elevation is between 237 to 250 m.

(5) Jiangkou: Hujiayu, 4.0 ha (60 mu). The elevation is between 237 to 260 m.

(6) Tielu: slightly up from original place, 4.0 ha (60 mu).

5.6.2 Number of People to be Relocated in Market Towns

The population includes direct affected people, permanent residents but no residence cards, boarders, accompanies, original residents at the new site and the normal increase. The planned population in actual moving years is the current population plus the normal growth (see Table 5.10).

5.6.3 Land Requirements for New Market Towns

The size of market town is designed according to planned population and standard area per head. The standard is 123 m^2 per capita, which includes houses, public buildings, workshops, transport network, public utilities, parks farm market, etc.. The standard space is 210.6 m^2 per capita in Tielu town because of the central school, central hospital and some mills. The land areas for new market towns are shown in Table 5.11.

5.6.4 Relocation Standards

The new sites of market towns are situated in mountainous district. After the project is finished, a narrow water body more than 74 km long will be formed. Therefore, the sites should be located near the reservoir shores for their environment. The main street will run through market town, and public buildings and shops will be arranged along this street. Schools, parks, hospital and official buildings will be with hills behind. The farm market which is close to the dock, road and the others are along the reservoir.

The main street is 11 m wide between property line, i. e. 7 m road and 2 m double sidewalks. The other roads are 4 to 5 m wide.

The water supply, safety and sanitation systems should be considered carefully. Daily water consumption for living is 100 L per head, and that for production is calculated according to actual demands. The drains should be constructed separately for rainfall and sewage, and open drains can be used for rainfall. Sewage should be disposed if it is necessary.

The average annual electrical consumption is planned according to 220 kWh per capita which includes daily life and public lighting consumption. Low voltage network is designed within market towns, and the high tension network and equipment will be included in development of infrastructure.

5.6.5 Investments for Relocating Market Towns

The investments for relocation of market towns amount to ¥16.97 million including land compensation, land levelling, house compensation, transport, public facilities, survey and design, administrative costs, and unforseen expenses. Of theses investments, ¥3.22 million is for Longtanwan

Town in Cili County, ¥8.86 million for three market towns in Sangzhi County, and ¥4.90 million for two market towns in Hefeng County (see Table 5.12). All costs are based on 1992 prices.

5.7 Rehabilitation and Development of Infrastructure

The infrastructure includes road pumping station and key pipeline network, high voltage network and relevant equipment, posts, telecommunications, wired broadcast network, TV relay station, etc. The current infrastructure in reservoir region should be rehabilitated, and some new infrastructure will be developed according to the lowest national standard for resettlers daily life and production development. The planning of infrastructure is carefully thought out without having to go far for saving investments.

5.7.1 Transport Network

4th Grade Roads: There are seven sections of 4th grade roads to need rebuilding, and the overall length is 31.1 km. The first one is from Zhuojiapo (new location of Longtanwan market town) to Huangshanwan to link with CiSang main road, and its length is 11.0 km. The second one is from Tongtai residential area near by Cili county seat (non-agricultural region) to Cili County meat processing factory, and its length is 2.0 km. The third, fourth and fifth sections are in Sangzhi County and their total length is 11.1 km. The sixth one is from Tielu Town center to the border of Sangzhi County through Jiangkou market town, and its length is 6.6 km. The seventh section is the rebuilding of 0.4 km of 4th grade road that is inundated in Jiangkou Township.

Non-graded Roads: There will be 42.0 km of new roads that will be built to a higher standard than the existing tractor roads in order to enhance local communications. Of the length, 22.0 km is in Cili County and 20.0 km is in Hefeng County.

Tractor Roads: There are several sections of tractor roads that need rebuilding and the total length is 40.3 km. Of the length, 32.3 km is in Cili County and 32.0 km is in Sangzhi County.

Major Paths: There are ten sections of major paths that need rebuilding, and they amount to 233.0 km. Of the length, 160.0 km is in Cili County, 43.0 km is in Sangzhi County and 30.0 km is in Hefeng County.

Bridges: There are two bridges and a suspension bridge that need rebuilding. One is a concrete road bridge with a length of 40 m in Renchaoxi Town and one is a concrete road bridge with a length of 30 m in Linxihe Town. The steel cable suspension bridge with a length of 180 m is for Jiangkou Town.

Docks and Ferries: Each town of Longtanwan, Changtanping and Renchaoxi has a dock and a truck ferry which needs rehabilitating, and one truck ferry will be also rehabilitated in Jiangkou

Town. There are total of 32 new small ferryboats required for people around the reservoir, of which 5 are in Cili County, 24 are in Sangzhi County and 1 is in Hefeng County.

5.7.2 Telecommunications, Broadcast and TV Network

Two TV relay stations need relocating. One is in Longtanwan town, and another in Changtanping town. One satellite receiver in each town of Longtanwan, Changtanping, Renchaoxi and Linxihe should be set up as their environment will be changed.

The wired broadcast network needs rehabilitating, and the length counts up 217.3 km. Of the length, 95.0 km is in Cili County, 61.3 km Sangzhi County and 61.0 km Hefeng County.

The length of telecommunication lines to be rehabilitated is total 222.9 km. Of the length, 57.2 km is in Cili County, 90.8 km in Sangzhi County and 74.9 km in Hefeng County.

5.7.3 Power Transmission Network

In Cili County, a 10 kV high tension line of 19.8 km long and 380/220 V low voltage lines with a length 70.0 km need rehabilitating in Longtanwan township. Another 10 kV high tension line with 20.0 km length will be constructed for the change of concentrated residential areas and working areas.

For the same reasons as above, power transmission networks of 10 kV high tension with 42.5 km length in Sangzhi County and 14.0 km length in Hefeng County, 35 kV high tension with 25.0 km length in Hefeng county. The 380/220 V low voltage lines with 62.0 km in Sangzhi County and 30.0 km in Hefeng County need rehabilitating and developing.

5.7.4 Water Supply in Cili County

Eleven pumping stations for water supply of residential areas around reservoir will be set up. The water sources are reservoir. Seventeen pumper station will be needed. Water can be lifted to residential areas directly in five systems, and two-stage lift will required the other six systems. The total length of main pipelines is 2750 m. The total capacity of main cisterns is 1022 m^3.

There is a spring with a flow of 100 to 150 litres per second near Sangjiawan which is the center of non-agricultural residential area. The elevation of the spring is about 170 m. The water quality is fine. This spring can meet the demands of resettlers' daily life. However, two pumpers, a cistern, main pipelines with 2820 m length and branch pipeline with 2500 m length will be used.

5.7.5 Water Supply and Irrigation in Sangzhi County

Forty-two water supply systems will be built in Sangzhi County because the residential areas will be relative scattered. Of the systems, thirty four will adopt diversion works, and the other eight systems will use one-stage lifts. Moreover, two diversion works and two pumping stations will be built for irrigation of 2090 mu farmland.

5.7.6 Investments in Infrastructure

The investments for rehabilitation and development of infrastructure are ¥31.65 million. This excludes the costs of water supply for domestic and irrigation uses because the cost is included in the rural resettlement items (Sections 5.2 and 5.5). Of the investments, ¥20.31 million is for transport networks, ¥1.14 million for telecommunications, ¥1.09 million for broadcast and TV network, ¥3.84 million for power transmission network and ¥5.27 million for others such as reservoir clearance, public health, treatment of cultural relics and miscellaneous items. The investment costs for infrastructure by county are shown in Table 5.13. All costs are based on 1992 prices.

Tab. 2.4 Jiangya Reservoir Inundation Impacts at 3 Stages

Items				Population	Farmers	Non-agric.	Houses and Accessory	Houses	Brick and concrete	Brick and wooden	wooden and tile-roofed	Clay and tile-roofed	Houses for odds and ends	Lands	Paddy field	Upland	Fallowland
Unit							m^2							mu			
Reservoir region	Human	Sum	<160m	3757	3576	181	144022	123680	11775	28166	79014	4725	20342	3838.1	2651.2	1797.3	680.3
			160~200m	4286	4013	273	161450	140005	12647	34507	88844	4007	21445	4960.5	3045	1694	541
			>200m	2117	2029	88	85274	74857	6311	20192	47104	1250	10417	2847	1685	678.6	136
		Civil	<160m	3493	3312	181	246194	109314	10980	25432	72902	4615	19018	3511.9	2481.9	1057	671.3
			160~200m	2546	2546	0		79701	8005	18513	53153	3365	13888	3230.5	1732.7	1497.8	490
			>200m	426	426	0		13368	1343	3110	8915	564	2330	996.6	362.2	634.4	82
		Sangzhi	<160m	264	264	0	144552	9641	795	2734	6112	110	1294	294.2	221.2	75	9
			160~200m	1740	1467	273		56297	4642	15904	35691	642	7557	1730	1292	438	51
			>200m	1691	1603	88		60239	4968	17082	38189	686	8087	1850.4	1382.2	468.2	54
	Hubei	Hefeng	<160m	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			160~200m	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			>200m	1679	1343	336	73606	71407	3268	13675	46493	7971	2199	2379	1781	598	626
	Sum		<160m	3757	3576	181	144022	123680	11775	28166	79014	4725	20342	3838.1	2651.2	1797.3	680.3
			160~200m	4286	4013	273	161450	140005	12647	34507	88844	4007	21445	4960.5	3045	1694	541
			>200m	3796	3372	424	158880	146264	9579	33867	93597	9221	12616	5226	3466	1276.6	762
Dam-site				567			19270.9	19103.6	6593.89	8563.72	3160.44	785.54	167.28	284.2	173.39	110.81	688.85
Total				12106			483623	429052	40591.9				54570.3	14308.18	9428.4	4878.8	2671.9

Items				Orchard	Forest	Cash trees	Timber trees	Houses base	Infrastructure	Road	Grade-4 road	Tractor road	Ferry	Telecommunication line	Broadcast line	Power transmission	Small hydro station
Unit						mu				km				km		High tension /low	kW/station
Reservoir region	Human	Sum	<160m	573.5	1933.7	620	1315	213		12.8	12.8	0	1	30.5	49	15/53	0
			160~200m	552	2185	[illegible]	1669	279		0	0	0	0	38	45	26.7/48.3	26/1
			>200m	431.1	1161.5	[illegible]	1012.5	152.9		0	0	7.7	0	23.4	17	0	0
		Civil	<160m	546.5	1782.7	607	1176	223		8	8		1	26.5	47	13/52	
			160~200m	398	1300	442	857	162		0	0		0	18	31	10.99/44.9	
			>200m	67	218	74.7	144	27.4		0	0		0	3	6	0	
		Sangzhi	<160m	27	151	13	139	20		4.8	4.8			4	2	2/1	0
			160~200m	154	885	73	812	117		0	0			19	11	15.7/3.4	26/1
			>200m	164.1	946.5	76.9	868.5	125.5		0	0			20.4	13	0/0	0
	Hubei	Hefeng	<160m	0	0	0	0	0				0	0	0	0	0	0
			160~200m	0	0	0	0	0				0	0	0	0	0	0
			>200m	173	184.66	181.66	3	108				7.7	1	19.9	46.5	31/0	206/1
	Sum		<160m	573.5	1933.7	620	1315	213		12.8	12.8	0	1	30.5	49		0
			160~200m	552	2185	515	1669	279		0	0	0	0	38	45		26/1
			>200m	401.1	1349.2	333.3	1015.5	260.9		0	0	7.7	1	43.3	57.5		206/1
Dam-site				397.67	365.42	16.06	349.36	44.35									
Total				1927.3	5833.3	1484.4	4349	827.3									

Tab. 5. 1 Resettlement Schedule by Affected Twonship

County	Township	Year						Total
		1992～1993	1994	1995	1996	1997	1998	
Cili	Longtanwan		3721*	1300	1413	455		6889
Sangzhi	Zhuyeping		274*	320	374	218		
	Renchaoxi			430	432	201		
	Changtanping					1003		
	Linxihe					290		
	Baishi				23			
	Guandiping				21			
	Sum		274*	750	850	1712		3586
Hefeng	Jiangkou				700	692		
	Tielu				400	320		
	Sum				1100	1012		2112
Damsite		567						567
Total		567	3995*	2050	3363	3179		13154

* These relocatees must move by April, 1995.

Tab. 5. 2 Agricultural Production Arrangement Plans

Area unit: mu

Administrative division		Cultivation												Aquatic breeding Resettlers	Enterprises Resettlers	Sum Resettlers
		Herbs		Orchard		Tea		Forest		Grain crop		Sum				
		Area	Resettlers	Area	Resettlers	Area	Resettlers	Area	Resettlers	Area	Resettlers	Area	Resettlers			
Cili	Longtanwan	5578	2789	2300	1700	2778	1389					10656	5878		1344	7222
	Jiangya														640	640
	Sum	5578	2789	2300	1700	2778	1389					10656	5878		1984	7862
Sangzhi	Renchaoxi	1082	541	1064	532	1120	560	3300	110			6566	1743	305	294	2342
	Changtanping	1000	500	1160	580	1044	522					3204	1602		100	1702
	Zhuyeping	1270	635	750	375							2020	1010	120		1130
	Linxihe	534	267	30	15	180	90	7020	234			7764	606		150	756
	Sum	3886	1943	3004	1502	2344	1172	10320	344			19554	4961	425	544	5930
Hefeng	Tietu	400	200	400	200					62	31	862	431	50	230	711
	Jiangkou	600	300	700	350	100	50	1500	50	942	471	3842	1221		180	1401
	Sum	1000	500	1100	550	100	50	1500	50	1004	502	4704	1652	50	410	2112
Total		10464	5232	6404	3752	5222	2611	11820	394	1004	502	34914	12491	475	2938	15904

Tab. 5.3(a) Production and Livelihood Development Plan

County	Town	Host site: Host Residential area	Average elevation (m)	Original host residents	Area (mu)	Relocatee village of origin	Relocatees	Total population	Before displacement: main crops	main income sources	After displacement: main crops	main income sources	Farmland per head for Relocatees (mu): Before	After	Distance to working area (km)	Transportation distance (km)	Elevation difference (m)	Relocation schedule: <150 Apr.95	150~200 Dec'95	150~200 Dec'96	200~230 Dec'97
Chili	Longjiaowan	Laowuchang	260	5	13.75 37.27	Liushiping Fengya	113 15	133	Rice,tea,maize	Cultivation & tea processing	Tea	Tea growing & processing	0.66	2.0	1.5	1.5	90	113			15
		Dengjiapo	340	18	18.52	Liushiping	281	361	Rice,tea,maize	Cultivation & tea processing	Tea	Tea growing & processing	0.66	2.0	2.0	1.0	195	164	62		58
		Haozhe	290	16	13.5	Taojiaju	144	160	Rice,maize,herbs	Cultivation	Eucommia ulmoides	Herbs growing	0.55	2.0	1.0	0.5	140	64		80	
		Zhoujiaya	270	18		Hexin	113	131	Rice,rapes,wheat	Cultivation	Herbs	Herbs growing	1.44	2.0	3.5	1.0	105	113			
		Zhoujiapo	250	45	122.9	Bijia Hexin	273 435 (501)	1261	Rice,rapes,wheat, maize,fruits	Cultivation	Herbs	Herbs growing,small business,transportation	1.28	2.0 2.0	4.5	1.5	310	435 304	100 200	111	62
		Yinjiawuchang	300	1	52.6	Tankou	503	510	Rice,rapes,wheat	Cultivation	Herbs,tea	Herbs & tea growing	0.66	2.0	0.5	1.0	140	363	140		
		Yuejiawuchang	315	241	39.9	Tankou	146	387	Rice,rapes,wheat	Cultivation	Herbs,tea	Herbs & tea growing	0.66	2.0	1.0	1.0	135			100	46
		Yanghanyuhou	270	2	20.53	Jinji	346	348	Rice,tea,maize	Cultivation & tea processing	Tea	Tea growing & processing	0.66	2.0	1.0	3.5	160			118	228
		Tianya	360	0	43.65	Bijia	423	423	Rice,rapes,maize	Cultivation	Cape jasmine, cork trees	Herbs growing	1.28	2.0	5.0	0.5	105	314	109		
		Shuiyuan	1200	20	83.72	Hexin	716	736	Maize,soybean,herbs	Cultivation	Tea	Tea growing & processing	0.73	2.0	1.5	18.0	1000		356	360	
		Fengshang	290	0	9.26	Mingtan	70	70	Rice,rapes,maize	Cultivation	Cape jasmine	Herbs growing	0.87	2.0	2.0	1.0	140		70		
		Baiyantou	320	0	73.6	Mingtan	714	714	Rice,rapes,maize	Cultivation	Tea,herbs	Herbs & tea growing	0.87	2.0	4.0	2.0	160	462	19	233	
		Wangjiapo	250	0	27.65	Mingtan	42	42	Rice,rapes,maize	Cultivation	Tea,herbs	Herb & tea growing	0.87	2.0	2.0	0.8	80		42		
	Hongjiaoping	Sunjiawan	250	195	170.0	Zhongjia Huangyaquan Longshulai Hexin	929 278 8 239	1649	Fruits,timber	Fruits	Fruits	Fruits growing, Company of construction & Building Materials, Flaxen Fabrics Mill	1.4	1.3	Cultivation 1.5 Enterprises 6.0	78 79 67 77	90	620 271 8 239	153 7	151	
		Tianwan	270	141	51.15	Longshulai	355	496	Fruits,timber	Fruits	Fruits	Fruits growing, Company of Construction & Building Materials, Flaxen Fabrics Mill	1.4	1.3		67	80	318			37
		Laomiao	310	17	78.3	Longshulai Yijiaping	277 516	760	Fruits,timber	Fruits	Fruits	Fruits growing, Company of Construction & Building Materials, Flaxen Fabrics Mill	1.4	1.3		78 72 77	110	110 237	130	117 140	9

Tab. 5.3(b) Production and Livelihood Development Plan

County	Town	Host site: Host Residential area	Average elevation (m)	Original host residents	Area (mu)	Relocatee village of origin	Relocatees	Total population	Before displacement: main crops	main income sources	After displacement: main crops	main income sources	Farmland per head for Relocatees (mu): Before	After	Distance to working area (km)	Transportation distance (km)	Elevation difference (m)	Relocation schedule: <150 Apr'95	150~200 Dec'95	150~200 Dec'96	200~236 Dec'97
Sangzhi	Chengtanping	Kuzhuwan	350	8	12.5	Changtanping	99	107	Fruits, tea,		Herbs & fruits	Herbs & fruit growing		2.0	1.5	3.5	140				99
		Wuguizao	250	9	13.5	Chishiping	104	113	rice, maize,	Cultivation	Fruits, tea	Sulphur Mine Works, cultivation,		2.0	1.5	1.0	45				104
		Luojiatai	260	9	14.0	Chishiping	107	116	herbs		Fruits	Sulphur Mine Works, cultivation		2.0	1.0	1.0	60				107
		Saihouai	305	9	14.0	Zongshuyu	108	117	Timber	Forestry	Timber	Timber processing		30.0	1.5	2.5	95				108
		Luojiabao	320	10	15.0	Hongqi	120	130	Fruits, tea,	Cultivation	Tea, fruits,	Cultivation, tea processing, aquatic breeding, handicraft, feed processing		Cultivation 2.0	1.0	0.5	140			120	
		Shaojiatai	320	9	13.0	Hongqi	104	113	rice, maize, herbs		Herbs			Aquatic breeding 2.5	2.0	4.0	140			130	
		Zhaojiaya	360	6	16.0	Liuyangai	90	96			Fruits, herbs	Fruits & herbs growing, aquatic breeding		Cultivation 2.0	1.5	0.5	180	90			
		Maotangjie	370	5	12.5	[illegible] yangai	70	75	Rice, wheat,	Cultivation & aquatic breeding	Fruits, herbs				1.0	2.0	195	70			
		Shaojiawan	320	5	12.5	[illegible]	70	75	maize, rapes		Fruits, herbs			Aquatic breeding 2.5	1.0	3.0	150	70			
		Lutangwa	310	10	17.5	Maojiai	119	129			Fruits, herbs				1.5	1.0	100				119
Dong-ting	Jiangya	Huanghuyu	270	0	47.74	Linjiang	397	397	Fruits, rice	Cultivation, small business, transportation	Fruits	Enterprises, small business, transportation	0.7		1.0	0.5	120	finished in 1993			
		Chengsanlu	260	0	33.25	Jiangya	100	100			Fruits				1.0	0.5	100				
		Dujiawan	270	0	8.81	Zhaojiaya	40	40	rapes, cotton		Fruits				1.0	0.5	100				
Hefeng	Tieliu	Chenjiahe	400	0		Tieliu	399	500		Cultivation	Fruits, herbs & cultivation	Fruits herbs & crops growing	1.5	2.0	1.0	10	170				399
						Jiangkou	101								1.0	10	170				101
	Jiangkou	Mayatou	500	18		Tangjia	322	700		Cultivation			1.5	2.0	1.5	7.0	280				322
		Mayatou	500	18		Qianhu	156			Cultivation			1.5	2.0	1.5	7.0	280				156
		Mayatou	500	18		Jiangkou	222						1.5	2.0	1.5	7.0					222

Tab. 5. 6 Planned Enterprises and Cost Estimates (1992 prices)

County	Town	Name	Costs (¥10⁴)	Resettlement funds (¥10⁴)	Resettlers	Jobs
Cili	Longtanwan	Liuzhiping Tea Processing Works	240	240	100	50
		Sanchaxi Tea Processing Works	212.29	212.29	100	50
		Company of Construction & Building Materials	603	603	724	300
		Cili Flaxen Fabrics Mill	336	336	420	200
	Jiangya	Shale Brick Works	280	280	244	180
		Dehydrated Vegetables Mill	200	200	180	115
		Small Business	84	84	67	
		Brush Processing Mill	124.05	124.05	119	70
Sangzhi	Renchaoxi	Bamboo Articles Processing Works	12	12	40	20
		Feed Processing Plant	80	80	120	65
		Tea Processing Plant	58.5	58.5	64	35
		Transport Team	17.5	17.5	30	10
		Handicraft Articles Processing Works	12	12	40	20
	Changtanping	Sulphur Mine Works	65	65	100	40
	Linxihe	Timber Processing Mill	90	90	150	70
Hefeng	Jiangkou	Navigation Corps	100	100	80	40
		Loading & Unloading Service	100	100	70	25
	Ticlu	Transport Team	100	100	50	25
		Tea Processing Plant	100	100	100	45
		Bafeng Chemical Factory	110	110	110	50
Total			2924.34	2924.34	2938	

Table 6 1 COMPARISON OF RESETTLEMENT COMPENSATION AND PLANNING COST ESTIMATES
(Based on 1992 price standards)

	COMPENSATION COST (million yuan)				PLANNING COST (million yuan)				COST DIFFERENCE
	CILI	SANGZHI	HEFENG	TOTAL	CILI	SANGZHI	HEFENG	TOTAL	
1. RURAL RESETTLEMENT									
1) Production Arrangement	49.59	22.71	13.06	85.36	41.26	27.38	14.35	83.00	(2.36)
2) Rural residential reconstruction	30.77	12.44	8.11	51.31	34.13	15.65	9.64	59.43	8.11
3) Other items	0.04	0.11	0.05	0.21	0.14	0.12	0.00	0.26	0.05
4) Indirect Costs (excluding administration)	5.63	2.47	1.49	9.58	4.91	2.81	1.58	9.27	(0.31)
Total of Rural Resettlement	86.03	37.72	22.71	146.46	80.45	45.96	25.55	151.95	5.49
2. RELOCATION OF TOWNS	2.78	7.99	4.23	15.01	3.22	8.86	4.90	16.97	1.97
3. INFRASTRUCTURE	8.72	7.70	4.22	20.64	12.70	10.35	9.21	32.26	11.62
SUB TOTAL FOR ITEMS 1 to 3	97.54	53.42	31.16	182.11	96.37	65.17	39.65	201.19	19 08
4. MANAGEMENT AND SUPERVISION									
1) Administration	2.41	1.06	0.64	4.11	1.58	1.73	1.14	4.44	0.34
2) Monitoring	0.50	0.27	0.16	0.93	0.85	0.85	0.42	2.12	1.18
Total of management and Supervision	2.91	1.33	0.80	5.04	2.42	2.57	1.56	6.56	1.52
TOTAL RESERVOIR COSTS	100.45	54.75	31.96	187 15	98.79	67.75	41.21	207.75	20.60
Total cost per person (yuan)	13,001	7,913	12,234	10,845	12,787	9,791	15,777	12,039	1,194
CONSTRUCTION ZONE RESETTLEMENT	15.54	0.00	0.00	15.54	15.54	0 00	0.00	15.54	0.00
TOTAL COST OF RESETTLEMENT	115 99	54.75	31.96	202.69	114.34	67 75	41.21	223.29	20 60
Total cost / affected person (yuan)				11,326				12,476	1,151
Total cost / affected person ($) (US$ 1.0 = Y8.65)				$1,309				$1,442	$133

Tab. 6.3 Compensation and Allowance for Land Requisition (1992 prices)

Lands	Cili						Sangzhi					
	Output value ¥/mu	Calculated multiples	Used multiples	Price ¥/mu	Area (mu)	Costs ¥10⁴	Output value (mu)	Calculated multiples	Used multiples	Price mu	Area (mu)	Costs ¥10⁴
Paddy field	562	7.25	7.4	4158.8	4578.84	1904.25	535	8.5	12	6420	2895.4	1858.84
Upland	430	7.25	7.4	3182	3189.71	1014.97	360	8.5	12	4332	981.2	423.88
Flood land	266	7.25	7.4	1968.4	1243.28	244.73	266	8.5	12	3192	114	36.39
Orchard	562	7.25	7.4	4158.8	1011.54	420.68	535	8.5	12	6420	345.1	221.55
Timber forest	276	7	7	1932	2176.94	420.58	276	7	7	1932	1819.5	351.53
Cash trees	562	7	7	3934	1123.82	442.11	535	7	7	3745	162.9	61.01
House base	562	4	4	2248	412.41	92.71	535	4	4	2140	262.5	56.18
Barren hill												
Sum						4540.03						3009.38
	Hefeng*						Dam—site					
Paddy field	535	6.18	10.5	5617.5	1781	1000.48	681.5	9.98	12	8214	173.39	142.42
Upland	360	6.18	10.5	3780	598	226.04	581.5	9.98	12	7014	110.81	77.72
Flood land		6.18										
Orchard	620	6.18	10.5	6510	173	112.62	684.5	9.98	12	8214	397.67	326.65
Timber forest	276	7	7	1932	3	0.58	312.3	7	7	2396.1	349.36	83.7
Cash trees	535	7	7	3745	181.66	68.03	681.5	7	7	4791.5	16.06	7.7
House base	535	4	4	2140	108	23.11	684.5	4	4	2738	44.35	12.11
Barren hill	160	4	4	640	626	40.06	136.9	4	4	547.6	688.85	37.72
Sum						1470.92						688.05

* The calculated multiples for land compensation are on the low side because the farmland area includes orchard in Hefeng.

Table 8.2 **BENCHMARKS FOR 1st STAGE RESERVOIR RESETTLEMENT**

July 31, 1994	- revised resettlement plan submitted to World Bank (plans, schedules and cost)
August 20,1994	- **Yuan 20 million** disbursed by LHPC to Hunan PRO - agreement on plans and costs (LHPC, PRO, CROs) - detailed designs for 8 village sites and key infrastructure (roads, water supply, electricity)
August 31, 1994	- land agreements and disbursement of at least 15% of land compensation funds to host near Cili - commencement of construction on 4 key roads for new village sites - round of public consultation complete (< 160m) - 1000 household agreements (< 160m) on private assets and compensation entitlements (1994 rates)
September 15, 1994	- Yuan 20 million disbursed by LHPC to Hunan PRO
October 15, 1994	- 4 key roads and land levelling completed - completion of 8 domestic water supply schemes - **Yuan 20 million** disbursed by LHPC to Hunan PRO - commencement of house construction (1000) - investment in 4 enterprises for damsite area - detailed land development and irrigation plans on new lands for population below 160m - **final decision to procede with cofferdam**
November 15, 1994	- **Yuan 20 million** disbursed by LHPC to Hunan PRO
December 31, 1994	- 50% of house construction completed - **Yuan 10 million** disbursed by LHPC to Hunan PRO (**100%** of funds for resettlement < 160m disbursed)
April 15, 1994	- 100% of house construction completed (1000) - people < 160m moved into new villages - commencement of land development schemes - commencement of investment in 4 enterprises

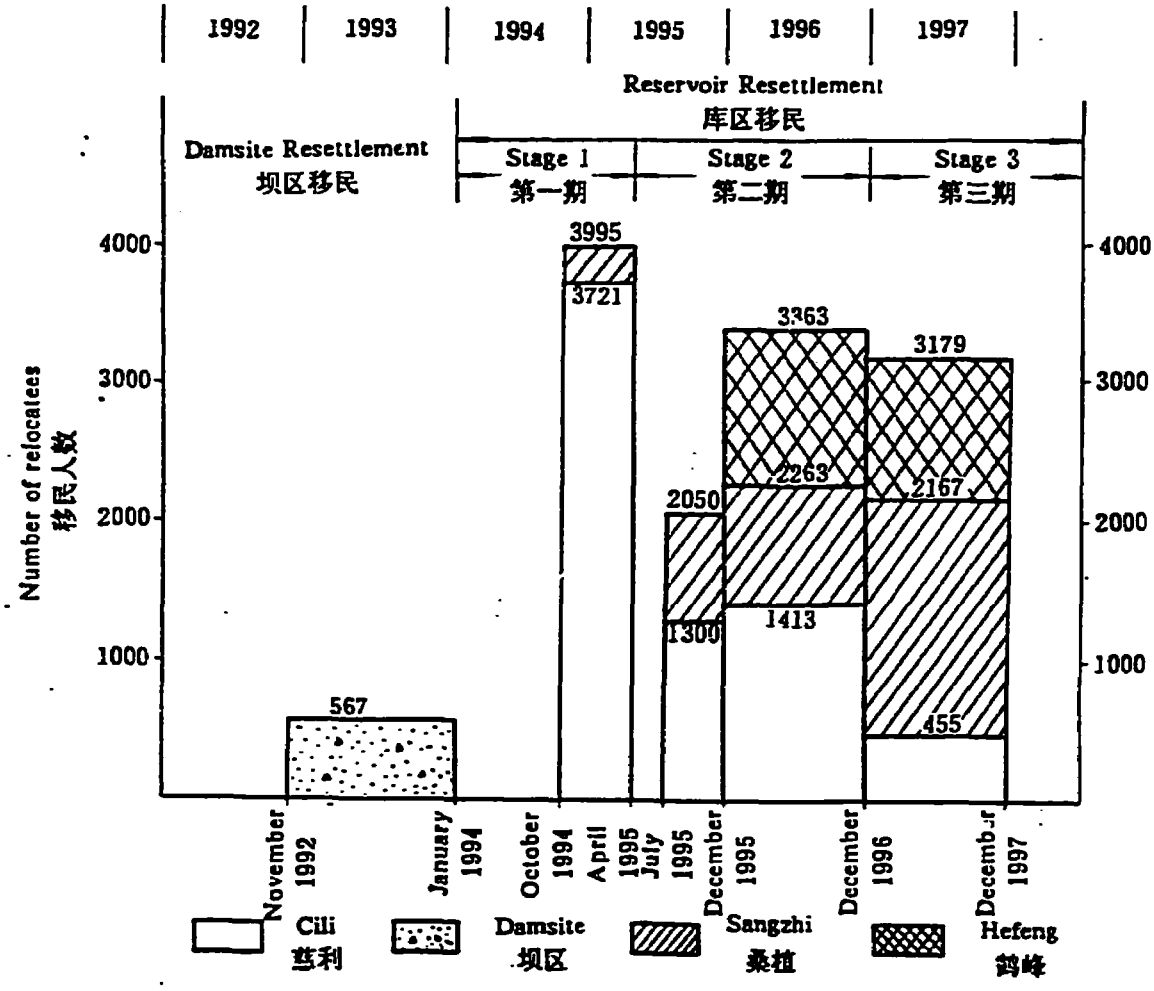
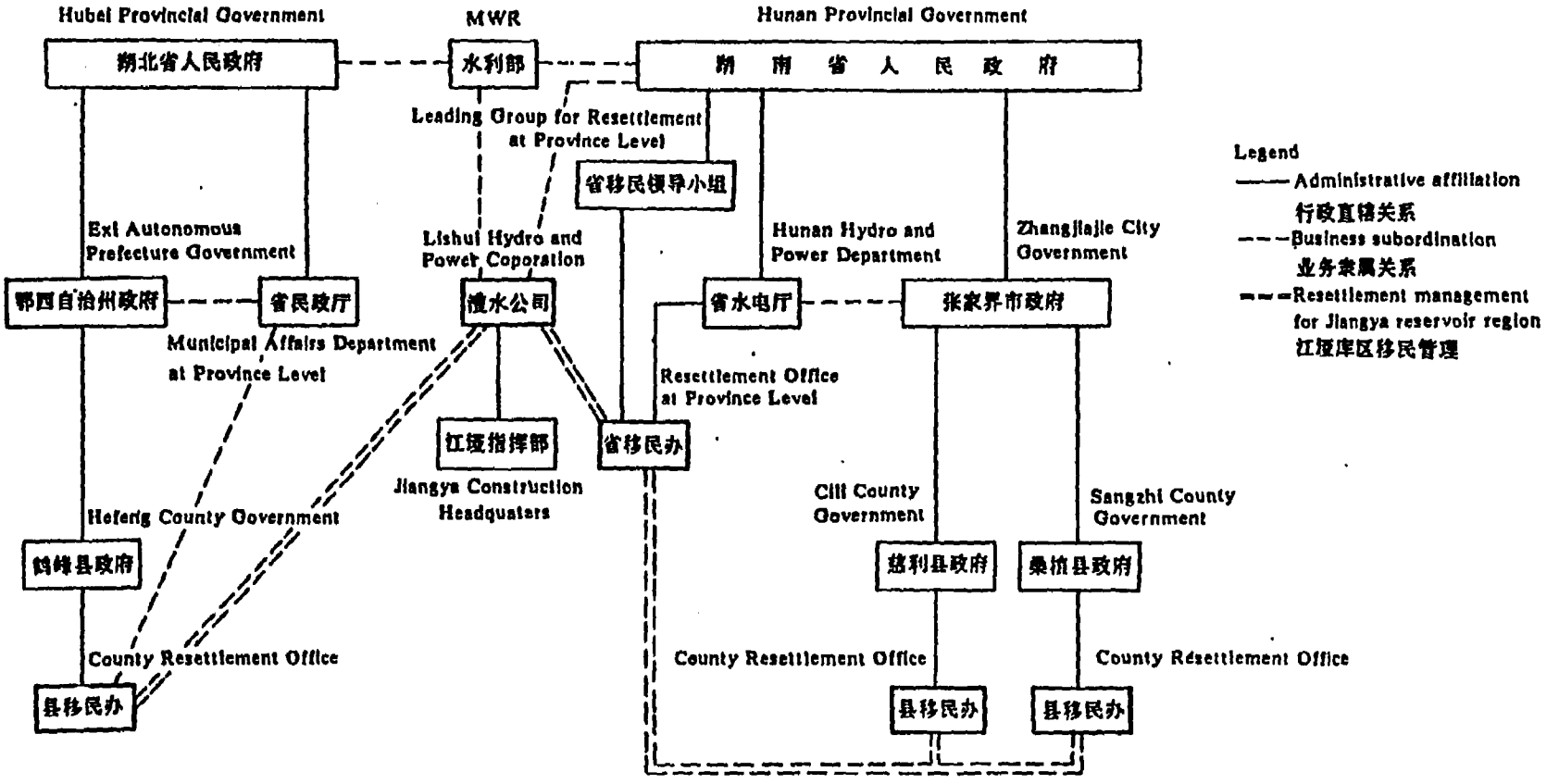


图 5.1 移民搬迁计划

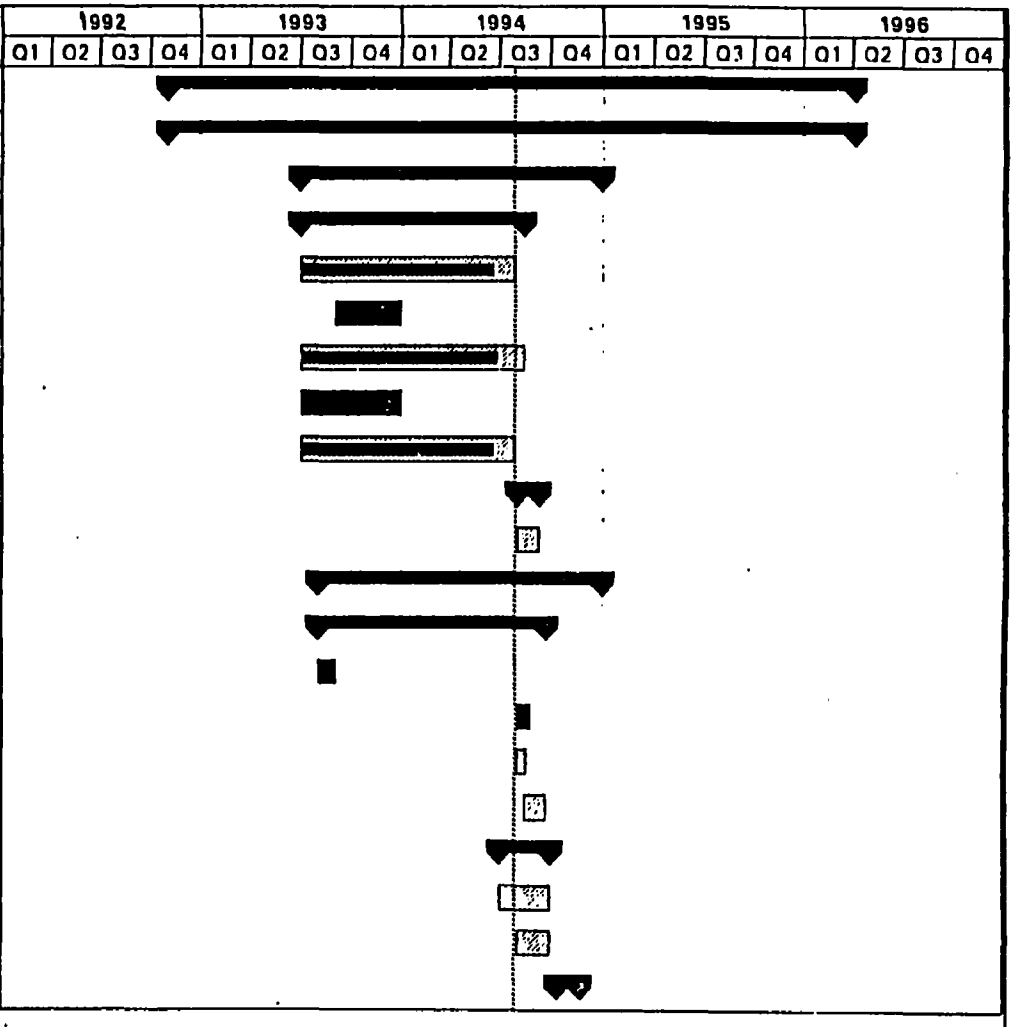
Figure 5.1 Resettlement Schedule

Figure 7-1 Organization Chart for Resettlement Management of Jiangya Reservoir

江垭水库移民管理机构框图



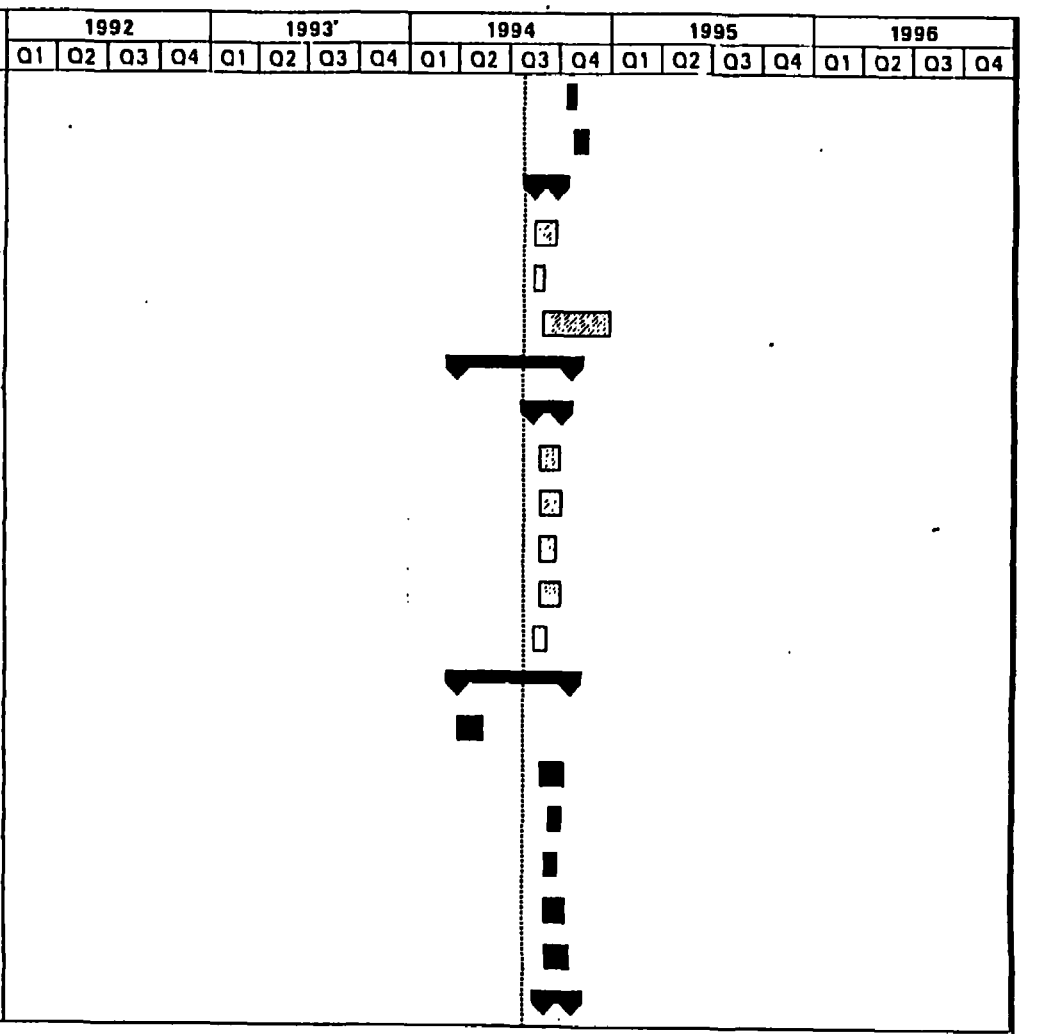
ID	Name
105	RESETTLEMENT BELOW EL 160m
106	Cili County Resettlement
107	Planning and Design
108	Planning
109	Agriculture Schemes
110	Enterprise Schemes
111	Village Sites
112	Xiang Town Planning
113	Infrastructure
114	Public Consultation on Plans
115	Longtanwan Xiang
116	Detailed Survey & Design
117	Infrastructure
118	Roads
119	Electricity Supply
120	Communication Lines
121	Domestic Water Supply
122	Agriculture Schemes
123	Land Development
124	Irrigation Facilities
125	Enterprise Schemes



APPENDIX B - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

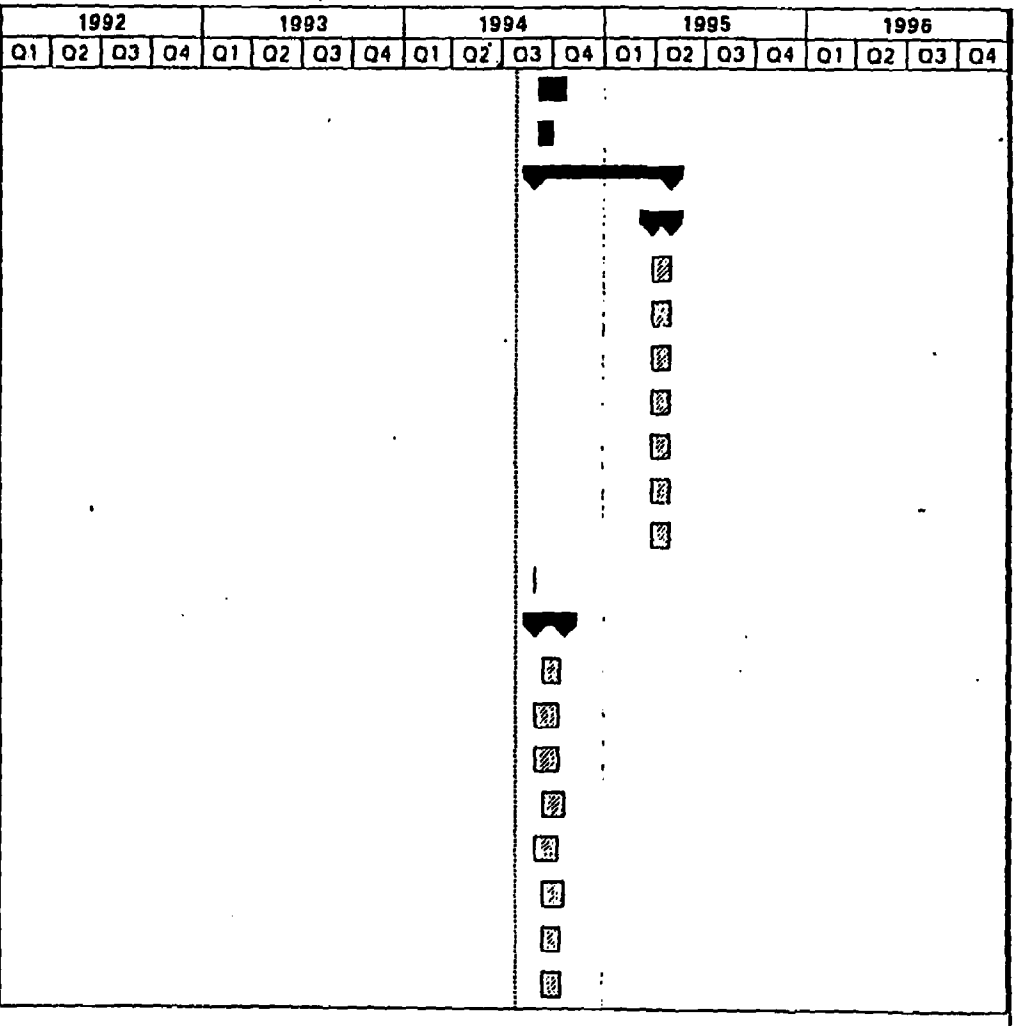
ID	Name
126	Building Materials
127	Cili Flaxen Fabrics Mill
128	Village Layouts
129	Concentrated Housing
130	Scattered Housing
131	Longtanwan Town Design
132	Infrastructure Construction
133	Roads
134	Zhoujiapo - Huangyaquan (4.7 km) - tractor road
135	Tankou - Wangjiapo (2.05 km) - tractor road
136	Damsite - Dengjiapo (2.8 km) - tractor road
137	Cili Road - Shuangang (2.2 km) - 4th grade
138	Land Compensation for Roads
139	Power Transmission Lines
140	35kV Jiangya - Zhoujiapo (20.0 km) - towers
141	35kV Jiangya - Zhoujiapo (20.0 km) - lines
142	35 kV Transformer Station at Zhoujiapo
143	10kV Zhoujiapo - Zhoujiaya (1.0 km) - new
144	10kV Zhoujiapo - Tankou (6.8 km) - new
145	10kV Tankou - Mingtan (2.0 km) - new
146	Telecommunications (Township - Village)



APPENDIX B - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

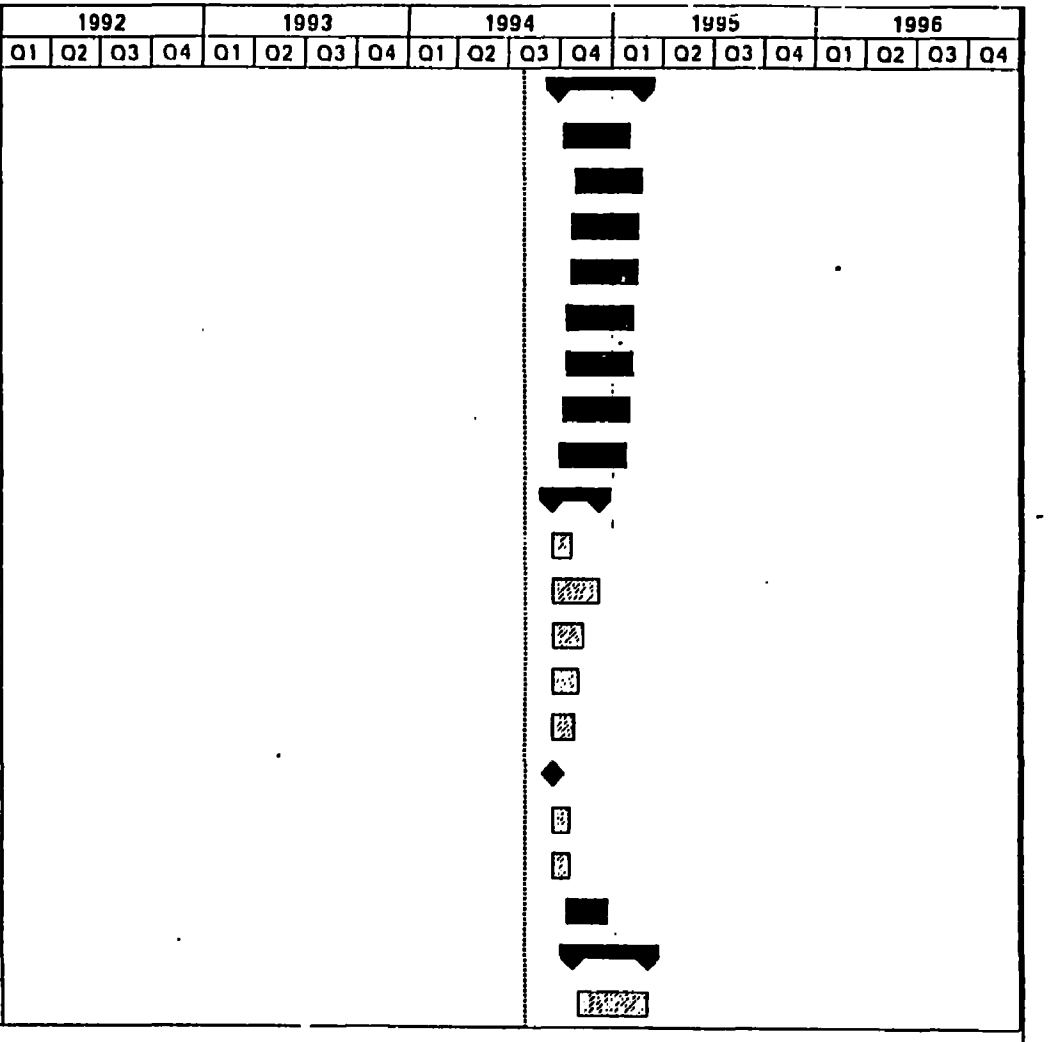
ID	Name
147	New lines (15.0 km)
148	Rebuilt lines (5.0 km)
149	Village Construction (reservoir)
150	People movement - 1922 people
151	Hexin to Zhoujiaya (113)
152	Hexin to Zhoujiapo (425)
153	Bijia to Tianya (242)
154	Mingtan to Baiyantou (455)
155	Tankou to Yinjiawuchang (359)
156	Taojiayu to Gaozhita (54)
157	Liuzhiping to Dengjiapo (274)
158	Land aquisition - none required
159	Land levelling
160	Zhoujiaya (12 mu)
161	Zhoujiapo (58 mu)
162	Tianya (32 mu)
163	Baiyantou (50 mu)
164	Yinjiawuchang (40 mu)
165	Gaozita (6 mu)
166	Dengjiapo (16 mu)
167	Laowuchang (12 mu)



APPENDIX 8 - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Progress | Summary
Noncritical | Milestone | Rolled Up

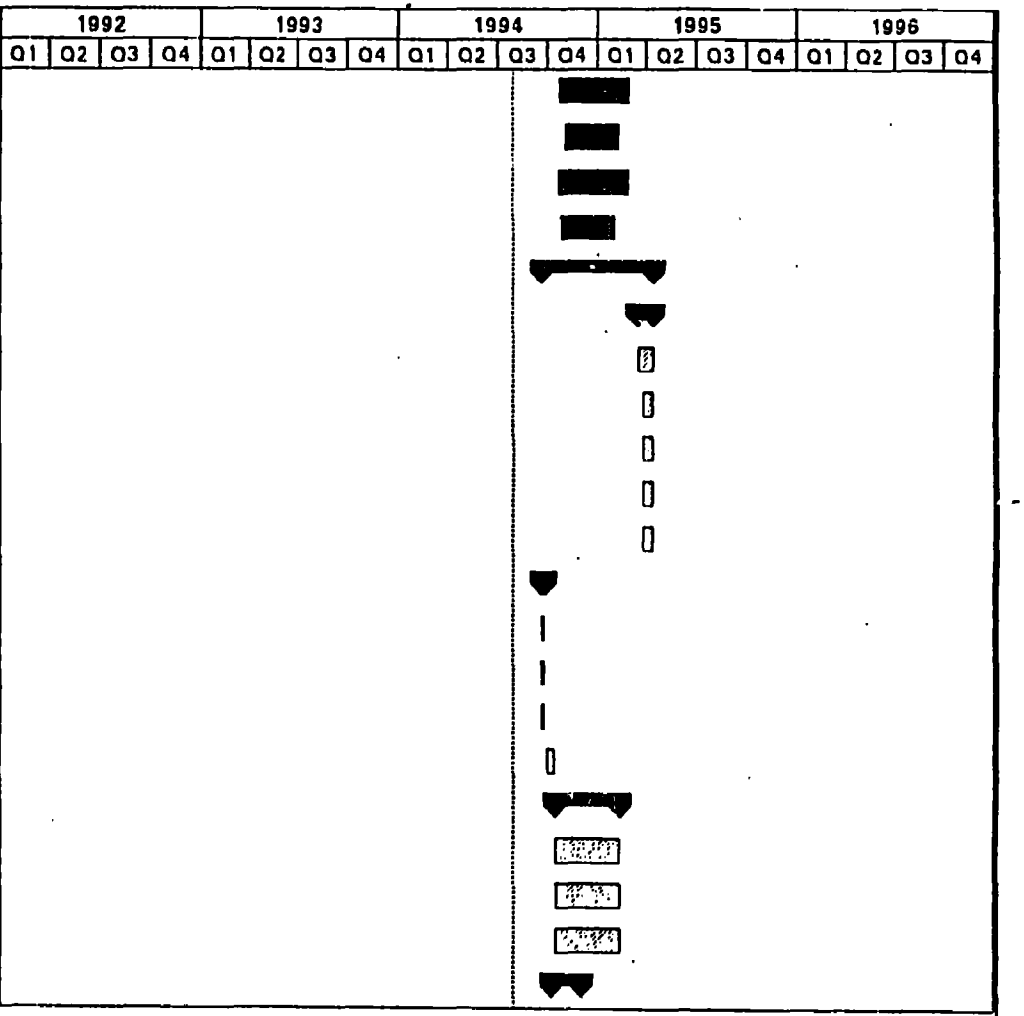
ID	Name
168	House Construction
169	Zhoujiaya (30 HH)
170	Zhoujiapo (110 HH)
171	Tianya (80 HH)
172	Baiyantou (115 HH)
173	Yinjiawuchang (90 HH)
174	Gaozita (15 HH)
175	Dengjiapo (40 HH)
176	Laowuchang (30 HH)
177	Domestic Water Supply
178	Zhoujiaya (131p) - 270m (reservoir)
179	Zhoujiapo (1185p) - 260m (reservoir)
180	Tianya (423p) - 260m (reservoir)
181	Baiyantou (714p) - 320m (reservoir)
182	Yinjiawuchang (510p) - 300m (reservoir)
183	Gaozita (160p) - 290m (spring)
184	Dengjiapo (302p) - 340m (reservoir)
185	Laowuchang (133p) - 260m (reservoir)
186	Electricity & Communication Lines
187	Schools & Public Buildings
188	Zhoujiapo (1185p)



APPENDIX B - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

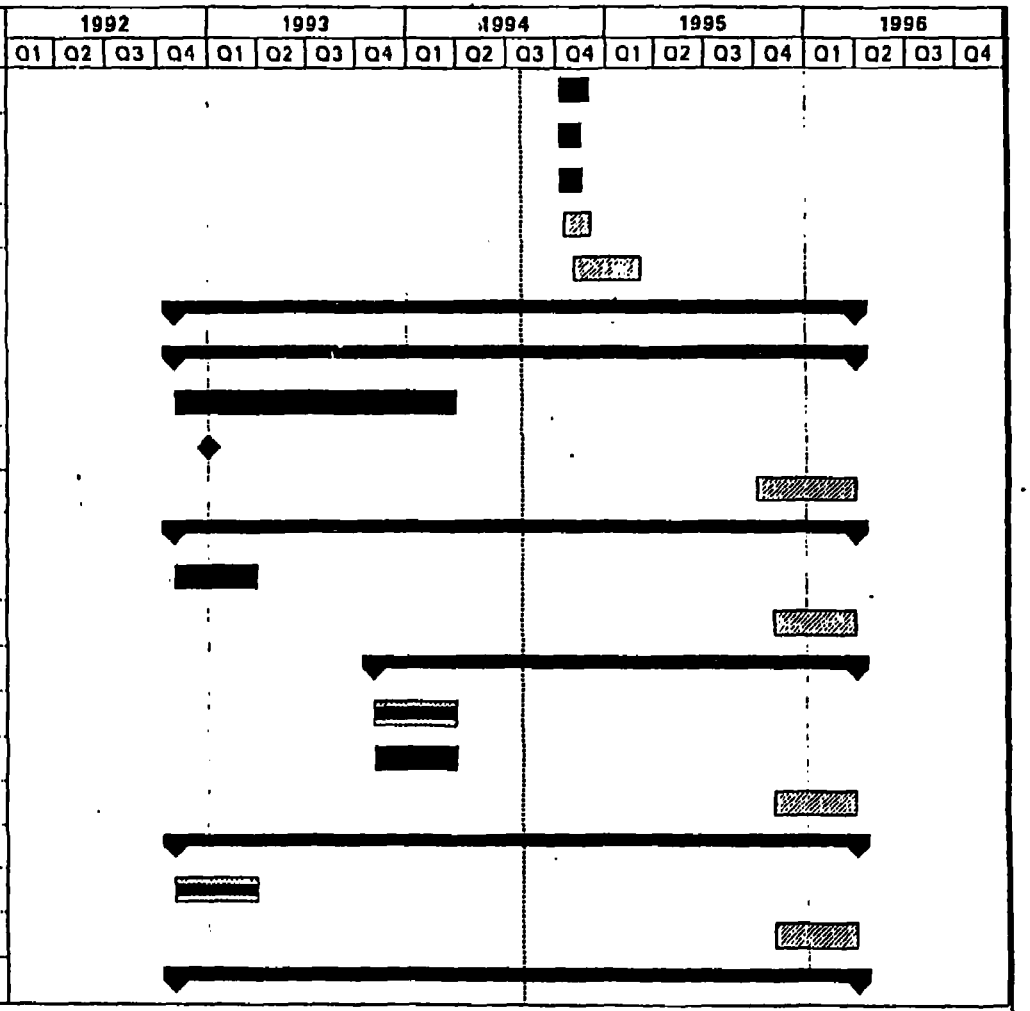
ID	Name
189	Tianya (423p)
190	Baiyantou (714p)
191	Yinjiawuchang (510p)
192	Dengjiapo (302p)
194	Village Construction (near Cili)
195	People movement - 1678 people
196	Zhongqiao to Sunjiawan (612)
197	Huangyaquan to Sunjiawan (269)
198	Hexin to Sunjiawan (239)
199	Lengshuixi to Tianwan (323)
200	Yijiaping to Laomiao (235)
201	Land aquisition
202	Longtanwan - Sunjiawan (170+1080 mu)
203	Longtanwan - Tianwan (51 + 320 mu)
204	Longtanwan - Laomiao (78 + 500 mu)
205	Land Levelling (minor)
206	House Construction
207	Sunjiawan (285 HH)
208	Tianwan (80 HH)
209	Laomiao (60 HH)
210	Domestic Water Supply



APPENDIX 8 - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

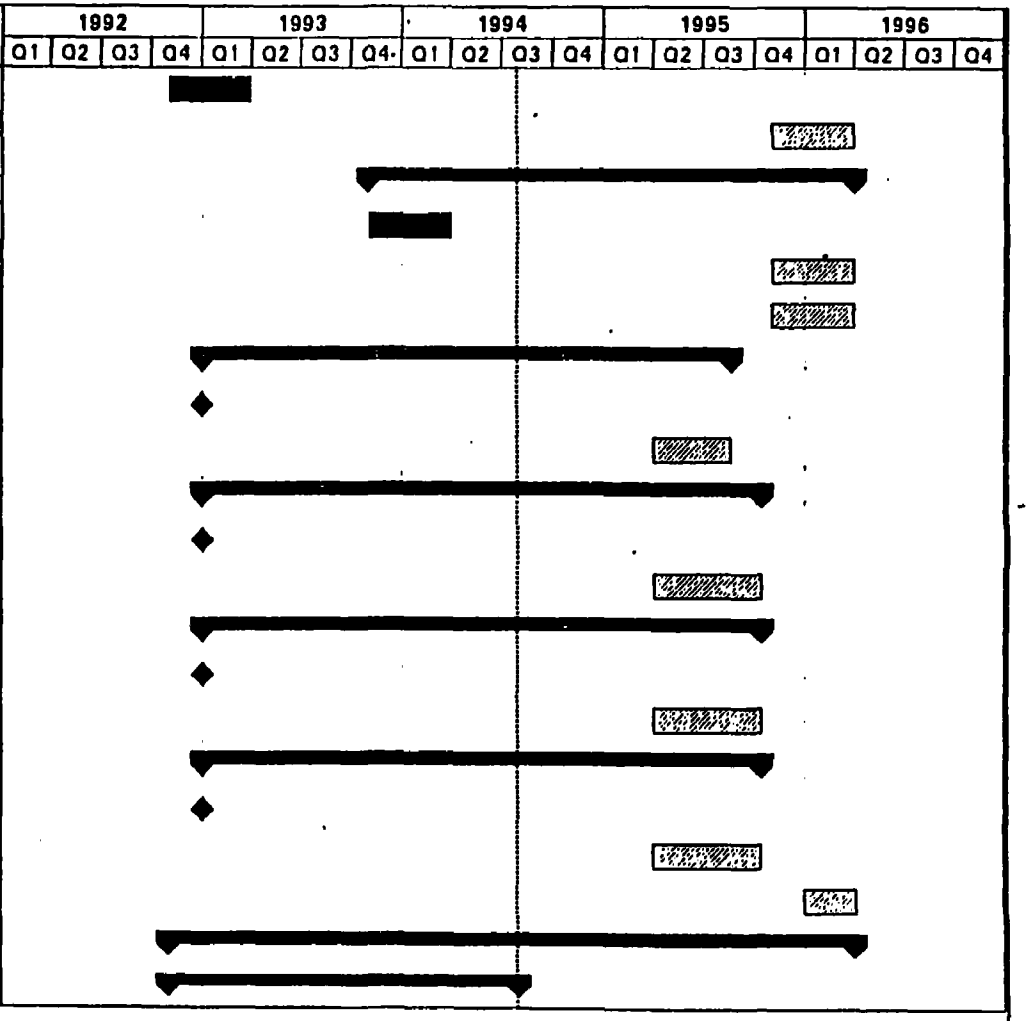
ID	Name
211	Sunjiawan (1649p) (spring + pump)
212	Tianwan (496p) (spring + pump)
213	Laomiao (760p) (spring + pump)
214	Electricity & Communication Lines
215	Schools & Public Buildings
216	Production Arrangements
217	Hexin (1372.7 mu)
218	Eucommia (796.5 mu existing) - Sifangtai
219	Orange Orchard (310.7 mu existing) - Shuangan
220	Cape Jasmine (265.5 mu new) - Bijia
221	Bijia (442 mu) - Sifangtai
222	Eucommia (331.5 mu existing)
223	Cape Jasmine (110.5 mu new)
224	Mingtan (818 mu)
225	Eucommia (104.5 mu existing) - Mingtan
226	Cork trees (100 mu existing) - Mingtan
227	Tea (613.5 mu new) - Sanchaxi
228	Taojiayu (512 mu)
229	Tea (113 mu existing) - Luizhiping
230	Eucommia (399 mu new) - Taijiayu
231	Liuzhiping (418 mu) - Fengya



APPENDIX B - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

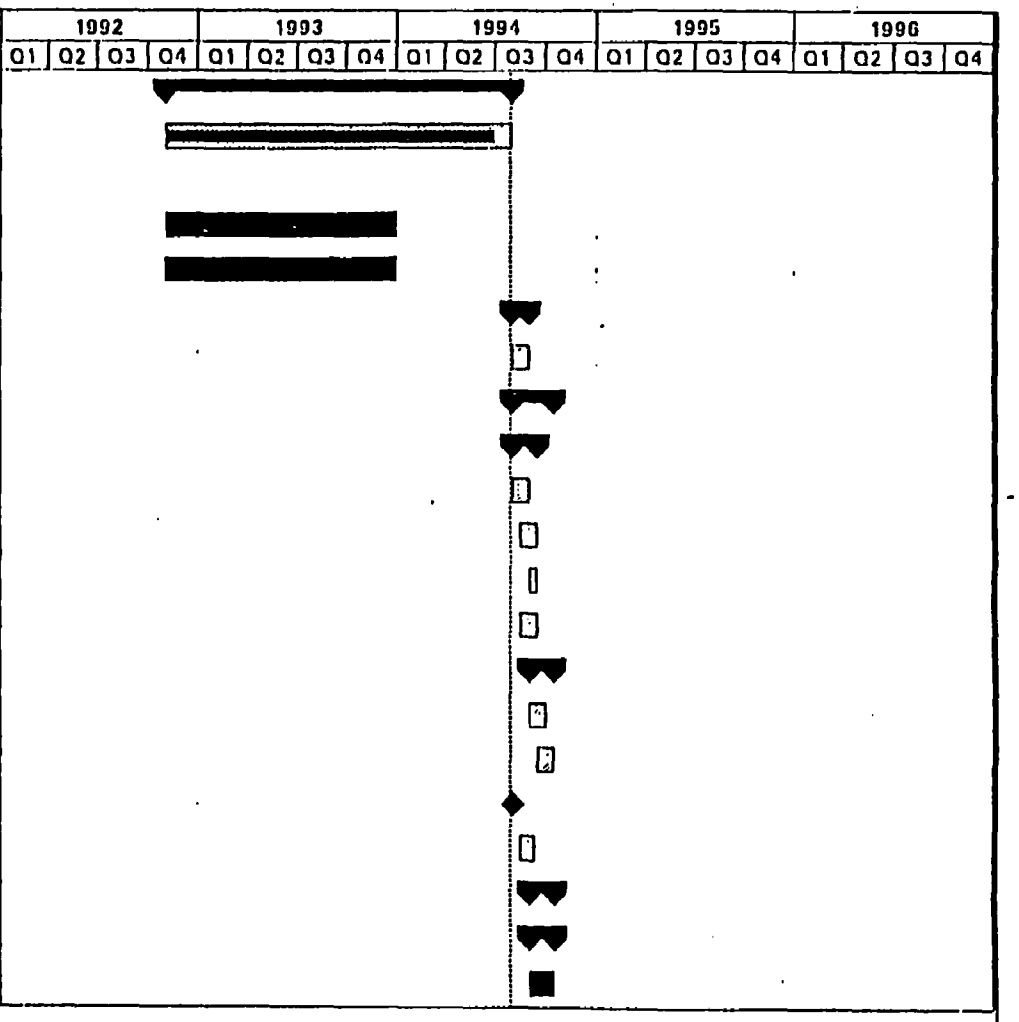
ID	Name
232	Tea (200 mu existing)
233	Tea (218 mu new)
234	Tankou (766 mu) - Tankou
235	Eucommia (100 mu existing)
236	Eucommia (91.5 mu new)
237	Cape Jasmine (574.5 mu new)
238	Zhongqiao (403 mu)
239	Orange (403 mu existing) - Shuangan
240	Construction Team (155 jobs)
241	Huangyaquan (176.8 mu)
242	Orange (176.8 mu existing) - Shuangan
243	Construction Team (68 jobs)
244	Yijiaping (157.3 mu)
245	Orange (157.3 mu existing) - Tongtai
246	Construction Team (58 jobs)
247	Nengshuixi (211.9 mu)
248	Orange (211.9 mu existing) - Shuangan
249	Construction Team (82 jobs)
250	Irrigation Facilities (new orange & tea)
252	Sangzhi County Resettlement
253	Planning and Design



APPENDIX 8 - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

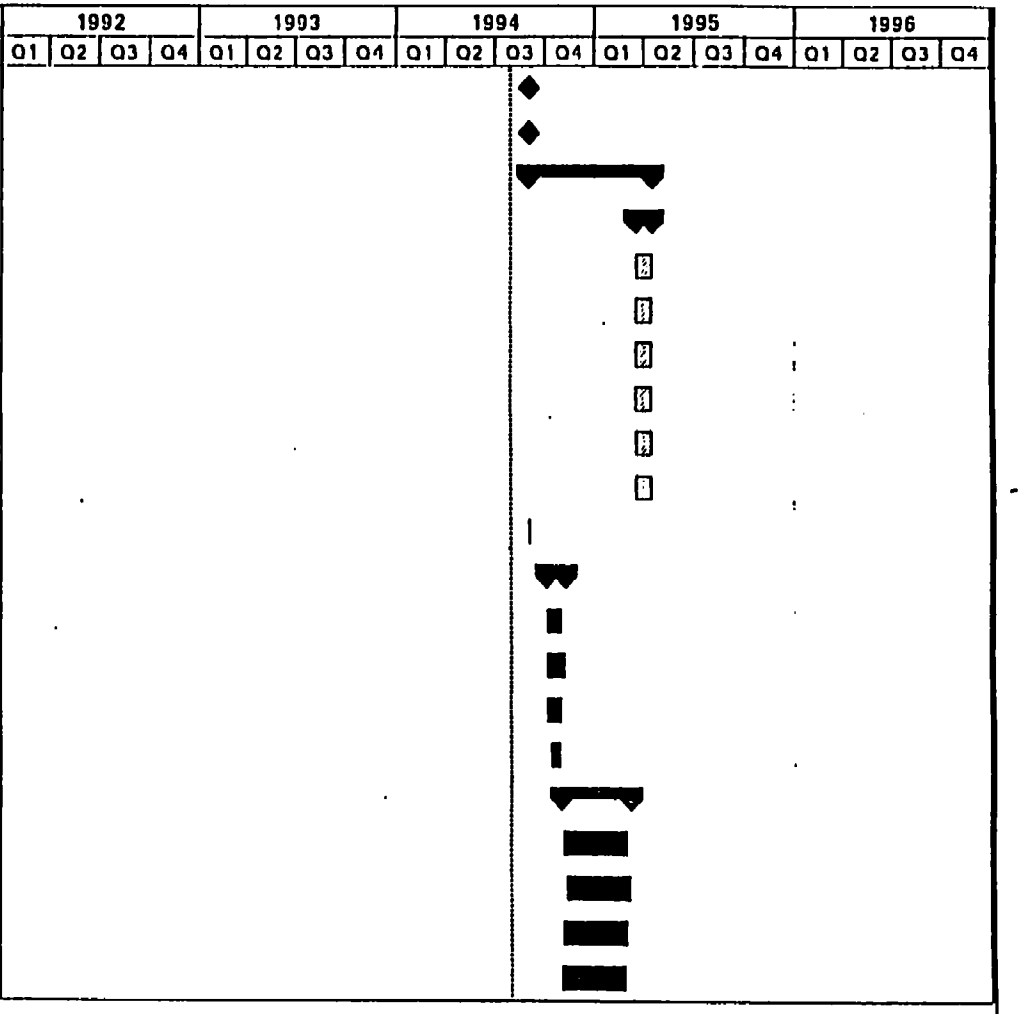
ID	Name
254	Planning
255	Agriculture Schemes
256	Enterprise Schemes - none required
257	Village Sites
258	Infrastructure
259	Public Consultation on Plans
260	Renchaoxi Xiang
261	Detailed Survey & Design
262	Infrastructure
263	Roads
264	Electricity Supply
265	Communication Lines
266	Domestic Water Supply
267	Agriculture Schemes
268	Land Development
269	Irrigation Facilities
270	Enterprise Schemes - none in stage 1
271	Village Layouts
272	Infrastructure Construction
273	Roads
274	New Renchaoxi - Liuyangxi (7.0 km) - tractor road



APPENDIX B - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

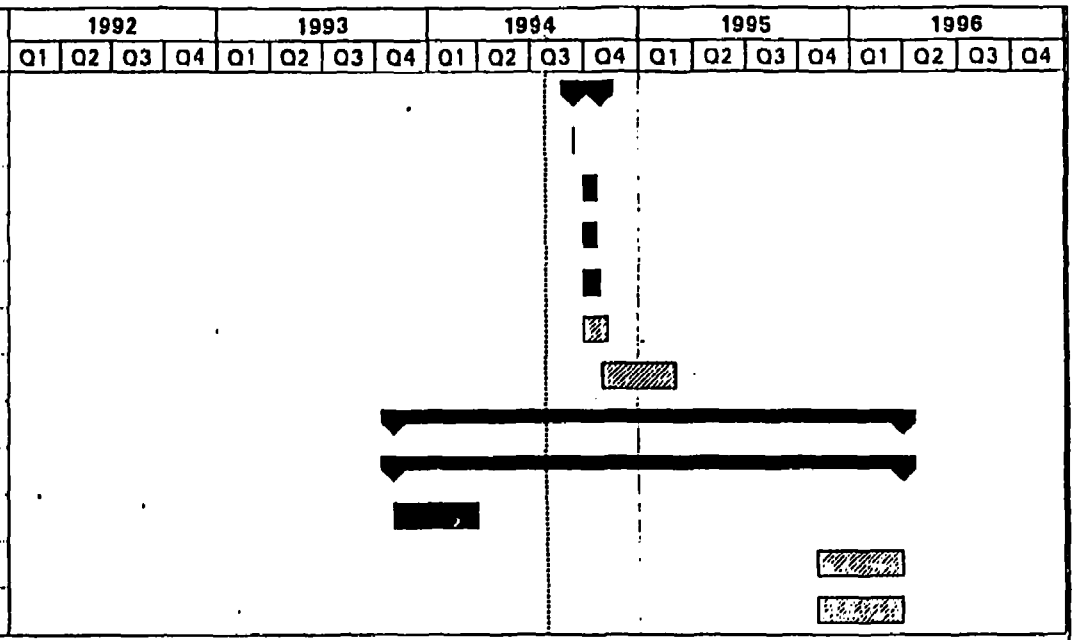
ID	Name
275	Power Transmission Lines - none in stage 1
276	Telecommunications (Township - Village) - none
277	Village Construction
278	People movement - 273 people
279	Dahe to Zhoujiaya (65)
280	Quanzhixi to Zhoujiaya (36)
281	Gaojiaping to Zhoujiaya (29)
282	Wujiaping to Maozongjie (62)
283	Laowuping to Shaojiawan (47)
284	Lijiawan to Tianerba (34)
285	Land aquisition - none required
286	Land levelling
287	Zhoujiaya (13.0 mu)
288	Maozongjie (6.0 mu)
289	Shaojiawan (5.0 mu)
290	Tianerba (3.5 mu)
291	House Construction
292	Zhoujiaya (30 HH)
293	Maozongjie (13 HH)
294	Shaojiawan (11 HH)
295	Tianerba (8 HH)



APPENDIX 8 - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical | Noncritical | Progress | Milestone | Summary | Rolled Up

ID	Name
296	Domestic Water Supply
297	Zhoujiaya (96 p) - 360m (spring)
298	Maozongjie (75 p) - 370m (reservoir)
299	Shaojiawan (75 p) - 320m (reservoir)
300	Tianerba (?? p) - m (reservoir)
301	Electricity & Communication Lines
302	Schools & Public Buildings
303	Production Arrangements
304	Liuyangxi (704 mu) - Liuyangxi
305	Eucommia (120 mu existing)
306	Eucommia (256 mu new)
307	Orange (328 mu new)



APPENDIX B - JIANGYA RESETTLEMENT
Detailed Implementation Schedule for 1st Stage

Critical
Noncritical
Progress
Milestone
Summary
Rolled Up

图3—3(FIGURE3—3)

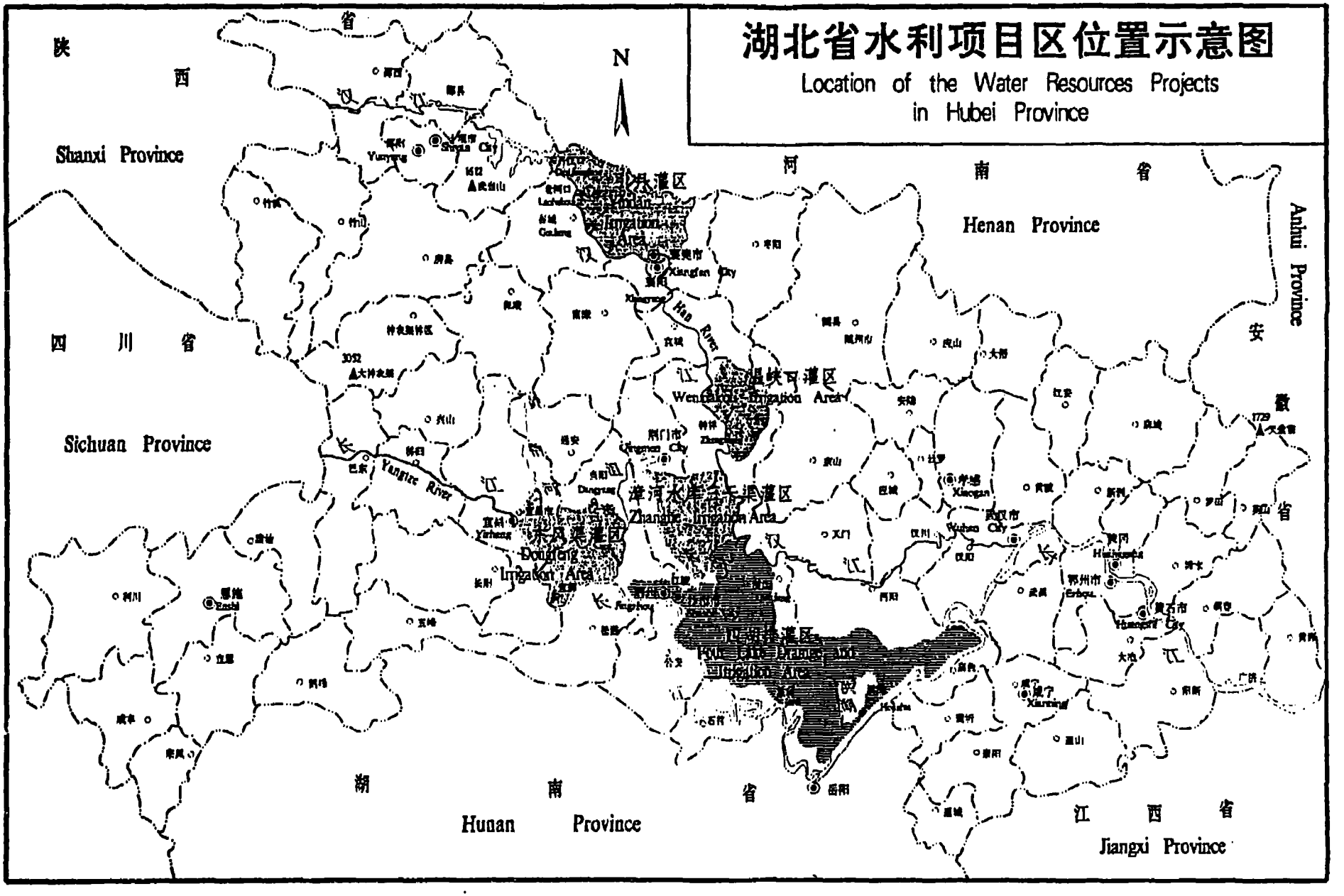


图3—2(FIGURE3—2)

湖南子项目区地理位置图

Location of Sub-Projects in Hunan Project Area