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Mountain-River-Lake Integrated Water Resources Development Program, Jiangxi, People's Republic of China

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Introduction and Background

During the 1960s and 1970s, Jiangxi Province, in eastern People's Republic of China (PRC), suffered from severe environmental degradation. By 1980, water and soil erosion was serious, as were frequent droughts and floods, accelerating deterioration of soil quality and desertification, loss of biological resources, widespread pollution, and an increasing incidence of schistosomiasis (120,000 persons infected in the lake area every year), and substantial poverty (14% of the population below the poverty line in 1985).

In the early 1980s, the Jiangxi provincial government, with the help of the Central Government, initiated an integrated eco-restoration and poverty reduction program. This program was based on the understanding that "the Mountain is the source—the River is the flow—the Lake is the reservoir" (MRL)—i.e., that the three comprise an integrated biological system. Water and soil erosion in the mountains was explicitly linked to poverty, so poverty reduction was a focus of the program, which is an example of an integrated water resources management (IWRM) approach. The program has won worldwide acclaim for its achievements. This case study paper highlights the key elements of the program, the main achievements, and the lessons learned.

Jiangxi Province is situated on the south bank of the mid-low reaches of the Yangze River in eastern PRC. The total area is 166,900 km^2 of which 36% is mountainous land, 42% hilly land, while plain land and water bodies make up the remaining 22%. Of the land area, about half is arable land and half forest. Jiangxi Province has a population of 41.4 million and includes 11 cities and 99 counties.

The main water body in the province is Poyang Lake, which receives its water from the watersheds of Fu River, Gan River, Rao River, Xin River, and Xiu River.

Source: www.chinaonline.com/refer/maps/secure/col_jiangxi.gif.

These watersheds cover about 162,225 km^2, occupying 97.2% of the total land area of Jiangxi Province.

In the early 1980s, authorities of Jiangxi Province identified the following main regional development problems.

- ***Serious water problems and soil erosion***

  Forest coverage was only 31.5% in the early 1980s against 60% historically. Rivers and lakes were silted up and the water bodies shrunk due to serious water and soil erosion.

- ***Frequent droughts and flooding disasters***

  Some parts of the province experienced almost yearly flooding and other parts regular droughts.

- ***Acceleration of soil deterioration***

  Organic substance declined and desertification started.

- ***Decline of biological resources***

  The previously widely available and diverse forest and natural water resources declined noticeably.

- ***Serious pollution***

  The province experienced serious industrial pollution as well as wastes from urban areas.

- ***Increase of endemic diseases***

  Every year around 120,000 persons are infected by snail fever in the lake area.

- ***Increasing poverty***

  In 1985 about 6.2 million people lived below the poverty line.

In 1983, the Jiangxi provincial government decided to conduct three integrated scientific surveys in the Poyang Lake region and the watersheds of the five rivers. The purpose was to identify the problems in the area and their interrelationships on the basis of which it would formulate relevant development strategies for the region. The following scientific surveys were conducted.

1983–1987	Integrated Scientific Survey in the Poyang Lake Region Survey Area: 40,000 km^2 in 25 counties
1984–1986	Agricultural Nature Resources Survey in South Jiangxi Mountain Areas Survey Area: 39,083 km^2 in 18 counties
1985-1987	Integrated Scientific Survey of Nature Resources in the Watershed of Gan River Survey Area: 117,000 km^2 in 64 counties

Through the surveys, historical trends, and the present situation, issues in the region were identified, including natural resources and their use. The analysis showed that the main issues in the Jiangxi Province were that watersheds are not independent, but interrelated and interdependent. This understanding is reflected in the MRL concept underpinning the program that "Harnessing the lake must harness the rivers, harnessing the rivers must harness the mountains." The mountains, rivers, and the lake are all part of a complex and complete biological system.

Another concept that underpins the MRL Program is that balancing the needs of the economy and the environment of the region requires coordination, planning, systematical development, and integrated management.

Setting Up the Mountain-River-Lake Program

In 1985, the Jiangxi provincial government, with the support of Central Government and international agencies, established the MRL Development Committee to lead the integrated development of the region. The MRL Development Office was established as the executive body with branches at the prefecture and county level. Project planning was based on catchments rather than administrative boundaries.

In 1991, after completion of the necessary surveys, the provincial People's Congress approved the "Profile of Comprehensive Plan of MRL." The Congress emphasized that the program was a long-term development project in the province that required all related parties to be involved in the implementation. The provincial governor took the leadership of the MRL Development Committee. However, since the approval of the program, the Congress has not monitored its implementation. Nevertheless, the legislation support and political commitment behind the MRL Program are considered essential for its success.

The MRL Program development can be divided into three stages.

- From the early 1980s to the end of the 1990s, **scientific survey and issues** were identified. At this stage the comprehensive plan for development was formulated through interdisciplinary and multidisciplinary scientific surveys. The research identified the principal issues in the area.
- From the beginning of the 1990s to mid-1990s, **pilot case studies** were undertaken to explore development models in different geographical areas, and disseminate the success stories to a wider area through governmental encouragement and incentives.
- From 1996 to the present, new participatory mechanisms and "bottom-up" methods are being introduced for the catchment development, with the help of a General Technical Cooperation (GTZ)-funded project.

Institutional development is the key factor in the MRL. Through various development stages, transitional functions of the institutional development can be seen. In 1981, the Poyang Lake Scientific Investigation Leading Group and its office were set up to conduct technical coordination for interdisciplinary and multidisciplinary survey and researches. The office, headed by a chief engineer, involved many institutes and organizations from central, provincial, and local levels.

In 1985, the Gan River and Poyang Lake Development Leading Group (the predecessor of the MRL Development Committee) and its office were set up, together with the academic committee. During the investigation, it was found that dealing only with Poyang Lake was not enough and that the area to be taken into account should extend to the middle and south of the province.

The Leading Group was responsible for organizing and coordinating development and management activities in the area. The committee members came from related government agencies, and included some prefecture leaders. At prefecture levels, subordinate bodies were set up. These agencies were guided by scientific and technological commissions at provincial and prefecture governments.

In 1991, the MRL Development Committee was formally set up, incorporating the original Leading Group, the Office and the Academic Committee. In 1995, the MRL Regional Development Center was set up as a subordinate organization of the MRL Development Committee to provide technical support. In 1999, the MRL Promotion Association was set up to promote public participation and disseminate the achievements to the public.

Initially, the provincial governor chaired the MRL Development Committee. Recently, after restructuring government organizations, the vice-governor took over. As a result, the coordination function of the committee became somewhat weak.

In 1997, the Office introduced a major change in the process by introducing participatory methods that consider local farmers as the focal point of rural development. They are assisted and encouraged to participate in the whole process of problem analysis, project planning, decision making, implementation, monitoring and evaluation, and follow-up management. This leads to the development of holistic land use planning as well as self-managed farmers' organizations in rural areas.

As a result of shifting to a participatory approach, the role of the Office changed from being the key actor to acting as a facilitator. In the new approach, the farmers make participatory land use plans themselves and the Office provides the necessary technical advice. The Office also provides access to technology, financial sources, and information. The Office has thus become an agency, which bridges the gap between farmers and various sources of technology and inputs. The MRL Promotion Association is responsible for promoting project development by providing technical services, building the experts, databases, etc.

Approach to Mountain-River-Lake Development

The following are the development goals of the MRL Program:

- to achieve integrated development of the MRL region through comprehensive planning and implementation;
- to gradually establish an economic complementary mechanism for resources renewal to protect and sustainably use natural resources, to develop the economy and human resources, and to improve the people's living condition in the MRL region;
- to establish a service network of high technology and training for the whole MRL region;
- to manage and control water and soil erosion, and environmental pollution in a holistic way; and
- to establish MRL ecological economic zones offering models to similar areas at home and abroad.

The MRL Program is based on the following seven basic strategies.

- To manage the lake, the river must be harnessed; to harness the river, the mountain must be managed; to manage the mountain, poverty must be reduced.
- Watershed development must be done systematically and water and land management must be done comprehensively, taking ecology and economy into account.
- Planning must be based on comprehensive scientific surveys on the resources, the environment, and society of the MRL region.
- Sustainable development of the MRL region requires research on macro-strategies.
- There must be an overall planning framework for the MRL regional development.
- Experiments and demonstrations are needed for development and management in selected typical zones of the MRL region.

- A technical training network is needed to promote human resource development.

One of the key elements of the MRL approach is the dissemination of successful experiments. Case studies were written about the following nine successful experiments.

- Integrated development of red soil hilly land
- Development of small watersheds in mountain areas
- Eco-forestry development in mountain areas
- Agro-forestry and comprehensive eco-economic development in paddy fields
- Fodder grass development in southern agriculture region
- Comprehensive development of large water surfaces in lake areas
- Eco-agriculture to control snail fever and reduce poverty in the Poyang Lake area
- Comprehensive development and management of sandy wasteland
- Planning and construction of an ecological city

The case studies and their demonstration and dissemination were the key success factor in the program. During the scientific investigation in 1988, it was realized that the pilot experiment is necessary to address the development and environmental issues, and that became the main work of the Office. The focus of the pilot experiments was on the environment, such as water and soil degradation in the catchment. Most pilot experiments involved multidisciplinary methods and combined development and harnessing of natural resources with participation of the local people.

Since 1983, 27 demonstration sites and 127 extension stations have been established with the help of the Ministry of Foreign Economic and Trading Cooperation (MOFETC), the Ministry of Science and Technology (MOST), and the State Planning Commission, etc. A total of 27 pilot experiments were developed, of which one third were successful. Experiments that failed did so mainly because the technology did not fit the local circumstances or because there was insufficient demand in the open market for the products.

However, successful experiments alone are not enough. The crucial question is how to scale up these success stories to cover the whole area of the MRL Program. Widespread training was considered to be the answer. Between 1990 and 1997, the MRL Program therefore developed a training center in Nanchang as well as three training centers in the southern, middle, and northern parts of the province. These centers provide training services to technologists and farmers. Initially this training was free of cost, but now participants have to pay part of the cost. Since then more than 1,400 training workshops have been conducted, 120,000 persons trained, and about 180 new technologies and methods introduced.

At the same time, MOST made arrangements with banks to develop a more than yuan (CNY)200 million ($25 million) loan project, with the interest subsidized. Counties or local companies that wanted to use technologies or models developed by the MRL Program could apply for a loan from the banks. These loans were issued against verifiable indicators.

After the loan projects were finished, they were assessed by the MRL Program in technology and financial operation. If a loan project were successful in these areas, the MRL Program would pay interest to the organization (7–8%). Loan projects that failed to successfully use new technology or that had a poor financial operation would not receive the subsidized interest.

In general, the banks were satisfied with the projects. Causes of failures were related to lack of capacity of the organizations concerned and other institutional issues. However, this technology dissemination process was rather top-down and implemented and promoted by government agencies. This process was another form of subsidy. Another key element of the MRL Program is that it provides access to small loans. Normally, the farmers in the poorer areas find it very difficult to get loans from banks. The banks consider giving loans to these poor farmers too risky, while the small amounts of the loan means the cost to handle them is very high. Helping poor farmers get access to capital for development through credit is crucial, so that they can grow out of poverty.

The MRL Program introduced the Grameen Bank model, which was successfully developed in Bangladesh. The Rural Bank is funded by the United Nations Development Programme (UNDP) and the bank applies the following selection criteria for households that apply for a loan.

- The total household property value is less than CNY20,000 ($2,500).
- The annual per capital income is less than CNY1,500 ($188).
- The farmers have working ability.
- Preference is given to women in granting loans (they are considered to be relatively stable and do not usually waste money on cigarettes and alcohol).

The implementation of the small-scale credit scheme is through the poverty reduction office at the county level. This office forms groups consisting of five households. Each group member is responsible to help, monitor, and take care of the other members. This arrangement allows an increase in the level of credit and reduces the risk for the bank. The basic groups are brought together in a central group, which convenes every 2 weeks for loaning, repaying, and training. The loans, which range from CNY500 to CNY2,000 ($63–250), do not require a collateral. Loans are payable within 1 year at an annual interest rate of 6%.

After getting the loan, from the third week, the farmers start repaying in 25 installments. The group also sets up a special fund to which 5% of each loan is deposited by collecting 0.2% of the loan at the time of the 2-weekly installment. The fund is owned by the group members, who can avail of loans at no interest. After the loans are repaid in full, the fund is returned to the farmers.

As of November 2001, 12 central groups with 83 subgroups and 439 farmers of which 430 were female, had been funded. The total amount of loans was CNY1.06 million ($133,000) and the repayment rate was 95%.

This model addressed the issues of the lack of access of the poor farmers to capital, the low repayment rate of loans, and low efficiency of capital use. It is very helpful in increasing the capacity for the poor to grow out of poverty, but it should be realized that the actual interest on the loans is about 9%, which means the poor farmers get access to capital at a relatively high interest rate.

With the help of international organizations, a geo-information system for the MRL region has been established since 1991. This system is used for resource surveys, monitoring floods, regional planning, sectoral planning, small-scale watershed development, and so forth.

Following the principle of "promoting development by opening to the outside," with the aid of the MOFETC, MOST, and the State Planning Commission, the MRL Program has established cooperation and exchange relationships with more than 20 international organizations and foreign countries. The following are a few examples of such cooperation, all of which were undertaken by the MRL Office:

- Development of the MRL Region of Jiangxi Province, 1990–1993; assisted by UNDP, $600,000;
- Sustainable Development of the MRL Region of Jiangxi Province, 1995–1998; assisted by UNDP, $970,000;
- Sino-German Cooperation: Sustainable Development of Mountain Areas of Jiangxi Province (Phases I and II), 1996–2003; assisted by German Government, DM12 million;
- Sino-Bengal Cooperation: Experiment of the GB Micro-finance to the Poor, 1999–2001; assisted by UNDP, $50,000;
- Demonstration Project on the Wetland Eco-Tourism Development in Shahushan in the Poyang Lake, Jiangxi Province, 2001–2002 (Phase 1); assisted by World Wide Fund for Nature, CNY500,000 ($62,500);
- Participatory Rural Development and Poverty Alleviation, 2002–2005; assisted by UNDP, $1 million; and
- Sino-Bengal Cooperation: Experiment of the GB Micro-finance to the Poor, 2002–2005; assisted by UNDP, $65,000.

The Forestry Department of Jiangxi Province carried out the Protection Forestry Construction of the Yangze River in 1998–2002 with the assistance of the German Government, amounting to DM12 million.

The Agriculture Department of Jiangxi Province implemented the following programs with the help of international funding agencies:

- Integrated Development of Agriculture of Ganzhou City of Jiangxi Province, 1996–2000; assisted by the Food and Agriculture Organization; C$24 million (loan);
- Red Soil Development Project (Phase I), 1986–1991; assisted by the World Bank, $37 million;
- Red Soil Development Project (Phase II), 1987–1989; assisted by the World Bank, $40 million; and
- Aquatic Product Development in the Low Wasteland of the Poyang Lake Region of Jiangxi Province, assisted by UNDP, CNY26.4 million ($3,300,000).

Finally, the Planning Commission of Jiangxi Province was the executing agency for the Jihu Agricultural Development Project, 1989–1997; amounting to $63.4 million, with the assistance of the World Bank. The European Union (EU) assisted

the Sciences and Technology of Nanchang City in the implementation of the Integrated Development of Desertilized Land of Jiangxi Province Project, amounting to $5 million, from 1993 to 1998.

The MRL Program has established relationships for cooperation and exchange with many international organizations such as UNDP, FAO, the World Bank, the EU and countries like Australia, Bangladesh, Canada, Germany, India, Israel, Japan, New Zealand, Philippines, Thailand, United Kingdom, United States, and Viet Nam.

Achievements of the Mountain-River-Lake Program

Under the leadership of the provincial government and with the help of the Central Government and international funding agencies, the MRL Program has achieved much success in promoting the integration of environmental protection, economical development, and poverty reduction following the MRL Development Overall Planning Outline of Jiangxi Province.

The main achievements are focused on the three ecological zones in the province:

- Integrated development of red soil hilly land in Jitai basin;
- Sustainable development of small watersheds in the mountain areas; and
- Eco-agriculture to control schistosomiasis and reduce poverty in the Poyang Lake area.

The following are main impacts.

- The forest coverage rate has increased from 31% to 56.8%. The number of forest parks at the state or provincial level has increased to 50.
- The area of Poyang Lake has been enlarged from 3,500 km^2 to 5,100 km^2. The water quality of Poyang Lake has reached the state standard of drinking water grade II.
- About 4 million poor farmers have become better-off by means of technical innovation, extension, and access to microcredit. GNP per capita of Jiangxi Province has increased from CNY597 ($78) in 1985 to CNY4,484 ($560) in 1998.

The MRL Program has received much acclaim from both home and abroad. Among others, in 1992, the MRL Program was selected to participate in the Technical Fair of the World Environment and Development Conference in Brazil. In 1994, the MRL Program was selected as one of the priority projects of the PRC's Agenda 21. In 2000, the MRL Program, as one of excellent projects in regional sustainable development around the world, was selected to attend EXPO 2000 in Hannover.

It is believed that the MRL Program is a successful model, which may be replicated in similar areas in the PRC as well as in other developing countries.

While implementing the MRL Program the following lessons were learned.

- Activities giving long-term benefits must be combined with those that yield immediate benefits.
- Development models must be based on local conditions.
- Technology must be applicable and extended step by step.

- It is useful to strengthen cooperation with outside organization by adopting a way of "development promoted by opening up."
- It is necessary to establish a management system with high effectiveness and efficiency.

In the 21st century, the MRL Program will focus on eco-environment improvement and enhance technology innovation to increase the science and technology content of the program. Based on the small watershed development, the development of MRL eco-economic zones will be the mainstay of the MRL Program. Emphasis will be given to the development of eco-agriculture-based modern agriculture, organic food-based food processing industry, and eco-tourism.

Policy Implications

The success of the MRL Program has the following policy implications.

- Political commitment is essential for undertaking such a wide-ranging program covering such a large area.
- An integrated approach—taking into account social, economic, and environmental issues—must be followed to reverse environmental devastation and help reduce poverty.
- The concept of the MRL should be replicated, as it is sound integrated management of water resources, land, and forest, while applying ecological methods for sustainable development.
- The setup of the MRL Program can be replicated as it provides an effective and open platform for agencies to cooperate and contribute in their own areas of specialization.
- Ensuring public participation and creating public awareness should be an inherent part of all development programs, as it turns out to be a major reason for the success of the MRL Program.