Document of
The World Bank
FOR OFFICIAL USE ONLY

Report No. 19475

IMPLEMENTATION COMPLETION REPORT

CHINA

RURAL WATER SUPPLY AND SANITATION PROJECT

(CREDIT 2336-CHA)

June 29, 1999

Urban Development Sector Unit
China Country Management Unit
East Asia and Pacific Regional Office

CURRENCY EQUIVALENTS

(As of May 1991)

Currency: Renminbi
Currency Unit: Yuan (Y)
Y 1.00=100 fen
$1.00=Y 5.31

FISCAL YEAR

January 1 - December 31

WEIGHTS AND MEASURES

Meter (m) = 0.62 miles
Liter (l) = 0.264 US gallons
lpcd = liters per capita per day
Cubic meter or ton of water = 284 US gallons

ABBREVIATIONS AND ACRONYMS

CPO	=	County Project Office
ICB	=	International Competitive Bidding
O&M	=	Operations and Maintenance
MOF	=	Ministry of Finance
NPHCC	=	National Patriotic Health Campaign Committee
NPO	=	National Project Office
PPO	=	Provincial Project Office
RWSS	=	Rural Water Supply and Sanitation Project
UNDP	=	United Nations Development Program
UNDB/WB	=	UNDB/World Bank Water and Sanitation Program
WHO	=	World Health Organization

Gansu	=	Gansu Province
Guangxi	=	Guangxi Zhuang Autonomous Province
Hunan	=	Hunan Province
Inner Mongolia	=	Inner Mongolia Autonomous Region
Xinjiang	=	Xinjiang Uygur Autonomous Region
Yunnan	=	Yunnan Province

Vice President	:	Jean-Michel Severino, EAPVP
Country Director	:	Yukon Huang, EACCF
Sector Manager	:	Keshav Varma, EASUR
Task Manager	:	Dawn Vermilya, EACCF

CONTENTS

IMPLEMENTATION COMPLETION REPORT

CHINA

RURAL WATER SUPPLY AND SANITATION PROJECT

(CREDIT 2336-CHA)

PREFACE

This is the Implementation Completion Report (ICR) for the Rural Water Supply and Sanitation Project in China, for which Credit 2336-CHA in the amount of SDR 78.9 million (US$110.0 million equivalent) were approved on April 10, 1992 and made effective on July 23, 1992.

The credit was closed on December 31, 1998. The Credit was fully disbursed and the last disbursement took place on May 24, 1999, with the Special Account recovery.

The ICR was prepared by Ms. Dawn Vermilya (Task Manager and Financial Analyst—EACCF) and Lee Travers (Economist and former Task Manager—TWUWS), with contributions from George Plant (Water/Sanitation Engineer—EACCF), Dr. Huang Ping (Sociologist—Consultant), and Li Xiaofeng (Task Team Assistant) and reviewed by Messrs. Keshav Varma, Sector Manager, EASUR and Yukon Huang, Country Director, China. The Borrower provided comments that are included as an appendix to the ICR.

Preparation of this ICR was begun during IDA's final supervision/completion mission, from November 23 to December 4, 1998. It is based on material in the project file. The borrower contributed to preparation of the ICR by the National Project Office contributing summary data, views reflected in the mission's aide-memoire, and their own evaluation of the project's execution.

CHINA

RURAL WATER SUPPLY AND SANITATION PROJECT

(CREDIT 2336-CHA)

EVALUATION SUMMARY

Introduction

1. The Rural Water Supply and Sanitation Project was designed to supply about 9 million rural inhabitants in 75 counties in the provinces and autonomous regions of Guangxi, Yunnan, Hunan, Gansu, Inner Mongolia and Xinjiang with safe drinking water, health/hygiene education, and access to improved sanitation technologies. The project supplemented the national rural water supply program's efforts to meet their 1995 target to supply 85 percent of the rural population with improved water supply, including 30 to 40 percent served by piped systems and 35 to 50 percent meeting water quality standards. As of 1997, 89 percent of China's rural population had access to improved water supply, of which 48 percent was being served by piped water and almost all piped water systems meet the government's standards for safe water quality. This project is the second in a series of four rural water supply and sanitation projects that have been negotiated with China, which address raising the quality of rural drinking water to meet national standards and improving the health and hygiene conditions in rural China.

Project Objectives

2. The overall project objective was to improve the health and productivity of the poorest and most needy inhabitants of rural China by increasing coverage of water supply, supported by sanitation services, health/hygiene education, technical assistance and training. Supporting project objectives were to: (a) develop sectoral strategies to prioritize investments at the county level, (b) use community participation to maximize project impact, (c) maintain properly staffed institutions to support adoption, implementation and operation of investment programs, (d) increase coverage in water supply, sanitation and health/hygiene education through physical construction, provision of equipment and utility vehicles, technical assistance and training; and, (e) establish ongoing and expanding programs and enhance community participation and replicability through provision of appropriate models, development and distribution of standards and manuals.

3. The project components in brief were:

- **Water Supply.** Construction of facilities such as waterworks systems, communal faucet systems, wells with hand pumps, and rainwater collectors to provide safe and sufficient drinking water to some 9 million rural inhabitants;

- **Sanitation**. Construction of facilities such as household, communal and school latrines, animal enclosures and drainage ditches in selected demonstration and pilot villages in each project county;

- **Health/Hygiene Education.** Provision of health/hygiene education to all project counties through training of provincial, county and community administrators, healthcare workers, teachers, and community women and through them the general population; construction of training facilities; dissemination of training and health/hygiene education materials;

- **Technical Assistance and Training.** In conjunction with the ongoing United Nations Development Program (UNDP) project, provision of technical assistance and training in management, finance, procurement, training of trainers, and technical aspects of the first three project components at the national, provincial, prefecture, county and community levels; and

- **Institution Establishment and Project Management.** Construction of project offices and dormitories; provision of office equipment; and financing of project management and supervision activities.

4. There were three legal covenants that, in particular, supported achieving the substance of the objectives and components:

- Satisfactory publication and distribution of design manuals for low-cost rural water supply technologies and rural sanitation facilities was a condition of credit disbursement for civil works;

- Planning and design of subprojects would be done in accordance with the criteria contained in the planning and design manuals and the criteria and procedures for review and approval of subprojects would be followed; and

- Each Project Province and Region shall cause charges for water provided by each piped and nonpiped water systems financed from the proceeds of the Credit to cover: (a) the costs of operating and maintaining such system and a pro-rata portion, determined in a manner acceptable to the Association, of the costs associated with the repayment by the Project Province or Region of the proceeds of the Credit made available to the Province or Region (excluding any grants from the Project Province, Region or Counties to the beneficiaries of water systems), during the period repayments of the Credit proceeds are being made by the Province or Region; and (b) thereafter, the costs of operating and maintaining such system including provision for depreciation on a basis acceptable to the Association.

5. The stated overall objective of the project was assumed to lead directly from the project components, but was not itself monitored. Among the objectives, the clear priority of the Borrower and the project task teams was to "increase coverage in water supply,

sanitation and health/hygiene education." The specific objectives mentioned above were appropriate at the time of appraisal except, in the sanitation improvement objective, that for "enhancing ... replicability through provision of appropriate models." There, even a preliminary economic analysis would have shown that the model villages and the sanitary latrine models being considered were so costly compared to traditional practices that they exceeded willingness to pay of almost all the targeted poor communities receiving improved water supplies.

Implementation Experience and Results

6. **The project *substantially* achieved its major objectives.** The project brought sustainable, improved water supplies to over 9 million poor people. Extensive borrower and IDA supervision consistently revealed highly positive beneficiary villager self-assessment of project results. Depending on the original water problem, reduction in incidence of intestinal diseases reported, particularly among children, and time reduction to fetch water daily have been the main ways in which the project has benefited the project villagers.

7. The physical completion of water facilities and the connection of beneficiaries has been *substantial*. At project close, over 2,000 water supply systems and 70,000 hand pumps and cisterns were operating. In total these systems are currently serving 8.9 million beneficiaries (99 percent of target). The target of 9.06 million beneficiaries is expected to be exceeded when the final 125 water plants, under construction at project close, become operational. In most water supply systems, the water tariff is covering operation and maintenance costs and is either fully or substantially covering agreed debt service set-aside payments. Community participation, although in most respects modest during the feasibility and design stages, has had a strong impact on project results. The health education achievements have been *substantial*. The sanitation achievements of the project have been *partial*. The improved sanitary latrine construction program failed to generate the expected demand from the target population, even with some government subsidy. This problem arose because of affordability concerns and because the linkage between improved sanitation and better health is not strong enough to overcome traditional preferences for fresh nightsoil use for part of crop fertilization. Although demonstration villages in themselves were successful in improving the quality of their environment and educating the village population on health education and sanitation issues, they have not been as successful as planned in producing an obvious demonstration effect in neighboring nonproject villages and counties.

8. The project was affected by a substantial devaluation in 1994 and by the government ending its import duty exemption on World Bank Group-procured goods, which raised the local currency cost of imports. In addition, in the early 1990s, China experienced inflation that substantially increased local currency project costs. However, devaluation increased the local currency value of the IDA Credit sufficiently to offset inflation during the project period, so the Credit remained sufficient for original project goals. Inflation nonetheless partially affected project completion, since local governments

had budgeted their local currency contribution in a fixed nominal amount and some of the provinces resisted making the needed counterpart fund adjustments. The cumulative result of the various financial and management problems was a 12-month delay in completing project activities.

9. Project sustainability is rated as *likely*. Financially, systems are covering operations and maintenance costs and are making a full or significant contribution to debt service repayment through the water tariff. Technically, the equipment and materials are almost all domestically produced and widely available. The mechanical operating skills are available, even in poor counties. Moreover, beneficiaries recognize the time savings and health benefits of safe water, hence have a strong impetus to keep the water systems operating smoothly and finance repairs and expansions. Health and hygiene education programs are ongoing, and the project's contribution was to supplement the existing much larger program, so its sustainability is considered *likely*. IDA performance has overall been *satisfactory* from project identification to completion. Borrower performance was *highly satisfactory* during preparation and has overall been *satisfactory* during implementation and project completion.

Summary of Findings, Future Operations, and Key Lessons Learned

10. Overall, the project is assessed to have achieved a *satisfactory* outcome. *Highly satisfactory* aspects of the project, for which all objectives were met, were the physical completion of water systems, and connection of almost 9.0 million beneficiaries, reported high levels of beneficiary satisfaction, and high levels of cost recovery. The physical implementation of the health and hygiene education program was *highly satisfactory* per the objectives set at appraisal, but since it is not clear that the health messages have resulted in significant behavior changes, the overall rating for this component is *satisfactory*. The sanitation program and demonstration village program are considered to be *satisfactory* as far as physical implementation, but because demand was not generated for the improved latrines program, and the model villages program lacked significant demonstration effect, the overall rating for this component is *unsatisfactory*.

11. Because the Government in China is reorganizing and plans to significantly reduce its staff, a final decision on institutional arrangements to oversee the water systems has not been decided. Currently, the three options under consideration are: (a) maintaining the County Project Offices (CPOs) but expanding their responsibilities to cover all government-sponsored rural water supply projects in the counties; (b) converting the CPOs into Rural Water Supply Companies, which would still allow government budgetary financing for a limited period of time before they would have to fully finance themselves; or (c) allowing the townships to take responsibility for providing services to the village water schemes, since most townships have a water company responsible for town supply, which could provide the technical expertise required. Health intervention initiatives will occur through existing service providers: doctors, women's committees, and through school programs.

12. There are five key lessons from this project. First, long-term loans to poor villages can complement village resources to sustainably and significantly improve water supply. Second, demand for improved latrines is correlated with higher income levels, and, in contrast to improved water supply, the income levels of the rural poor in this project were too low to support the latrine improvement strategy. Third, investing in model villages is not a successful strategy for yielding demonstration effects when the external government financing needed to construct the model is not available to other villages seeking to replicate the model. Fourth, training of water plant managers, operators and accountants is critical to the sustainability of the water plant subprojects and proceeds of the Credit should be made available to ensure that adequate training is taking place. Fifth, intensified traditional approaches to health education have reached a saturation point. In order to increase the acceptance of health messages and behavior modification, the inhibitors for improved practice must be identified, and the health education program modified accordingly.

CHINA

RURAL WATER SUPPLY AND SANITATION PROJECT

(CREDIT 2336-CHA)

PART I: PROJECT IMPLEMENTATION ASSESSMENT

A. PROJECT OBJECTIVES AND DESCRIPTION

1. **Objectives.** As stated in the project Staff Appraisal Report, the overall objective was to improve health and productivity of the poorest and most needy inhabitants of rural China by increasing coverage of water supply, supported by sanitation services, health/ hygiene education, technical assistance and training. Through project preparation and implementation, immediate objectives set for the project were to: (a) develop long-term sectoral and subsectoral strategies to prioritize investments at the county level; (b) explore and develop appropriate low-cost alternatives as well as formulate affordable and sustainable programs for water supply, water treatment and sanitation through community participation to maximize project impact; (c) establish and maintain properly staffed institutions as well as provide technical assistance and training to support adoption, implementation and operation of investment programs; (d) increase coverage in water supply, sanitation and health/hygiene education through physical construction, provision of equipment and utility vehicles, technical assistance and training; and, (e) establish ongoing and expanding programs and enhance community participation and replicability through provision of appropriate models, development and distribution of standards and manuals, as well as dissemination of experience and lessons learned.

2. **Components.** The project components were:

- **Water Supply:** construction of facilities such as waterworks systems, communal faucet systems, wells with hand pumps, developed springs, rainwater collectors and related facilities to provide safe and sufficient drinking water to some 9 million rural inhabitants; provision of water quality testing equipment and utility vehicles; continuation of development, introduction and dissemination of new technologies through demonstration, publication and distribution of manuals and guidelines;

- **Sanitation:** construction of facilities such as household, communal and school latrines, animal enclosures and drainage ditches in selected demonstration and pilot villages in each project county; provision of the foundation for replicable programs by developing and demonstrating all aspects of the program that delivers not just latrines but facilities that are demanded, effectively used and sustained for the duration of their service life;

- **Health/Hygiene Education:** provision of health/hygiene education to all project counties through training of provincial, county and community administrators, trainers, healthcare workers, teachers, community women and through them the general population; construction of training facilities; development and dissemination of training and health/hygiene education materials; provision of materials, supplies, equipment and utility vehicles;

- **Technical Assistance and Training:** in conjunction with the ongoing United Nations Development Program (UNDP) project, provision of technical assistance and training in management, finance, procurement, training of trainers, and technical aspects of the first three project components at national, provincial, prefecture, county and community levels; and

- **Institution Establishment and Project Management:** construction of project offices and dormitories; provision of office equipment; and financing of project management and supervision activities.

3. **Covenants.** There were three legal covenants that particularly focused on achieving the substance of the objectives and components:

- Satisfactory publication and distribution of design manuals for low-cost rural water supply technologies and rural sanitation facilities would be a condition of credit disbursement for civil works;

- Planning and design of subprojects would be done in accordance with the criteria contained in the planning and design manuals and the criteria and procedures for review and approval of subprojects would be followed; and

- Each Project Province and Region shall cause charges for water provided by each piped and nonpiped water systems financed from the proceeds of the Credit to cover: (a) the costs of operating and maintaining such system and a pro-rata portion, determined in a manner acceptable to the Association, of the costs associated with the repayment by the Project Province or Region of the proceeds of the Credit made available to the Province or Region (excluding any grants from the Project Province, Region or Counties to the beneficiaries of water systems), during the period repayments of the Credit proceeds are being made by the Province or Region; and (b) thereafter, the costs of operating and maintaining such system including provision for depreciation on a basis acceptable to the Association.

4. **Assessment of Objectives.** The stated overall objective of the project was assumed to lead directly from the project components, but was not itself monitored. Among the objectives, the clear priority of the Borrower and the project task teams was to "increase coverage in water supply, sanitation and health/hygiene education." The specific objectives mentioned above were appropriate at the time of appraisal except, in the sanitation improvement objective, that for "enhancing ... replicability through

provision of appropriate models." There, even a preliminary economic analysis would have shown that the model villages and the sanitary latrine models being considered were so costly compared to traditional solutions that they exceeded willingness to pay of almost all the target poor communities receiving improved water supplies.

B. Achievement of Project Objectives

5. **The project substantially achieved its major objectives.** The project brought sustainable, improved water supplies to over 9 million poor people. Although lacking a monitoring program to measure health and productivity gains, extensive borrower and IDA supervision consistently revealed highly positive beneficiary villager self-assessment of project results. The National Project Office (NPO) conducted a few more formal baseline and follow-up surveys that support this finding (although the survey methodologies have weaknesses). Depending on the original water problem, reduction in incidence of intestinal diseases reported, particularly among children, and time reduction to fetch water daily have been the main ways in which the project has benefited the project villagers. Supervision teams have verified financial sustainability through direct inspection of water plant accounts.

6. **Water Supply.** The physical completion of water facilities and the connection of beneficiaries has been *substantial*. At project close, 2,193 water supply piped networks were operating and an additional 125 water plants were under construction (87 percent of plan), 7,296 hand pump schemes (93 percent of plan), and 63,998 rain catchment systems (116 percent of plan) have been completed. In total these systems are currently serving 8.9 million beneficiaries (99 percent of target; target is expected to be exceeded when the final 125 water plants become operational), and if design population targets are achieved, could supply as many as 12 million beneficiaries during the next 10 to 15 years.

7. Design and construction quality has generally been good, but supervision has revealed weaknesses in a number of systems. On the water plant design side, problems that have been reported in aide-memoires generally fall into the following categories: (a) some system designs may not represent least-cost engineering options, but while unnecessarily increasing costs, in the known cases this has not threatened service affordability and willingness-to-pay; and (b) overoptimistic billable water consumption design parameters have resulted in actual operating levels significantly below design capacities, again increasing unit service costs. Among construction problems, certain "outlier" engineering deficiencies may shorten the service life of individual water plants, or compromise water quality unless rectified, e.g., improperly installed main meters, well heads not sealed or surface water sources not sufficiently protected, poor ventilation and drainage at installations, or improperly installed household meters.

8. Quality water plant management was not a separate objective of the project nor was project financing included for training of water plant managers, engineers and accountants. System operation and maintenance (O&M) has generally been satisfactory, but has also been quite varied. Since weak management performance threatens water

plant sustainability, during project implementation the need to support training for quality management at some water plants became clear. As a result, IDA agreed to allow funds in the technical assistance category to be used for the training of water plant staff.

9. Financial recordkeeping for the water plants has also been variable, but generally it has been satisfactory. Where financial recordkeeping was noted to be poor, accounting staff turnover or lack of training were the causes. As a partial response, financial training was included in the topics suitable for technical assistance funds.

10. **Cost Recovery.** Financial cost recovery in water schemes has been *substantial* and has reached levels unprecedented in other Bank Group-funded rural water supply projects. Of the total investment, beneficiaries have contributed, on average, 30 percent of the investment in upfront cash, materials and labor. In addition, 60 percent of water plants are covering water plant operating costs and the agreed set-aside for debt service repayment through the water tariffs paid by the beneficiaries. Of the remaining 40 percent of water plants, most are covering O&M and a significant portion of the debt service. Almost all piped water systems have met or exceeded the cost recovery covenant.

11. **Community Participation.** Community participation, although in most respects modest during the feasibility and design stages, has had a strong impact on project results. Specifically, villager preference for piped network systems supplying water to yard or house taps forced designers to shift from mostly hand pump systems to piped network systems. Likewise low beneficiary demand for improved sanitary latrines, largely based on their own and hence more realistic assessment of their economic and education level, led to a 50 percent reduction in that construction target. Throughout the project, beneficiaries participated significantly through the provision of cash and in-kind contributions of labor and materials. Original estimates suggested that beneficiaries would pay about 20 percent of the project investment costs in upfront cash and in-kind contributions, and assume, on average, 88 percent of the Credit repayment responsibilities. Together, the beneficiaries were to be responsible for about 71 percent of the investment costs, the remainder to be provided through government counterpart funding at various levels. As of the latest actuals in June 1998, beneficiaries through upfront contributions and assuming the burden of most of the debt repayment through the water tariff, are covering about 74 percent of investment costs.

12. **Health/Hygiene Education.** Health education programs for health educators, women's committees and village leaders, and the dissemination of health educational materials has been widespread and has supported the government's existing health education programs. The NPO reports that some 9.4 million rural women, children and men have received health education under the project. The beneficiaries received health education by attending training classes at the village level, reading health/hygiene educational materials (including posters, pamphlets, videos, etc.), or participating in other health education activities (including public meetings and performances).

13. A Yunnan province report, based on sampling interviews and direct observation, shows significant behavioral changes when compared with baseline survey data. Latrine use has risen for housewives from 92 to 95 percent, and for school-age children from 44 to 86 percent. The incidence of washing hands before eating has risen for housewives from 3 to 83 percent, and for school children from 56 to 98 percent. Drinking boiled water among housewives has risen from 16 to 75 percent, and among school children from 25 to 93 percent. As the survey report states, there may be many other factors such as socioeconomic development that have played roles in these behavior changes, but nonetheless the project itself did help beneficiaries to improve their hygiene behavior and sanitation environment. However, independent observations during routine supervision missions suggests that beneficiaries are not consistently practicing good hygiene, such as boiling drinking water, and washing hands before eating and after using the toilet, even though they knew they should be doing so.

14. A later survey conducted by the Bank Group found that although the behavior messages were being understood by most beneficiaries, the messages were not conveying why poor hygiene led to disease (e.g., germ transmission, disease vectors, etc.). Hence, the messages need to be studied and revised if a significant improvement in behavior modification is to occur.

15. **Sanitation.** The sanitation achievements of the project have been *partial*. Per the original proposal and in terms of the number of household latrines, the improved sanitary latrine construction failed to generate significant demand from the target population, even with some government subsidy. This because of affordability concerns—even the least costly sanitary latrine models can cost half of a poor family's annual income—and the linkage between improved sanitation and better health is not strong enough to overcome traditional preferences for fresh nightsoil use for crop fertilization. At the mid-term review, latrine construction targets were halved. At project close, household latrine construction was 120 percent of the revised plan. School and public latrines also exceeded their revised targets, by 107 percent and 114 percent, respectively.

16. Although demonstration villages in themselves were successful in improving the quality of the environment and educating the village population on health education and sanitation issues, they have not been as successful as planned in producing a demonstration effect in neighboring nonproject villages and counties. There are two reasons for this: (a) government subsidies were used to construct most of the latrine and supporting facilities in the demonstration villages, but similar government financing could not be provided to nondemonstration villages; and (b) the cost of demonstration facilities constructed was high compared to villagers' annual disposable income and no means of providing long-term financing for these assets to nondemonstration villages was devised during the project implementation. Some 84 demonstration villages out of an original target of 112 were completed under the project.

17. **Technical Assistance and Training.** Training of project office staff at all levels—national, provincial and county—was *substantially* achieved and led to

satisfactory implementation of the project by most County Project Offices (CPOs). After the project's mid-term review, Credit proceeds were made available to train water plant staff, thus helping to improve the sustainability of the water systems. As of project close, only 46 percent of the Credit's Consulting Services and Training category had been disbursed, although this does not reflect the level of effort, but rather the use of domestic, hence much cheaper, consultants and trainers than the international consultants anticipated at appraisal. The remaining $331,000 from the category was transferred to the civil works expenditure category per the Government of China's request just before project close. During supervision missions it was noted that where training of project office staff was carried out to a high level and where staff turnover was low or where replacement employees were properly trained, the project progressed smoothly. It was also noted that the quality of water facility financial and operational management was directly correlated with the training received by the operators.

18. **Project Management.** Management responsibilities are shared among central government, project province, project county, and water plant levels. The county and water plants play the key implementation role, with central and provincial governments active in some procurement and overseeing county work. The latter were marginally satisfactory, with administrative financing constraints that held field supervision below desired intensity, but was fully satisfactory when undertaken. Routine reporting requirements were satisfactorily met. At the county and water plant level, the large number of diverse players led to varied performance. Overall, performance objectives were *substantially* achieved, with both auditors and IDA supervision identifying a small number of performance failures that were, in all instances, remedied.

19. **Procurement.** Procurement under the project overall was satisfactory and almost all transactions fully satisfied World Bank Group guidelines. There were more than 2,000 civil works contracts and three international competitive bidding (ICB) contracts carried out under the project. During supervision missions the procurement documentation was reviewed by the IDA team at each CPO. In a few cases where World Bank Group guidelines were not fully complied with, the problems encountered were that the Borrower had used marking or bracketing, which is in agreement with the central government's procurement regulations. In all cases reviewed during supervision, the lowest evaluated responsive bidders were selected, and the result was the same as would have occurred if the Borrower fully complied with Bank Group guidelines. In these cases the mission leader stated in the aide-memoires that the practice of marking and bracketing was not allowed and should not be continued. The ICB procurement was carried out in compliance with Bank Group guidelines, but the bidding documents had to be revised several times in order to meet Bank Group guidelines, and hence there were delays in the ICB procurement process.

20. **Economic Reevaluation**. As stated in the Staff Appraisal Report, "The overall project objective is to improve the health and productivity of the poorest and most needy inhabitants of rural China by increasing coverage of water supply, supported by sanitation services, health/hygiene education, technical assistance and training." Both the borrower

and task team were persuaded that the inputs—improved water supply, sanitation services, and health/hygiene education—would necessarily lead to health and productivity improvements. In support of this, they reported two studies of previous water, sanitation or health education projects in a range of countries that showed positive health outcomes. The Staff Appraisal Report provided no details, or even citations, of those studies, but one seems clearly to be the well-known 1991 paper by Esrey, et al. ("Effects of improved water supply and sanitation on ascariasis, diarrhoea, dracunculiasis, hookworm infection, schistosomiasis, and trachoma," *WHO Bulletin 69* (5) (1991): 609-621). The borrower, and IDA team, reasoned that improved health would lead to improved productivity.

21. Neither the borrower nor the appraisal team undertook further benefit analysis. Nor did they put into place a monitoring program that would allow ex-post evaluation of the program assumptions. However, the Esrey paper shows a substantial range of reductions in disease incidence from the various programs analyzed, while making the point that few of the studies would themselves pass a strong methodological test. In the worst cases, the Esrey paper reports investments showing little or no impact on disease incidence. And, of course, disease incidence does not have a one-to-one relationship with productivity. In their defense, the appraisal team explicitly recognized that serious evaluation efforts on health impacts are difficult to do well, probably contributing to their decision not to invest resources in this area. With this history, the ICR team cannot reanalyze the expected benefits.

22. With the expectation of substantial health benefits (Staff Appraisal Report, para. 5.5), the team concentrated its preparation and appraisal attention on two other elements of project design—beneficiaries and cost-effective inputs.

23. A major departure of this second rural water project from the first (China: Rural Water Supply Project, Cr. 1578) can be found in the targeted beneficiaries. The first project invested primarily in larger water systems, often serving towns rather than villages. It also included several wealthier provinces, including Beijing Municipality. While successfully implemented, beneficiaries tended to be among the better-off rural residents. The government and Bank Group agreed that the second project would focus on poorer rural areas and, within them, on poorer people.

24. During project preparation, the teams devoted considerable effort to developing an effective targeting mechanism to reach their objective of serving "the poorest and most needy inhabitants of rural China." First, the project was limited to six poorer provinces. Then the targeting mechanism used four indicators: income, water-related health, water shortages, and minority prevalence, to identify potential beneficiary counties. Finally, it eliminated county towns as potential beneficiaries, then specified preferred technologies more suited to lower service levels, hence lower-income communities. Within those communities, water supply solutions would be designed to benefit all residents. This approach took advantage of the relative homogeneity of Chinese villages, a consequence of strictly limited migration and the communal system prevailing for so many years. The

counties chosen for project participation had 1989 (the most recent year statistics were available) average per capita incomes ranging from $30 to $150.

25. The targeting effort was successful. That success cannot be understated, given that the project design targets the poor while expecting a 20 percent initial capital contribution (in some combination of cash, materials and labor) from villagers and passing on the full loan and O&M obligation to the benefiting village. This financial test forces a much more careful assessment of sustainability than the traditional practice of full capital subsidies. Despite the fact that the very poorest villages could not be included due to their inability to generate sufficient cash, the borrower did an excellent job of identifying poor villages whose need was for long-term financing rather than welfare handouts. Supervision teams visited a large number of beneficiary villages and found very few where household assets or other wealth indicators suggested mistargeting.

26. The project design for cost-effective inputs complemented the beneficiary targeting work. The borrower utilized extensive domestic and international expertise in preparing design manuals that would help bring effective nonpiped, small system and sanitation solutions to rural areas. These manuals are an important resource for engineers trained in standard municipal designs and were completed and disseminated to meet design needs, as well as a disbursement condition. Bank Group supervision teams have found the manuals in broad use several years after project inception and systems based on them to effectively meet village needs.

27. The project design anticipated minimal numbers of household water connections, instead favoring standpipes and other group facilities. This was driven by the desire to maximize the number of beneficiary villages. However, in practice many residents of villages receiving piped water have demonstrated a strong preference for household connections. This demand has been met without reducing project scope, as households wanting that service have simply been asked to pay the extra cost of the connection. Since a household connection reduces water-gathering time, increased use typically results, as does increased villager commitment to proper system functioning.

28. Just as unanticipated household demand led to more frequent system connections than anticipated, a lack of household demand led to lower sanitation coverage. The sanitation component sought "to promote demand for improved sanitation" by bringing a few improved latrines to all villages, and comprehensively upgrading selected villages in several aspects, including drainage, latrines, and livestock compounds. The villages would thereby become models for their neighbors.

29. The project successfully introduced latrines and upgraded villages, but by the mid-term review it was clear that the learning effect was small. Latrine use was already extensive in project villages, due to a long history of collecting feces for use as fertilizer. The sanitation component introduced latrine designs with longer retention periods and composting features, both designed to lower pathogen counts before use of feces on fields. As mentioned above, design manuals were also prepared for this component.

Unfortunately, the design characteristics of composting latrines left most villagers unable to build the latrines themselves, and the latrines required manufactured components that drove up costs. Since traditional latrines required only labor and locally gathered materials, most villagers found the new latrines an unattractive alternative if not accompanied by a substantial subsidy. The same was true of the other measures designed for model villages. Because government lacked the money to subsidize more than the pilot programs, neighboring villagers or villages could not replicate the upgraded facilities provided by the program.

30. The latrine/model village program scope was substantially reduced at the mid-term review. Although Chinese domestic programs have successfully introduced similar changes in wealthier villages, the borrower concluded, and the Bank Group agreed, that poor villages served by this Credit simply lacked the means to substantially upgrade sanitary facilities at their own expense. Emphasis was therefore placed on health education inputs to which villagers could respond without major cash expenditures. This project provided a valuable test of compost latrines in poor areas, but the lesson was that China cannot expect broad uptake in poor areas.

31. The water supply services are community-owned and operated, with the goal of cost recovery but not profit. For this reason, the appraisal team did not estimate a project financial rate of return and no re-estimation could take place. The other components had no ongoing revenue flows.

C. Implementation Record and Major Factors Affecting the Project

32. Factors not generally subject to government control had little influence on the achievement of project objectives, so this discussion will focus on factors under government or implementing agency control.

33. During the project period, the Chinese government ended its earlier practice of maintaining an overvalued local currency, resulting in substantial devaluation in 1994. One year later the government also ended its import duty exemption on World Bank Group project-procured goods. These actions raised the local currency cost of imports. The first of them reduced import competitiveness and the second import desirability (tariffs were not factored into bid evaluations, but certainly were by borrowers into total costs). However, all major equipment and materials are produced in China to acceptable quality levels and although the import composition of the project fell, project components continued to meet quality and cost goals.

34. Government macroeconomic policies in the early 1990s fostered inflation that substantially increased local currency project costs. However, devaluation increased the local currency value of the IDA Credit sufficiently to offset inflation during the project period, so the Credit remained sufficient for original project goals. Inflation nonetheless partially affected project completion, since local governments had budgeted their local currency contribution in a fixed nominal amount and some of the provinces resisted

making the needed counterpart fund adjustments. The adjustments were eventually made, but played a large role in the delayed project completion.

35. The NPO funding shortfall is discussed under Borrower Performance. This affected their supervisory effort and, through that, partially reduced both their effectiveness and overall project quality. The NPO also had some difficulty writing procurement specifications to adequate quality and leading the subsequent evaluation and contracting effort, leading to delays in ICB goods procurement. This, too, partially affected timely project construction, contributing to the delayed completion.

36. The cumulative result of the various financial and management problems was a 12-month delay in completing project activities, with an overall disbursement period of 89 months compared to the 72 months foreseen at appraisal.

37. **Implementation Timing.** The project's implementation period was officially extended by one year to December 31, 1998 after the project mid-term review to allow sufficient time to complete construction of water facilities, connection of target beneficiaries and training of water plant staff. Delays in counterpart funding commitments and in preparation of satisfactory ICB bidding documents were the main reasons the project needed to be extended to meet the targets.

38. **Project Costs.** The project experienced significant cost increases in Renminbi terms, but is expected to meet appraisal estimates in US dollar terms. At appraisal, the project was expected to cost Y 1,094.6 million or $189.1 million equivalent. As of June 30, 1998, the project investment totaled Y 1,377.7 million or 126 percent of the original estimate. Project financing expectations at appraisal were divided as follows: IDA, 58 percent; various government levels, 22 percent; and communities and individuals, 20 percent. Project financing in Renminbi terms as of June 30, 1998 was: IDA, 51 percent; various government levels, 19 percent; and beneficiaries, 30 percent. Beneficiaries in all provinces and regions have exceeded their planned contributions by an average of 124 percent. The variance in project costs and project financing resulted from two changes: (a) significant domestic inflation—contingencies were originally estimated as 41 percent of the base cost in Renminbi terms, but in actuality, contingencies to base costs were 78 percent; and (b) subproject redesign from mostly hand pump systems to mostly piped water systems—this in response to beneficiary demand. The debt service burden on projects constructed after 1994 is much larger in Renminbi terms than originally anticipated because of a 56 percent devaluation in the Renminbi/US dollar exchange rate that occurred in 1994. Increases in average per capita income during the project appraisal and implementation period were on the order of 17 percent per year. The significantly increased incomes make it likely that debt repayment will not be a significant problem.

D. Project Sustainability

39. Project sustainability is rated as *likely*. Financially, systems are covering O&M costs and are making a full or significant contribution to debt service repayment through

the water tariff. This provides the financial resources needed for sustainable operation. Technically, the equipment and materials are almost all domestically produced and widely available. The mechanical operating skills are available even in poor counties, where hand tractors and other machinery of a technical level comparable to the water plants are in common use. To bolster those inputs, county governments plan to continue, in a modified form, the function of the county project office, to provide technical support for the project's assets as well as the Government's broader rural water supply program. Moreover, beneficiaries recognize the time savings and health benefits of safe water, hence have a strong impetus to keep the water systems operating smoothly and finance repairs and expansions. Health and hygiene education programs are ongoing, and the project's contribution was to supplement the existing much larger program, so its sustainability is considered *likely*. The two subsequent Bank Group-financed rural water supply and sanitation projects have recognized the successful elements of this project, while being modified to reflect lessons learned.

E. IDA PERFORMANCE

40. IDA's performance in project identification, preparation and appraisal was satisfactory. This project developed from the Rural Water Supply Project (Cr. 1578), but represented a substantial evolution in terms of poverty targeting and in the inclusion of sanitation and health education. Identification and preparation of this project drew directly on results from a UNDP/World Bank Water and Sanitation Program project undertaken in Xinjiang and Inner Mongolia, both included in this project, and on a 1990 European Economic Community-funded rural water sector study and training program. Simultaneously with preparation of this project, Bank Group staff worked with UNDP staff in preparing a supporting UNDP project to strengthen management in beneficiary counties, provinces and the national project office. The IDA preparation team played an effective role in facilitating these substantial external partner efforts. That team contained a strong mix of water and sanitation engineers familiar with the technical and management requirements of providing the needed services, health education specialists, and a financial analyst and economist. They effectively conveyed international experience in similar conditions and helped translate that experience into actual design practice in China. Appraisal was carried out with a full team of specialists, ranging over water supply, sanitation, and health education. The economic analysis was the one area of appraisal weakness, because it made no apparent effort to establish willingness-to-pay for the improved sanitation. Even a simple effort would have shown that villagers lacked the ability to replicate the highly subsidized model latrines introduced by the project.

41. IDA teams also demonstrated satisfactory performance in project supervision. The 75 project counties and thousands of beneficiary villages presented a particular supervision challenge. But the 13 supervision missions over the project life visited a broad selection of project counties and villages, utilized county-level audit reports as an important complement to direct visits, and worked consistently to strengthen the provincial and national project office supervision efforts. Initially, rapid task manager turnover, with three task managers in the first three years of project life, may have

weakened supervision efforts, although continuity was not wholly broken, as the second task manager had been on the appraisal team and the third a member of the second task manager's supervision team. Staff rotation forced yet another task manager change late in the project life, although again the new task manager had been a key member of earlier supervision teams. These changes did not impede effective Bank Group advice and Bank Group supervision was key in helping the borrower identify why the sanitation demonstration program was not progressing as expected, and, through the mid-term review, rebalancing the project to adjust for that.

42. Bank Group decentralization had an important, positive impact on supervision in the latter stages, as a field-based engineer and a financial analyst combined with a locally hired consultant sociologist to provide a strong supervision team located in the same city as the national project office. This considerably increased the frequency of contact with that and other project offices and brought welcome flexibility to project site visits. With that change, the traditional Bank Group technique of counting mission numbers lost relevance.

F. Borrower Performance

43. Borrower preparation performance was highly satisfactory. The borrower identified appropriate beneficiary counties and played a large role in developing sustainable village-level project financing mechanisms. The project design was based on high levels of beneficiary financial commitment, hence project ownership. All project counties prepared feasibility studies and preliminary project designs appropriate to their conditions. The NPO took the lead in developing, with international consultants, the needed design manuals.

44. Borrower implementation performance was much more mixed. The NPO was expected to play a major supervisory role but their administrative financing arrangements, developed during project preparation, were not honored during implementation. With inadequate resources, the NPO could not act with the independence and efficiency envisioned at appraisal. Instead, they focused on ICB procurement, engineering review and approval, training, meeting Bank Group reporting deadlines, and accompanying Bank Group teams to the field. NPO staff quality was good, although their numbers were inadequate. Reporting deadlines were met, and reports were of good quality, but NPO procurement delays were common. In a larger sense, sector and financial policies remained generally positive.

45. Relative to their task, the six provincial project offices (PPOs) were generally better financed and more active than the NPO. But they, too, provided less aggressive field supervision than the Bank Group desired. In similar, but domestically funded, development projects the provincial level typically becomes less active after appraisal, focusing on reviewing progress reports and authorizing financial transfers. Counterpart funding generally lagged project needs at the height of the project investment cycle and contributed to implementation delays. Overall, in spite of having well-qualified

individuals in the provincial project offices, some provinces performed to satisfactory levels while others fell short of fully satisfactory performance.

46. With 75 counties and thousands of villages, this level is difficult to generalize about. This level also faced the greatest challenges, as they were least familiar with Bank Group requirements, but they build and run the systems. The counties deliver training and oversee design, procurement and construction. The villages contribute to building and then run their systems. Village beneficiaries demonstrate very high levels of water system ownership. The project succeeded in reaching coverage targets while instituting sustainable financing and operations management. On the whole, then, this group has satisfactory performance. In many locations, "highly satisfactory" would be a fairer assessment, but several instances of deficient performance have also been found.

47. Covenant performance was good. Government auditors performed well in most counties, providing additional implementation guidance.

G. Assessment of Outcome

48. Overall, the project is assessed to have achieved a *satisfactory* outcome. *Highly satisfactory* aspects of the project, for which all objectives were met, were the physical completion of water systems, and connection of almost 9 million beneficiaries, reported high levels of beneficiary satisfaction, and high levels of cost recovery. The physical implementation of the health and hygiene education program was *highly satisfactory* per the objectives set at appraisal, but since it is not clear that the health messages have resulted in significant behavior changes, the overall rating for this component is *satisfactory*. The sanitation program and demonstration village program are considered to be *satisfactory* as far as physical implementation, but because demand was not generated for the improved latrines program, and the model villages program lacked significant demonstration effect, the overall rating for this component is *unsatisfactory*.

H. Future Operation

49. The national, provincial and county leaders have given considerable thought as to what type of institutional arrangements would safeguard the assets created under the project, provide a channel for loan repayment, provide training and service assistance to water plant staff, and continue the health education initiatives. In previous missions, the Bank Group had been informed that where budgets permitted, counties would like to retain the CPOs and expand their responsibilities to all rural water systems in the county. They would be responsible for new construction but would expand their capacity to focus more on supporting maintenance of the completed systems. During the ICR mission, however, the Bank Group was informed that the Government's personnel reorganization (designed to cut government staff levels by 40 to 50 percent) would mean that CPOs may not be able to continue to receive government budget allocations. The two provinces visited during the ICR mission stated that they were still reviewing their options, but that converting the CPOs into Rural Water Supply Factories or Companies (RWSCs) was one option they were considering. Apparently, the change of legal status would allow for

government budget support for at least the next couple of years. Other than purchasing spare parts and selling these to the water plants as requested (with no markup), the provincial and county leaders had no intention of charging a "service fee" to provide maintenance and repair services or for training of staff. These services would be useful in areas short of local materials distributors or mechanics, but the Bank Group has encouraged the CPOs and PPOs to consider charging small service fees soon, to avoid unfair competition with private service providers and so that as government budgets decline a separate revenue base could be built. In addition, transfer of all fixed assets was to be completed by project close, with the ownership of most systems residing with village committees or township governments (in the case where a system covers multiple villages). A third option is to allow the town or townships to manage the plants, since many of them have some kind of existing water supply entity for the township town. Health intervention initiatives will occur through existing service providers: doctors, women's committees, and through school programs.

I. Key Lessons Learned

50. There are five key lessons from this project that have been taken into consideration during the preparation of the follow-on National Rural Water Supply Project (Cr. N027-CHA) and Fourth Rural Water Supply and Sanitation Project (Ln. 4485-CHA/Cr. 3233-CHA). First, long-term loans to poor villages can complement village resources to sustainably and significantly improve water supply. The project demonstrates that government capital subsidies (if needed at all) can be substantially lower than typically argued for when discussing improved rural water for the poor. What the project does not reveal is how much of the success reflects the social capital built up during the era of collective action in Chinese villages during their now-ended period of communal organization. Second, demand for improved latrines is correlated with higher income levels, and, in contrast to improved water supply, the income levels of the rural poor in this project were too low to support the latrine improvement strategy. Third, investing in model villages is not a successful strategy for yielding demonstration effects when the external government financing needed to construct the model is not available to other villages seeking to replicate the model. Fourth, training of water plant managers, operators and accountants is critical to the sustainability of the water plant subprojects and proceeds of the Credit should be made available to ensure that adequate training is taking place. Fifth, intensified traditional approaches to health education have reached a saturation point. In order to increase the acceptance of health messages and behavior modification, the inhibitors for improved practice must be identified, and the health education program modified accordingly.

PART II: STATISTICAL TABLES

TABLE 1: SUMMARY OF ASSESSMENTS

A. Achievement of Objectives	Substantial	Partial	Negligible	Not Applicable
Macroeconomic policies				✓
Sector policies		✓		
Financial objectives	✓			
Institutional development	✓			
Physical objectives	✓			
Poverty reduction				✓
Gender issues				✓
Other social objectives				✓
Environmental objectives				✓
Public sector management				✓
Private sector development				✓
Other (specify)				✓

B. Project Sustainability	Likely	Unlikely	Uncertain
	✓		

C. IDA Performance	Highly Satisfactory	Satisfactory	Deficient
Identification		✓	
Preparation assistance		✓	
Appraisal		✓	
Supervision		✓	

D. Borrower Performance	Highly Satisfactory	Satisfactory	Deficient
Preparation	✓		
Implementation		✓	
Covenant compliance		✓	
Operation (if applicable)			

E. Assessment of Outcome	Highly Satisfactory	Satisfactory	Unsatisfactory	Highly Unsatisfactory
		✓		

TABLE 2: RELATED BANK GROUP LOANS/CREDITS

Loan/Credit Title	Purpose	Year of Approval	Status
Preceding operation			
Cr. 1578-CHA Rural Water Supply Project	Water supply; health education to rural areas	1985	Closed
Following operations			
Cr. N027-CHA National Rural Water Supply Project	Water supply; sanitation/health education to poor rural areas	1997	Implementation
Ln. 4485-CHA/Cr. 3233-CHA Fourth Rural Water Supply and Sanitation Project	Water supply; sanitation/health education to poor rural areas	1999	Board completed, not yet signed

TABLE 3: PROJECT TIMETABLE

Steps in project cycle	Date planned	Date actual/latest estimate
Identification (Executive Project Summary)	N/A	April 1990
Preparation	N/A	1990/1991
Appraisal	N/A	May-June 1991
Negotiation	N/A	December 1991
Board presentation	N/A	February 11, 1992
Signing	N/A	April 10, 1992
Effectiveness	N/A	July 23, 1992
Project completion	December 1997	December 1998
Loan closing	April 1998	December 31, 1998

TABLE 4: LOAN/CREDIT DISBURSEMENT: CUMULATIVE ESTIMATE AND ACTUAL /a

($ million)

	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Appraisal estimate	26	51	76	94	107	110	
Actual	7.00	41.38	47.78	77.84	99.34	110.63	112.42/b
Actual as percent estimate	26.92	81.14	62.87	82.81	92.84	100.57	100.0
Date of final disbursement	08/03/93	06/29/94	07/27/95	06/24/96	07/11/97	03/24/98	05/24/99

/a Data from World Bank Group Loan Department.
/b Actual disbursed amount differs from the appraisal estimate due to changes in SDR/US dollar exchange rate.

TABLE 5: KEY INDICATORS FOR PROJECT IMPLEMENTATION

Not applicable for this project.

TABLE 6: KEY INDICATORS FOR PROJECT OPERATIONS

Not applicable for this project.

TABLE 7: STUDIES INCLUDED IN PROJECT

None

TABLE 8A: PROJECT COSTS
(Y million)

Item	Appraisal estimate			Latest estimate (6/30/98)		
	Local	Foreign	Total	Local	Foreign	Total
Water supply	319.3	322.7	642.0	549.0	666.7	1,215.7
Sanitation construction	31.3	0.0	31.3	43.9	0.0	43.9
Health and hygiene education	22.8	9.7	32.5	15.3	5.5	20.8
Technical assistance and training	26.9	8.4	35.2	7.4	2.6	10.0
Institutional establishment and project management	25.8	6.6	32.4	67.9	19.4	87.3
Total Base Cost	**426.1**	**347.3**	**773.4**			
Contingencies	177.0	144.1	321.2			
Total Project Cost	**603.1**	**491.5**	**1,094.6**	**683.5**	**694.2**	**1,377.7**

TABLE 8B: PROJECT COSTS
($ million)

Item	Appraisal estimate			Latest estimate (6/30/98)		
	Local	Foreign	Total	Local	Foreign	Total
Water supply	60.1	60.8	120.9	66.8	81.0	147.8
Sanitation construction	5.9	--	5.9	5.3	0	5.3
Health and hygiene education	4.3	1.8	6.1	1.9	0.7	2.5
Technical assistance and training	5.1	1.6	6.6	0.9	0.3	1.2
Institution establishment and project management	4.9	1.2	6.1	8.2	2.3	10.6
Total Base Cost	**80.3**	**65.4**	**145.6**			
Contingencies	23.9	19.5	43.5			
Total Project Cost	**104.2**	**84.9**	**189.1**	**83.1**	**84.4**	**167.5**

TABLE 8C: PROJECT FINANCING
($ million)

Item	Appraisal estimate			Latest estimate (6/30/98)		
	Local	Foreign	Total	Local	Foreign	Total
IDA	25.1	84.9	110.0			84.9
Domestic contribution	79.1	-	79.1			82.6
Total	**104.2**	**84.9**	**189.1**			**167.5**

TABLE 9: ECONOMIC COSTS AND BENEFITS

Not applicable.

TABLE 10: STATUS OF LEGAL COVENANTS

Agree-ment	Section	Cove-nant Type	Present Status	Original fulfillment date	Revised fulfillment date	Description of covenant/a	Comments
DCA	3.04	1	C			Borrower to open and maintain six provincial revolving accounts, each of an amount equivalent to three months' local expenditures by 4/30/92	
DCA	4.01(a)(i)	1	C			Borrower to maintain records and accounts of central components	
DCA	4.01(a)(ii)	1	C			Borrower to consolidate the audit of records and accounts of provinces.	
DCA	4.01(b)	1	C			Borrower to furnish annual audit reports including those of Special Account no later than six months after the end of each fiscal year.	
DCA	Sch.3.1	5	C			Borrower to maintain NPO with staffing and functions satisfactory to IDA.	
DCA	Sch.3.2	9	CD			Borrower to prepare and consolidate annual project implementation plan (PIP for the following year for IDA's review and approval by Oct.15 each year).	
DCA	Sch.3.3	5	C			Borrower to publish design manuals for nonpiped water supply facilities and sanitation facilities.	
DCA & PA	Sch.3.4 Sch.2.II.2	9	C			Responsibility for review of water supply system designs are : NPO: Y 2.0 million or more; PPO:>Y 500,000 - <Y 2.0 million; CPO: Y 500,000 or less	
PA	3.01(a)	1	C			Provinces to maintain records and accounts of activities and transactions within its jurisdiction.	
PA	3.01(b)	1	C			Province to furnish annual audit reports no later than six months after the end of each fiscal year.	
PA	Sch.I.I.A.2	10	C			ICB goods contract to be grouped in bid packages of $200,000 or more.	
PA	Sch.I.I.C	10	C			For civil works, > $400,000: by NCB, < $400,000: by local shopping with at least three quotations, <$20,000: by force account with aggregate total no more than $13.5 million. Total local shopping and force account not to exceed $ 63.0 million.	
PA	Sch.I.D.I	9	C			IDA to review contracts above $500,000 for goods and $2.0 million for civil works. Contract to be furnished to IDA prior to first payment out of Special Account.	
PA	Sch.2.1	5	C			Province to maintain PPO and CPOs satisfactory to IDA.	
PA & Minutes of Neg.	Sch.2.II.1	9	CD			Province to prepare annual PIP for following year by Sep. 1 of each year. PIPs to include information on high fluoride > 2.0 mg/liter villages.	
PA	Sch.2.II.3	3	C			Provinces to onlend credit at: maximum maturity of 20 years including 5 years grace; interest of 4% a year; provinces to bear all foreign exchange risks.	
PA	Sch.2.II.4	2	CP			Water charges to cover full O&M costs and depreciation or credit repayment, excluding grants from government.	

Covenant Class:
1 = Accounts/audits
2 = Financial performance/revenue generation from beneficiaries
3 = Flow and utilization of project funds
4 = Counterpart funding
5 = Management aspects of the project or executing agency
6 = Environmental covenants
7 = Involuntary resettlement
8 = Indigenous people
9 = Monitoring, review, and reporting
10 = Project implementation not covered by categories 1-9
11 = Sectoral or cross-sectoral budgetary or other resources allocation
12 = Sectoral or cross-sectoral policy/ regulatory/institutional action
13 = Other

Status:
C = covenant complied with
CD = complied with after delay
CP = complied with partially

Abbreviations:
NCB = National Competitive Bidding
PIP = Project Implementation Plan

/a Description of covenant includes the original fulfillment date.

TABLE 11: COMPLIANCE WITH OPERATIONAL MANUAL STATEMENTS

There was no significant lack of compliance with an applicable Bank Operational Manual Statement (OD or OP/BP)

TABLE 12: IDA RESOURCES: STAFF INPUTS

Stage of project cycle	Actual /a	
	Weeks	$'000
Preparation to appraisal	102.1	302.9
Appraisal	21.1	73.2
Negotiations through Board approval	7.1	25.6
Supervision	111.6	362.3
Completion /b	14.5	25.0
Total	**256.3**	**789.0**

/a IDA management information system did not record the planned staff-weeks and planned cost.
/b Completion figures are estimates only; actual figures not yet known.

TABLE 13: BANK RESOURCES: MISSIONS

Stage of project cycle	Month/year	No. of persons	Days in field	Specialized staff skills represented	Performance rating /a		Types of problems
					IP/b	DO/b	
Through Appraisal	N/A	N/A	N/A	Financial, engineering, economic, sociology, health education, environment	N/A	N/A	N/A
Appraisal through Board approval	May-Jun 1999	6	N/A	Financial, engineering, economic, sociology, health education	N/A	N/A	N/A
Supervision /c	Jun 1992	5	6	Financial, engineering, sanitation	N/R	N/R	Project Launch Workshop
	Jul-Aug 1993	6	21	Financial, engineering, sanitation, health	2	1	Pass through of foreign exchange risk to county; slow ICB preparation
	Jul-Aug 1993	5	16	Financial, health education, engineering, sanitation	1	1	ICB procurement delay, counter part fund delay, shortage of project office staff.
	Jul 1994	4	22	Health education, economic, engineering	S	S	Some project offices not adequately staffed; lack of NPO funding.
	Oct 1994	1	2	Economic	N/A	N/A	Informal discussions with Borrower in Beijing; ICB procurement delay, and lack NPO office funding.
	Apr 1995	1	2	Economic	U	S	Overall project delay due to slow ICB, lack of counterpart funds
	Nov 1995 & Jan-Feb 1996	4 4	19 30	Financial, engineering, economic, sociology, health education	S	S	Mid-term review; some counterpart funding delays; one year lag in water supply program; slow adoption of latrine program
	Oct-Nov 1996	7	13	Financial, engineering, economic, sociology, health education	S	S	Slow adoption of latrine program; one year lag in water supply program
	Nov 1997	3	8	Financial, engineering	S	S	Poor financial records; poor operational management
	Jan 1998	3	8	Financial, engineering	S	S	No problems in Guangxi
	Sep 1998	6	15	Financial, engineering, economic, sociology, health education	S	S	Possible misprocurement; poor financial records; tariff not covering debt service in some cases
Completion	Nov-Dec 1998	6	13	Financial, engineering, economic, sociology	S	S	Tariff not covering debt service in some cases, possible misprocurement

/a 1: Highly satisfactory; 2: Satisfactory; U: Unsatisfactory; S: Satisfactory.
/b IP: Implementation status; DO: Development objectives.
/c Since project task management transferred to the Resident Mission in February 1998, numerous meetings have taken place during which project issues were discussed. These meetings, which impact project supervision, are not shown in the table.

ANNEX A: BORROWER'S CONTRIBUTION TO THE ICR

I am very glad to inform you that NPO agrees, in principle, the ICR text agreed by the two sides through talking on the line on June 25, 1999. The effort and the sprit of cooperation made by the Bank are really appreciated.

Besides, I also want to inform you of the NPO's comments on the ICB management, i.e., to the causes for ICB procurement delay, NPO and the Bank should commonly shoulder the responsibilities. Especially in the process of ICB 1 and 2, NPO did not finish the bidding documents in line with the requirements of the Bank, as led to the delay of goods supply, hence hindered the overall progress of the project. On the Bank's side, the frequent change of task manager, too long the time of reviewing and approving the bidding documents, frequent changes of procurement experts, and different standards of reviewing and approving all bring impact to the ICB procurement delay. For example, after the review and confirmation of the first ICB bidding documents by the Bank, the procurement was completed. Yet, the second ICB procurement for the same goods/ materials/equipment, with the same bidding documents in use, was asked by a new expert of reviewing and approving the procurement to be changed greatly on its format, as is one of the causes of ICB procurement delay. This lesson is also to be learned.

ANNEX B: ICR MISSION'S AIDE MEMOIRE

November 23 to December 4, 1998

AIDE-MEMOIRE

A. INTRODUCTION

1. An IDA mission consisting of Ms. Dawn Vermilya (mission leader/financial analyst), Mr. George Plant (sanitary engineer), Mr. Mark Wu (project analyst), Mr. Charles Andrews (water supply specialist), and Ms. Li Xiaofeng (project assistant), visited Inner Mongolia and Yunnan between November 23 to December 4, 1998, to conduct the implementation completion mission (final supervision mission) for the Rural Water Supply and Sanitation Project (RWSS). Mr. Guy Alaerts (water quality specialist) accompanied the mission in Inner Mongolia to review fluoride issues, and Mr. Huang Ping (sociologist) accompanied the mission in Yunnan to review health education, sanitation and beneficiary participation issues. In each province and autonomous region the mission met with provincial leaders to discuss provincial project issues. Meetings were also held with the National Project Office (NPO), Inner Mongolia and Yunnan Autonomous Region Project Offices (PPOs), and the Tuoketuo and Baoshan County Project Offices (CPOs). A wrap-up meeting with the NPO, SDPC and MOF was held on December 10, 1998.

2. The mission expresses its sincere appreciation to the provincial leaders, NPO, PPOs, CPOs and officials of other agencies for the assistance and cooperation provided the mission. In particular, meeting arrangements with the Inner Mongolia Epidemiological Station and fluoride and arsenic specialists were valuable to the mission. This aide-memoire summarizes the findings and recommendations of the mission, as well as next steps on further preparation of the Implementation Completion Report. The main text of the aide-memoire deals with project-wide issues. A list of persons met is attached as Annex 1. Annex 2 is the government's draft Operational Plan for the project. Annex 3 is a summary of the mission findings on the status of fluoride contamination, monitoring and treatment in Inner Mongolia. Annex 4 is a summary of the audit irregularities to be addressed. Annex 5 contains Bank's advise on institutional arrangements for the water systems during the operational phase. The mission bases its views on the most recent national progress report as of June 1998 and site visits during the past year to Guangxi, Xinjiang, Gansu, Inner Mongolia and Yunnan (the Hunan visit was cancelled due to severe flooding).

B. PROJECT IMPACTS

3. In terms of physical achievement, the mission considers the project to be highly satisfactory. Based on the mid-term 1998 Progress Report, project beneficiaries total 7.92 million, but it is expected that by project close on December 31, 1998 the original target of 9.097 million beneficiaries will have received safe and sufficient drinking water, and this is further evidenced by the final connection rates seen in Inner Mongolia and Yunnan of 100% and 99%, respectively. A total of more than 2400 pipe water systems and 70,000 hand pumps and cisterns

will have been constructed by project close. The capacity of the systems built allows for future expansion to cover up to about 12 million beneficiaries. Where improved water supply systems have been installed and complemented by health and hygiene education and improved sanitation facilities, clear benefits have accrued to the beneficiaries. The nature of these benefits vary depending on the initial water and health problems. The problems addressed in this project have been numerous and include: seasonal lack of water, polluted water sources, high fluoride and arsenic content water, remotely located water sources, high levels of dysentery, hepatitis and other water-borne diseases. The more dramatic the original water problem, the greater the accrued benefits have been to the village beneficiaries, but in almost all cases beneficiaries view the project as having substantially reduced their time to fetch water and/or improved their families' long-term health. Physical targets for health and hygiene education training and project office staff training are also likely to be fully realized, if not exceeded. The revised estimates for the sanitation program are also likely to be met, if not exceeded. Based on the improved emphasis on training, the mission upgraded the status of training from unsatisfactory to satisfactory.

4. Concerning institutional establishment and long-term sustainability of project assets, the mission is concerned with the deterioration of both cost recovery levels and water system maintenance practices seen in the past two missions. Based on the findings of the last two missions, the Bank is concerned that unless improvements are made on both counts a significant portion of the piped water systems will have a reduced service life and therefore reduce the project's future impact. For this reason, the mission downgraded the status of financial covenants (cost recovery) from satisfactory to unsatisfactory. Further investigation is expected to clarify the extent of the problems with cost recovery and the underlying reasons at which time the status of financial covenants may be reverted to satisfactory.

5. Beneficiary participation though modest during the feasibility and design stages, has had a strong impact in altering the type of water supply system received-- hand pump systems were converted to piped water systems, and in reducing the scale of the sanitation program -- it was cut in half. This reflects beneficiaries increased ability to pay for a higher service standard, and beneficiaries have contributed well over 25% of the upfront project costs, plus have paid substantial amounts to cover the costs of house hold connections (these costs are outside the project scope) and continue to support the majority of systems through substantial tariff payments. Beneficiaries have shown much less willingness to invest their own funds and time in upgrading their private sanitation facilities.

6. The Borrower provided its views on implementation phase of this project. As of June 30, 1998, 2318 water plants have been constructed, 87.27 percent of the original plan have been finished. 8.89 million rural residents have been benefiting from the project. During last five years, 84 demonstrative villages have been established. Local beneficiaries benefited from the improved sanitation and health education and initiated to set up 12 demonstrative villages and 7,124 household latrines in non project areas. Through project implementation, economic benefits and social impact has improved remarkably as well as having access to improved water. A survey conducted by the NPO shows about 203 water plants revenue exceed their cost; 960 water plants are not fully covering their operation and depreciation costs. Hunan, Guangxi and Xinjiang have fared the best on cost recovery. The Borrower thinks government subsidies can solve the cost recovery issue.

C. PROJECT MANAGEMENT

Project Offices

7. The National Project Office is an experienced team but is understaffed to meet the needs of simultaneously implementing two projects and preparing a third project and managing the other responsibilities of the NPHCC's water supply program. In general, the provincial project offices visited in Inner Mongolia and Yunnan have reasonable staff levels and competency. The Yunnan and Inner Mongolia PPO staff levels are presently stressed because they have been implementing two projects at the same time (RWSS and NRWS) but this is expected to improve soon with the completion of RWSS. County Project Offices visited vary in capacity, but generally the staff employed are qualified and diligent. In most project offices visited there was little turnover of technical staff during the project.

Disbursements and Reallocation of Credit Proceeds

8. As of February 8, 1999, the Credit has disbursed SDR 112,156,709.97 (US$ 78,708,620.87 equivalent). This represents 99.8% of the Credit. The Bank received a request from the Ministry of Finance on November 16 to reallocate credit proceeds from the Goods, Consulting Services & Training and Unallocated categories to Civil Works. The Bank reallocated the Credit proceeds as requested before project close on December 31, 1998.

Audit Findings

9. County audit reports in the five provinces (except for Hunan) have been reviewed during the past two missions. County audit reports have in many cases provided good detail on problem areas and areas for improvement, but some have been weak in identifying procurement related problems (see para. 23). The mission requests that the audit discrepancies in Annex 4 for Yunnan and Inner Mongolia's 1997 audit reports be explained or rectified before April 15, 1999. Based on the responses, Association management will decide whether Credit proceeds should be returned to the Association.

D. HEALTH EDUCATION AND SANITATION

Health Education

10. By June 30, 1998, more than 8.1 million people had been trained under the project of which 43% were men, 36% were women and 20% were children. In addition, almost 192,000 people have been trained as trainers and are capable of continuing to spread the health messages generated under the project. The largest group trained for this purpose are community women, totaling more than 127,000.

11. In a Yunnan report, based on sampling interviews and observation, it appears that behavior changes have been significant when compared with baseline survey data. Use of latrine has risen for housewives from 91.6% to 95.2%, and for school-aged children from 43.6% to 85.95%. The incidence of washing hands before eating has risen for housewives from 2.9% to 83.2%, and for school children from 55.7% to 97.5%. Drinking boiled water among housewives has risen from 15.8% to 74.7%, and among school children from 24.8% to 93.39%. As the report realizes, there may be many other factors such as socio-economic development which have played roles in these behavior changes, but nonetheless the project itself did help beneficiaries to

improve their hygiene behavior and sanitation environment. The mission recommends that all project counties and provinces include such survey results in their completion report.

Sanitation

12. Sanitation targets (revised at mid-term) have been exceeded. As of June 30, 1998, latrine coverage has reached 106% of target, animal enclosures have met its target, garbage dumps and drainage canals have exceeded targets. In total, 75 demonstration villages have been completed, which meets the targets set at the mid-term review.

E. FINANCIAL PERFORMANCE

Project Expenditures

13. As of June 30, 1998 project investment totaled Y1,378 million, or 126% of original estimate. Total project investment as of December 31, 1998 is expected to rise to about 150% of the original estimate once the reallocation takes place, and civil works and ICB allocations are finalized. About 88% of project investments have been spent on water supply, to date.

Counterpart Funds

14. As of June 30, 1998 counterpart financing had reached 93% of the revised commitment levels (commitment levels were revised upward by 39% at Mid-term Review). Both Xinjiang and Yunnan have performed very well and have surpassed their targets by 137% and 105%, respectively. Beneficiaries in all provinces have exceeded their planned contributions (both cash and in-kind) by an average of 124%.

Cost Recovery

15. As of June 30, 1998 the Progress Report showed that average water charges did not cover average water costs (O&M and debt service) in Inner Mongolia and Yunnan, and Gansu did not report on the matter. This in combination with the site inspection in Baoshan County, Yunnan, which showed a general problem with cost recovery, especially to cover the debt service, has prompted the mission to seek further clarification on the extent of the problem. After reviewing three sites in Baoshan, the mission concluded that in two cases relatively small tariff increases would be required to meet debt service repayment responsibilities and the third plant would need a more substantial increase to the same level as anticipated for the other plants.

16. During its mission, the team observed three main areas which contribute to the cost recovery difficulties in Yunnan. First, in many instances, facilities were overdesigned. The water consumption estimates used for planning purposes were unrealistically high, and in reality, plants may be operating at only half of their actual capacity. Residents in many areas are still resorting to their original water sources for tasks such as washing their clothes, bathing, and feeding the animals, and using the new improved water for drinking and cooking purposes only. Second, in many areas, there are problems with collection of tariffs. In a number of plants visited during the mission, tariffs were collected only on one-third to one-half of the water actually produced. Inadequate tariff collection appears to stem from two sources: water theft and lapses in collection time. In a number of instances, villagers have determined techniques to obtain water without activating their meters, and using this stolen water to irrigate their fields. Also, there are extended gaps in between collection times in some villages, with the end result that the tariffs are not

collected on water used during this gap period. Finally, a possible third cause of cost recovery difficulties is that beneficiaries do not appear to understand that their new systems were financed through World Bank loans and need to be repaid through tariff collections. This was not explained to them at the time of the systems' construction, nor were initial tariffs set high enough for them to understand this. This may therefore contribute to their willingness to steal water and their poor efforts in tariff collection.

17. The mission requests that Yunnan and Inner Mongolia Autonomous Region Project Offices to report by March 15, 1999 the name of the facilities not meeting cost recovery terms, the number of beneficiaries affected, and whether the plant is currently earning enough through revenues to cover operations and maintenance and a portion of debt service, or whether the revenues don't even cover debt service in an attempt to further clarify the situation.

Financial Management of Water Systems

18. The mission found the quality of financial management to be highly variable atthe water plants which it visited and would recommend further financial training of staff at water plants in both Inner Mongolia and Yunnan. While in some instances, extensive receipts were kept of expenses and tariff collection, in others, staff had poor records and no knowledge of debt repayment obligations. The mission also found one instance in Inner Mongolia of funds for a water plant being kept in a personal bank account, and reminds project offices to notify plant staff that funds must be kept in a separate official bank account. In another case in Yunnan, the bank account statement didn't reconcile with the cash balance (apparently because household meters had been purchased by the water plant to provide to households free of charge to encourage them to return to a metering system). Also, provincial and county project officials should pass on relevant information concerning the schedule of debt repayment to water plant staff in order to better help them assess their financial situation. In Inner Mongolia, water plant account staff were frequently not available and records sometimes locked away.

F. TECHNICAL SUSTAINABILITY

Engineering

19. Design and construction of water supply systems is generally satisfactory. Engineering aspects may impact service sustainability as follows:

- Some system designs may not represent "least cost options". But this applies only to water abstraction and transmission capacity, and is probably not significant vis-à-vis service affordability and willingness-to-pay.
- Apparently optimistic billable water consumption design parameters have resulted in actual operating levels significantly below design capacities. It is probably too early to tell whether this under-utilization is a permanent state and thus a result of system "overdesign".
- Certain "outlier" engineering deficiencies may shorten the service-life of individual water plants, or compromise water quality unless rectified, e.g. improperly installed main meters, well heads not sealed, poor ventilation and drainage at installations, improperly installed household meters.

PPO and CPO Design and Construction Supervision

20. Construction supervision appears to have been adequate. But some sub-project feasibility studies have clearly not evolved appropriate, least cost service options for consumers. This

reflects upon CPOs' design capabilities, and the PPO's supervision performance. This is a key area for improvement in subsequent projects.

Operations and maintenance

21. Water plants are presently delivering a reliable service of clean water to satisfied consumers. But O&M practices and regimes need to be improved to ensure the continuation of these service levels, particularly production monitoring and recording, certain key preventative maintenance procedures, ability to carry out basic repairs, and water disinfection.

Effectiveness of operations and maintenance training

22. O&M training has not yet achieved requisite O&M competencies and incentives amongst water plant operators and managers. More training and constant retraining will be necessary. Water plant staff turnover has been high, particularly amongst accountants.

G. PROCUREMENT

23. In both counties visited the method used for procurement of civil works above the force account limit was not in accordance with World Bank guidelines. In Tuoketuo County non-force account civil works contracts were negotiated and in Baoshan County the Government of China procurement regulations were followed and marking was used. The Bank asked for and received reports from both counties to better determine the effect of the procurement practice used on the final selection of contractor and on the difference of the contract price to that of the engineering design cost. The mission will forward its findings to Bank Management for guidance on whether the procurement practices as constitute misprocurement. Due to these findings the mission has downgraded the project's procurement status from satisfactory to unsatisfactory.

H. FLUORIDE AND ARSENIC CONTAMINATION IN WB-FINANCED INVESTMENTS

24. In Inner Mongolia, fluoride and arsenic are found in many aquifers, often in concentrations exceeding national standards. Annex 3 provides an overview of the current knowledge regarding the occurrence of fluoride and arsenic, and the technological options for their removal.

25. Tuoketuo County is generally considered a "hot spot" for fluoride and, to a lesser extent, for arsenic. Fluoride would occur in different concentrations in different places but be of a county-wide concern, whereas high arsenic concentrations were found in only some of the villages. Not all wells or villages have been analyzed for arsenic as yet, but the (now derelict) shallow wells in Naizegai have arsenic levels that exceed the standards. In addition, ample evidence shows that the shallow wells, which were before the project the means of the rural population to have access to water, had been supplying water with a substantially higher fluoride concentration than the deeper wells that have been installed by the project. The county Anti-Epidemic Disease Station samples all water plants twice annually and follows the development of the fluoride concentration since several years. The record on arsenic is less complete so far. None of the water plants under this project is reported to contain arsenic in levels exceeding national standards.

26. The mission gave particular attention to three water plants containing too high fluoride levels (Yongshengyu, Dabeiyao and Masiyao). Although the CPO believes that the analysis results suggest a gradual deterioration of the fluoride contamination over the past two or three years, the mission rather concluded that the scatter in the analysis results suggests that the trend is not statistically significant.

27. The mission inspected a small filtration pilot plant for fluoride removal based on the "boiled stone" technology of Hohhot University (see Annex 3) in Yongshengyu. Three months of experimenting have been concluded and data are currently being analyzed. If this material proves to be an effective adsorbing medium, the CPO will install full-scale filters in the mentioned water plants. Importantly, the CPO has agreed earlier to not consider installing household-based filters because such decentralized treatment may be less reliable and more costly in view of the fact that the filter's operation does require a minimum of technical capacity and diligent operation. Concern exists about the technical feasibility, the cost, and the institutional complexity of the fluoride removal technologies in rural water supply. This argues against early investment in additional fluoride removal filters.

28. It is recognized that all plants still yield water with some fluoride, of which the concentration in some cases exceeds the standards. However, also in the latter cases the fluoride content of the new water supply is much lower than in the pre-project situation. Because the disease incidence and seriousness are directly proportional to the daily intake of fluoride (and arsenic), it can be concluded that the project has led to a substantial improvement in the quality of the drinking water, and hence, has a positive impact on health. Installing fluoride removal filters, of which the feasibility remains to be demonstrated, has a high opportunity cost as many counties in Inner Mongolia have not yet been equipped with improved water supply. Therefore, the project has been cost-effective.

29. It is recommended that the County Anti-Epidemic Disease Station analyzes the water of the plants on an annual basis only but in a more systematic fashion for both fluoride and arsenic, and that the accuracy of the analyses is improved. An important objective of this monitoring is to detect at an early stage any new leaching of the contaminants from the soils into the wells. Similarly, the efforts to develop a feasible and cheap method for fluoride removal in the rural setting should be stepped up. It is suggested that the World Bank could consider providing financial assistance for this purpose under a subsequent rural water supply loan.

I. INSTITUTIONAL ARRANGEMENTS FOR SUSTAINABILITY OF PROJECT INVESTMENTS

30. The National Project Office has prepared a draft Operational Plan which is in Annex 2.

31. The provincial and county leaders encountered had given considerable thought as to what type of institutional arrangements would safeguard the assets created under the project, provide a channel for loan repayment, provide training and service assistance to water plant staff, and continue the health education initiatives. In previous missions, the Bank had been informed that where budgets permitted counties would like to retain the CPOs, but expand their responsibilities to cover all rural water systems in the county. They would be responsible for new construction but would expand their capacity to focus more on maintenance of the completed systems. During this mission, however, the mission was informed that the Government's personnel reorganization (designed to cut Government staff levels by 40-50%) would mean that CPO's may not be able to

continue to receive Government budget allocations. The two provinces visited stated that they were still reviewing their options, but that converting the CPOs into Rural Water Supply Factories or Companies (RWSCs) was one option they were considering. Apparently, the change of legal status would allow for Government budget support for at least the next couple of years. Other than purchasing spare parts and selling these to the water plants as requested (with no markup), the provincial and county leaders had no intention of charging a "service fee" to provide maintenance and repair services or for training of staff. The mission encourages the CPOs and PPOs to consider charging small service fees soon, so that as Government budgets decline a separate revenue base could be built. In addition, transfer of all fixed assets will be completed by Project Close, with the ownership of most systems residing with village committees or township governments (in the case where a system covers multiple villages). Health intervention initiatives will occur through existing service providers: doctors, women's committees, and through school programs. Bank reviewed with the Borrower international experience of alternative institutional arrangements during the operational phase of the project (see Annex 5).

J. ICR PREPARATION STEPS

32. The mission discussed preparation steps for the ICR in detail with the staff from the NPO. The mission provided NPO with (i) a Chinese version of the World Bank's ICR Preparation Good Practices, and (ii) an outline for the Operational Plan (see Annex 2). The mission requests that the draft of this Operational Plan be provided to the Bank by end mid-March 1999 for its comments, and a final version by end April 1999. By March 15, 1999 the World Bank should supply a draft of the Implementation Completion Report to NPO for its review and comments. By March 15, 1999 NPO should provide a draft of its Evaluation Report to the Bank and its final version by May 15, 1999. The ICR will be published by June 1999.

ANNEX B

ANNEX 1

PERSONS MET

Mr. Chen Huan	Deputy Division Chief, Ministry of Finance
Ms. Hou Yan	Division Chief, State Development and Planning Commission
Mr. Zhang Yiren	Standing Deputy Director, NPO, CRWSSP
Mr. Liu Jiayi	Deputy Director, NPO, CRWSSP
Mr. Luo Fengji	Deputy Division Chief, NPO, CRWSSP
Mr. Shi Risheng	Deputy Division Chief, NPO, CRWSSP
Mr. Zhao Zhenrong	Acting Division Chief, NPO, CRWSSP
Mr. Meng Shuchen	Division Chief, NPO, CRWSSP
Mr. Wang Zhanshe	Interpreter, NPO, CRWSSP

Inner Mongolia Autonomous Region

Mr. Bao Jinsheng	Deputy Director, Autonomous Region Health Bureau
Ms. Li	Division Chief, Autonomous Region Financial Bureau
Ms. Bao Lanman	Project Officer, Autonomous Region Financial Bureau
Mr. Guo Yigang	Director, PPO
Ms. Li Wenhua	Director, Hohhot Project Office
Ms. Guo Yaqin	Accountant, PPO
Mr. Qi Yibin	Accountant, PPO
Mr. Zhang Ziyuna	Project Officer, PPO
Mr. Kou Wenhua	Project Officer, PPO
Ms. Ren Lihua	Interpreter

Tuoketuo County

Mr. Zhao Zhenbing	Magistrate
Mr. Yue Gaohui	Secretary General
Mr. Jiang Shouzhi	Chairman, County People Congress Commission
Mr. Gao Shanfeng	Deputy Magistrate
Mr. Kang Xiaohu	Deputy Magistrate
Mr. Zhai Zhenxiong	Director, CPO
Ms. Ma Yuzhen	Deputy Director
Mr. Liu Guoping	Engineer, CPO
Mr. Li Guanghu	Accountant, CPO
Mr. Fu Lianyao	Project Officer, CPO
Mr. Li Zhenbi	Project Officer, CPO

Yunnan Province

Mr. Yang Chaobin	Deputy Director, Provincial Health Bureau
Mr. Lu Yunsong	Deputy Division Chief, Provincial Development and Planning Commission
Mr. Du Biao	Deputy Division Chief, Provincial Development and Planning Commission
Ms. Lu Xuefan	Project Officer, Provincial Development and Planning Commission
Ms. Shen Fan	Project Officer, Provincial Finance Bureau

Mr. Zhao Hongshen	Acting Director, PPO
Mr. Wan Jixin	Accountant, PPO
Mr. Luo Yanghang	Engineer, PPO
Ms. Yang Xuemei	Accountant, PPO
Mr. Zeng Qingyun	Interpreter

Baoshan County

Mr. Yang Jingjian	Mayor
Mr. Chen Xuefan	Vice Mayor
Mr. Yu Zhiqiu	Director, City Bureau
Mr. Yang Zhengjun	Deputy Director, City Finance Bureau
Mr. Li Jiabin	Project Officer, City Finance Bureau
Mr. Huang Jian	Deputy Director, City Planning Bureau
Mr. Yang Yuhui	Deputy Director, Prefecture Health Bureau
Mr. Gao Zhixian	Director, City Health Bureau
Mr. Yu Yingbo	Deputy Director, City Health Bureau
Mr. Zhao Weidong	Director, CPO
Mr. Zhang Yanglin	Deputy Director, CPO

ANNEX 2

DRAFT OPERATION PLAN

The National Project Office (NPO) conducted a water plant operation survey in December 1998. Based on the survey, NPO thinks all water plants should strengthen operational management and technical assistance because sustainability is critical to this project. In order to better operational performance in the future, NPO drafted the following operation plan:

1. Water plants, in which water supply production hasn't reached full capacity, should strengthen mass mobilization, encouraging local peasants to adopt household connections, so that the water plant's revenue can cover its costs. NPO will coordinate local governments to speed up household connections and increase beneficiaries.

2. In most water plants water is not regarded as a kind of commercial good, which is the key reason why water plant's revenue does not cover their costs. NPO will strengthen training for trainers in order to instill the concept that water is a commercial good. In the meantime, training courses should particularly focus on financial management.

3. Regarding CPOs conversion, there are three options at present. One is to continue the existing CPOs operation if possible. NPO prefers this option because CPOs are very familiar with the project and sustainability can easily be assured if management is strengthened and service levels are improved. Converting the CPOs into Rural Water Supply Factories or Companies is the second option. The last option is to transfer all fixed assets to townships or towns and water plants will be managed and operated by townships or towns.

NPO is considering the conversion and functions of CPOs and water plants as one of the most important matters. NPO will discuss these issues with related agencies and hope they can be solved during the provincial/prefecture and county governments' institutional reform.

ANNEX 3

FLUORIDE AND ARSENIC CONTAMINATION OF GROUNDWATER IN INNER MONGOLIA

A substantial part of the Inner Mongolia region is known to have groundwater aquifers containing moderate to high concentrations of fluoride. In addition, in specific areas the groundwater also has been reported to contain high concentrations of arsenic.

The region contaminated with fluoride is identified to cover a 60-160 km wide belt that runs west to north-east over a distance of approximately 1,400 km, from west of Linhe to Chifeng and Ulanhot. In shallow groundwater, concentrations can vary from below 0.7 to well above 4 mgF/l. Some areas in this belt are to be considered "hot spots", with a high proportion of the wells (more than 50% of those tested) containing fluoride concentrations of 2-4 mg/l. Among those hot spots are Tuoketuo (Togtoh) County and possibly small parts of adjacent counties.

Five areas are reported to be contaminated with arsenic: a small zone close to Chifeng; a strip of contingent counties including Tuoketuo County, the western part of Helinger (Hohinger) County that borders Tuoketuo County, and Tumd Right-banner (Youqi) County which lies between Tuoketuo County and Guyang County; larger areas in the Bao Meng region (between the Yin Shan mountain range and the Yellow River, around Baotou and Wuyuan); areas west of Bengkou; and some areas on the Loess Plateau across the Yellow River south of Bao Meng. In contrast to the other areas, Chifeng lies some 600 km to the east of Hohhot and is clearly isolated from the other contaminated areas, which all lie to the west of Hohhot. The arsenic contamination near Chifeng is of a very localized nature and is limited to spring water, which suggests a mineralogical origin. The arsenic presence west of Hohhot is of a more diffuse nature and seems associated with both the shallow and deep alluvial sediment layers. Typically, the shallow layers (5-25 m deep) and their groundwater tend to have higher fluoride and arsenic levels than the deeper layers, although this situation may be reverse for particular wells. The JICA study (1997-1998) has compiled data on 16,000 predominantly shallow wells in the Bao Meng area and in Tuoketuo. The highest concentration reported in Bao Meng is 3 mgAs/l, and some 1,600 arsenicosis patients have been identified. Nonetheless, it is recognized that these studies can only be considered as preliminary. A study in three villages in the Hohhot Basin in the early nineties revealed one third of the analyzed shallow and deep wells to contain arsenic levels above the national standard; the prevalence of arsenicosis patients was 5.8%.

The areas with high fluoride and high arsenic levels overlap to a limited degree, but it is clear that fluoride is more widespread.

The geological complexity of the sediment deposits in the region strongly suggests that very localized geo-hydrological phenomena can occur, although it seems practical and reasonable to describe the average groundwater contamination situation for planning purposes on a scale of a county. The heterogeneity of the sediments is borne out, for instance, by the fact that in Tuoketuo County quite a number of artesian wells can be found, whilst neighboring villages have much deeper water tables of -20 or 30 m.

National drinking water standards define the maximally allowable level of fluoride in rural water supplies at 1.5 mgF/l ("Grade III quality", or poorest allowable quality), which exceeds the 1.0 mg/l level applicable to urban supplies. The maximum for arsenic is 0.050

mgAs/l, which corresponds to the maximum allowable concentration set by the World Health Organization (the WHO recently set the maximum advisable concentration at 0.010mg/l).

Physico-chemical technologies to remove fluoride from water are available and have been demonstrated to be feasible. These technologies are often based on filters containing ion exchange resins or inorganic adsorbants (such as calcium oxide, phosphate, and/or alumina). Removal of arsenic, on the other hand, is less obvious, and few technologies are currently available that are easy to operate and maintain. However, all these technologies tend to be rather expensive and require a higher degree of technical and management capacity from the operator. Although feasible for larger-scale urban water supply, there is no straightforward removal technology option available for the small-scale rural operations under the projects' purview. Presently, the Chemical Department, Hohhot University (Prof. Li Tu Xing), conducts experiments for fluoride removal at field level with a pilot plant using "boiled stone" (composition as yet not communicated to the mission) that is mined from a location 60 km from Hohhot. If proven to be technically and institutionally feasible, this option may also be sufficiently cheap. It is estimated that the depreciation and O&M cost would amount to 0.2-0.3 Y/m^3, which is typically 10-20% of the total cost for a regular plant without the fluoride removal. This cost could still be carried by most of the consumers. However, for arsenic, no removal options are currently available that are both cost effective and technically feasible under rural conditions. The National Project Office is not considering arsenic removal technologies, beside the option of searching for a well location or a well depth that yields safe water.

References

Atlas of The Natural Environmental and Endemic Diseases in Inner Mongolia Autonomous Region. Inner Mongolia Autonomous Region Anti-epidemic Disease Leading Team Office, Hohhot Anti-epidemic Disease Research Institute, Inner Mongolia Autonomous Region Publishing House, Hohhot, 1986. This Atlas provides reasonably comprehensive information on fluoride and arsenic concentration in shallow groundwater.

Luo Zhen-dong, Zhang Yu-min, Ma Liang, Zhang Ge-yeu, He Xingzhou, Wilson R., Byrd D., Griffiths J., Lai Shenghan, He Lili, Grumski K., and Lamm S.H. Chronic Arsenicism and Skin Cancer in Inner Mongolia – Consequences of Arsenic in Well Water. *Proc. SEGH Meeting*, San Diego, CA, 1995.

The 1995 report by the Hohhot Sanitation and Anti-epidemic Disease Institute Preliminary, and results of a JICA sponsored study (1997-1998) (information conveyed by Prof. Li Sumei, Director. It should be noted, however, that the mission did not have the opportunity to directly talk to members of the JICA study team).

Analysis results of well water compiled by the Tuoketuo County Anti-Epidemic Disease Station.

Notes of a discussion with Mr. Liu Jiayi, Deputy director, National Project Office, National Patriotic Health Campaign, Beijing, May 15, 1998.

ANNEX B

ANNEX 4

AUDITING IRREGULARITIES (1997 AUDIT)

Inner Mongolia Autonomous Region

Inner Mongolia PPO:
1. In September, 1997, PPO lent RMB 100,000 to non-project office; as of today, not repaid.
2. In December, 1997, PPO lent RMB 25,000 to Foreign Economy Division, Inner Mongolia Financial Bureau; as of today, not repaid.

LinXi CPO
1. RMB 9,980.38 improper expenditure;
2. RMB 99,883.99 account receivable to be deferred;

Hohhot City Project Office:
1. "IOU" materials value reached RMB 104,600;
2. RMB 265,100 worth of materials and pumps were recorded in red ;
Accumulated intercompany account reached 661,400; and other accumulated account receivable reached 61,800. All of these were private borrowing.

Tuzuoqi CPO
1. Illegal expenditure reached RMB 104,100.
2. RMB 4,900 management fee was over withdrawn; RMB 3,100 commitment fee was over withdrawn.

Tuoketuo CPO:
1. In the audit report, it mentioned that some problems were found but not sorted out.

Yunnan Province

Chuxiong City Project Office
1. RMB 419,728.28 worth of materials lost;
2. RMB 73,000 counterpart fund appropriated from beneficiaries could not be used for the project. Among which RMB 5,000 was held by Fayi Office; RMB 23,000 of the fund was used to construct office building by Ziwu Water Management Station.

Qiaojia CPO
1. RMB 73,189.28 field survey and exploration cost without formal invoice

Yunxian CPO
1. RMB 76,000 provision for debt service were diverted to repay the revolving fund to the Financial Bureau.

Mile CPO
1. Some financial accounts could not be recorded properly.

Baoshan CPO

1. Due to poor management , water tariff collection in some of water plants could not cover staff's salary. Such as, Xinguanghe Water Plant.
2. RMB 365,000 project fund were used for office building and dormitory construction.

ANNEX 5

ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR OPERATIONAL PLAN

WORLD BANK ADVICE TO BORROWERS

A. INSTITUTIONAL OPTIONS

1. Two guiding principles

Examples of umbrella service organizations successfully and sustainably "intermediating" between their "client" water supply and sanitation (WSS) system owners/operators and commercial service providers[1] seem to present at least two common "guiding principles". They are linked, and not surprisingly relate directly to incentives for efficient and effective value adding:

- Competition: Regulatory and subsidy arrangements should not unreasonably obstruct fair and open competition in the service market.
- Commercial viability: Positive cash flows are the best assurance of sustainability of service provision.

2. County Rural Water Supply and Sanitation Company

During the World Bank's RWSS II Implementation Completion Mission (ICM) in November/December 1998, provincial and county project officers suggested the "*County Rural Water Supply and Sanitation Company*" (Coys) as one possible institutional option for ensuring the sustainable delivery of WSS services after project implementation. The model described by different officers had certain key commonalities:

- Re-tooled County Project Offices (CPOs): The coys would essentially be the CPOs but with different mandates delivering different services -- from project implementation to operational support.
- With some ongoing National government funding support: Given the long and "laudable" history of National government social welfare support in China, some continuing level of on-going government subsidy for the coys was argued to be both necessary and desirable. There was no definitive discussion on a notional schedule or mechanism for phasing out this support.

---

[1] The *PROSANEAR* urban environmental sanitation program in Brazil rests, inter alia, on the successful operational phase intermediation between poor communities and market service providers. Although the market and the services are somewhat different, the concept is directly relevant for RWSS II. The *Water and Sewerage Construction Company* (WASECO) in Ho Chi Minh City in Vietnam provides an interesting example of operational phase technical and management support, including training of local operators ahead of the transfer of assets. In the Philippines, the AusAID -assisted *Central Visayas Water and Sanitation Project* has been followed up with a Federation of WSS service co-operatives established through the project, across the four participating provinces (each about the size of a typical county in China).

- Providing a range of operational support services: The mission and project officers discussed the range of service which might be properly provided by these coys, including training, bulk procurement of spare parts and system expansion materials and equipment, operations and maintenance advice, technical repairs, and financial management assistance including collection and bundling of IDA credit repayments.
- Partially on a commercial basis: Project officers acknowledged that some of these services should be provided on a commercial basis, and could therefore generate an independent cash flow for the coys, especially the supply of spares, goods and materials.

3. Compliance with the "guiding principles"

The notion of an umbrella organization serving project-initiated small WSS system operators is conceptually sound; and the model explained by the Bank's interlocutors may be reasonable for the project counties at this time. However, the model suffers two potentially fatal deficiencies:

- Net negative cash flows: The model assumes that government subsidies will be necessary, *ad infinitum*. In this sense, the proponents see the coy as a CPO, but who's function is to deliver government sponsored operational support instead of implementation support. Even if government were to accept this arrangement initially, its policy on subsidies would inevitably change, the public benefactor will disappear, and with it the bankrupt coy. Some level of government subsidy during a defined transition phase may or may not be necessary and wise. But whatever the arrangement, **no services should be offered to the WSS system operators on less than a commercial basis unless for commercial strategic reasons** (e.g. a deliberate loss-leader position to establish a sub-market). A positive cash flow is any organization's best guarantee of survival.
- Market distorting subsidies: Any government subsidy for the coy will distort the market for providing those services, potentially disqualifying more suitable contenders, and downgrading the quality of service. It may be, for instance, that pre-existing county town water supply companies would be more competitive in providing some or all of the services envisaged. It is conceptually incorrect to assume that the CPOs are best placed to provide these services. **No subsidy arrangement should disqualify potential commercial competitors**. Open and fair competition ultimately maximizes customer satisfaction and continued demand for those services.

4. Some variations and lessons learned

Umbrella company owned by the WSS system operators: The coy. may be owned by the system operators who have subscribed for stock in the coy. This underpins the relationship between the CVWSP WSS cooperatives and their Service Federation in the Philippines (see footnote 1). The Federation's shareholders are the WSS cooperatives who have subscribed Pesos 150,000 to establish the Federation's capital base. There is no government support or interference, and the WSS cooperatives have total discretion over their dealings with the Federation. Each has an absolute interest in the well-being of the

other. But it is too soon to draw conclusive lessons from this experience; and it suffers the same anti-competition risks suffered by any vertically integrated conglomerate.

Integration of project implementation and project operation; and project replication: In the successful WASECO example in Vietnam, the company packages each project as a small-scale *build-operate-transfer* scheme. After signing a service contract with a participating commune, WASECO borrows funds from local banks to finance construction. The coy. then operates the system and charges an agreed tariff, for five to seven years. Tariffs are always sufficient for full cost recovery. Households pay the full cost of connections from the street to the house. Following construction, the coy. provides training for local system operators to ensure operation sustainability after transfer of assets.

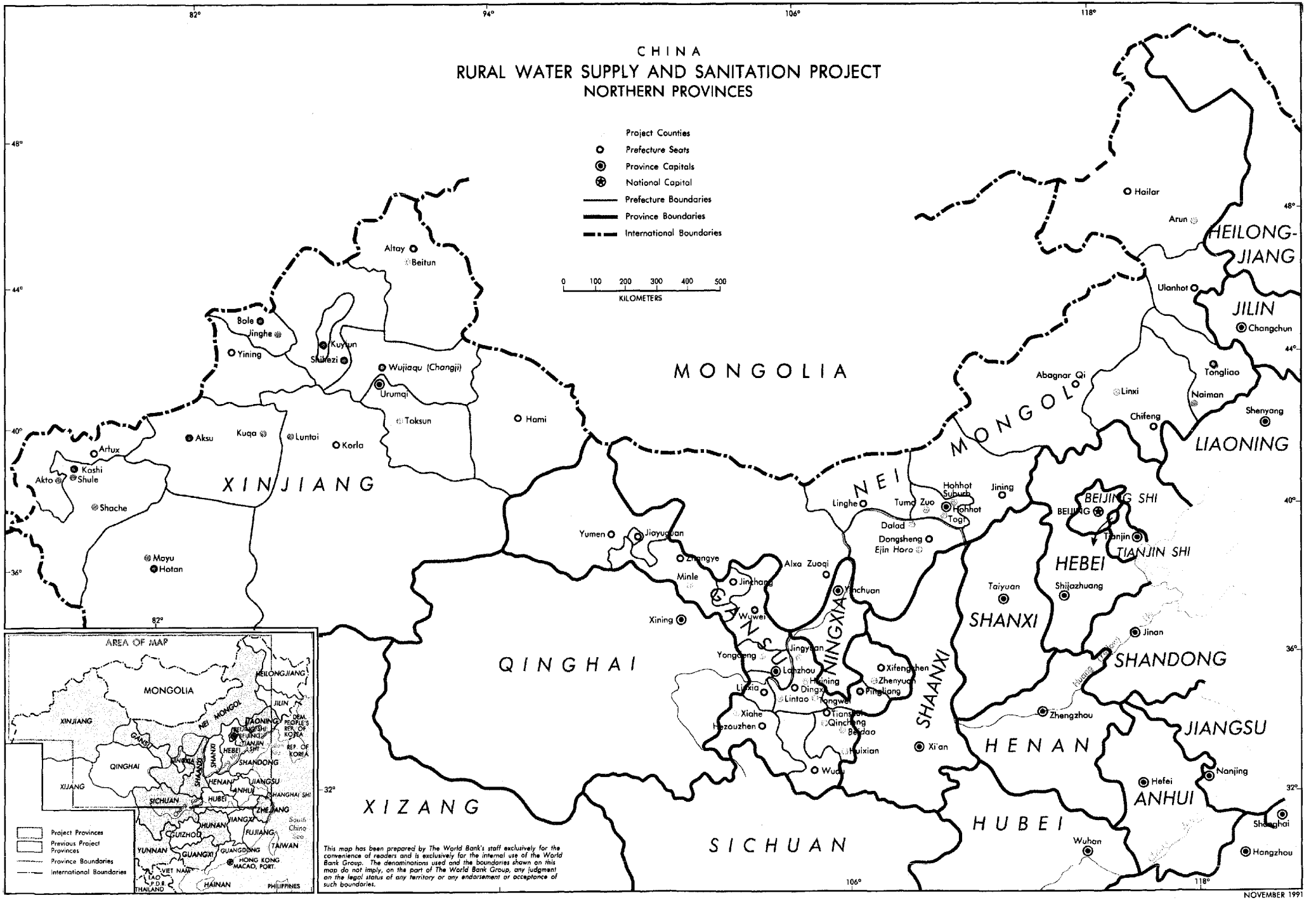
There are three important lessons for RWSS II:

- The importance of full cost recovery and the advantages of engendering fiscal and commercial discipline from the start of the operations phase;
- As an example of how to replicate the project to other villages, and the potential for expanding the coy's immediate scope of services and its eventual service market; and
- An example of a government-owned company -- WASECO -- locking in a viable long-term future.

MAP SECTION

IBRD 23276

CHINA
RURAL WATER SUPPLY AND SANITATION PROJECT
NORTHERN PROVINCES



NOVEMBER 1991

IBRD 23348

CHINA
RURAL WATER SUPPLY AND SANITATION PROJECT
SOUTHERN PROVINCES

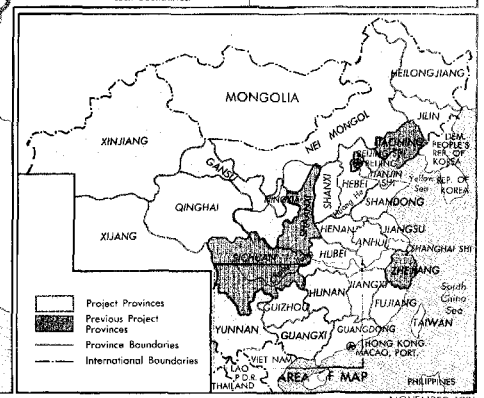
Project Counties
Prefecture Seats
Province Capitals
Prefecture Boundaries
Province Boundaries
International Boundaries

0 100 200 300
KILOMETERS

XIZANG
SICHUAN
HUBEI
HUNAN
JIANGXI
GUIZHOU
YUNNAN
GUANGXI
GUANGDONG
MYANMAR
LAO PEOPLE'S DEM. REP.
VIET NAM

Wuhan
Huarong
Linli
Sangzhi
Anxiang
Nanxian
Yueyang
Nanchang
Changde
Yongshun
Yiyang
Changsha
Jishou
Fenghuang
Chenxi
Xinhua
Loudi
Xiangtan
Zhuzhou
Huaihua
Qianyang
Shaoyang
Hengshan
Hengdang
Hengyang
Chaling
Lingling
Chengbu
Guiyang
Zhaotong
Zhongdian
Lijiang
Qiaojia
Jinsha Jiang
Dongchuan
Liuku
Xiaguan
Qujing
Booshan
Weishan
Chuxiong
Kunming
Luxi
Yunxian
Mile
Lincang
Chengzhou
Chenxian
Jiahe
Jiangyong
Guilin
Jianghua
Yangshuo
Hechi
Liuzhou
Laibin
Duan
Bose
You Jiang
Pinggui
Qian Jiang
Wuzhou
Xun Jiang
Guigang
Longan
Nanning
Cenxi
Fusui
Yulin
Gejiu
Wenshan
Simao
Jinghong
Qinzhou

This map has been prepared by The World Bank's staff exclusively for the convenience of readers and is exclusively for the internal use of the World Bank Group. The denominations used and the boundaries shown on this map do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory or any endorsement or acceptance of such boundaries.



NOVEMBER 199