

**FINANCING STRATEGY
OF THE
URBAN WASTEWATER SECTOR IN SELECTED
MUNICIPALITIES OF THE SICHUAN PROVINCE
IN CHINA**

OECD 2004

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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EXECUTIVE SUMMARY

Notwithstanding impressive recent efforts urban wastewater infrastructure is underdeveloped

1. Until the 1980s, the wastewater management infrastructure in Chinese cities was virtually neglected. In the 1980s, about 20 small-scale wastewater treatment plants were constructed in China that provided low levels of treatment. Wastewater was discharged to open drainage ditches, sometimes temporarily collected in septic tanks and dumped to water bodies without treatment. Impressive investments in this sector began in the 1990s. By 2000 about 400 wastewater treatment plants had been completed and the total treatment capacity increased to almost 40 per cent of wastewater generated in 2003.

2. Despite these significant achievements, wastewater treatment in urban areas results in significant risks for human health and the environment. About two thirds of all urban effluents are still discharged into surface waters without treatment. The odour of sewage is common in Chinese cities, and most rivers and lakes are excessively polluted. This generates water borne diseases, decreases the quality of life, and undermines the attractiveness of cities to foreign investors, and the competitiveness of tourism, water intensive industries, fisheries and agriculture. Moreover, there are some indications that newly-built wastewater treatment plants are not always used efficiently, and that several of them even remain idle because of backlogs in the development of wastewater collection networks, or because of the lack of funding for regular operation and maintenance.

3. The OECD secretariat has examined the financial sustainability and affordability of developing modern, centralised wastewater management infrastructure in medium sized cities and counties in China; This has been done by analysing fourteen cities in Sichuan Province, all located in the basin of the Yangtze river, in the impact zone of the Three Gorges Dam. The study used the FEASIBLE model as the basis for elaboration of realistic finance strategies including an analysis of the costs of achieving targets for wastewater treatment infrastructure, options for financing the construction, operation and maintenance of such infrastructure, and analysis of the affordability of different financing options. The institutional arrangements within which wastewater infrastructure is developed, financed and managed were also examined.

4. In all municipalities studied, much needs to be done to establish functional wastewater infrastructure. In 2000, even in urban zones, only 65 per cent of the population on average was connected to some form of centralised wastewater collection network, mainly a combination of open ditches, old pipes that mix storm water and sewage, and septic tanks. No wastewater treatment plants had been constructed in any of the municipalities. All wastewater was discharged to surface waters without treatment.

Infrastructure development targets are ambitious and compatible with Millennium Development Goals

5. Recognising the problems in the wastewater sector, the State Council established the target that by 2005 a 45 per cent of the wastewater generated in the cities having administrative level of a County and higher should be treated. All cities having more than 500,000 inhabitants should treat at least 60 per cent of their wastewater effluents by that time. In addition, the Ministry of Construction in 2000 issued guidelines, "Urban Wastewater Treatment and Control Advice", in which the target of 70 per cent treatment rate was

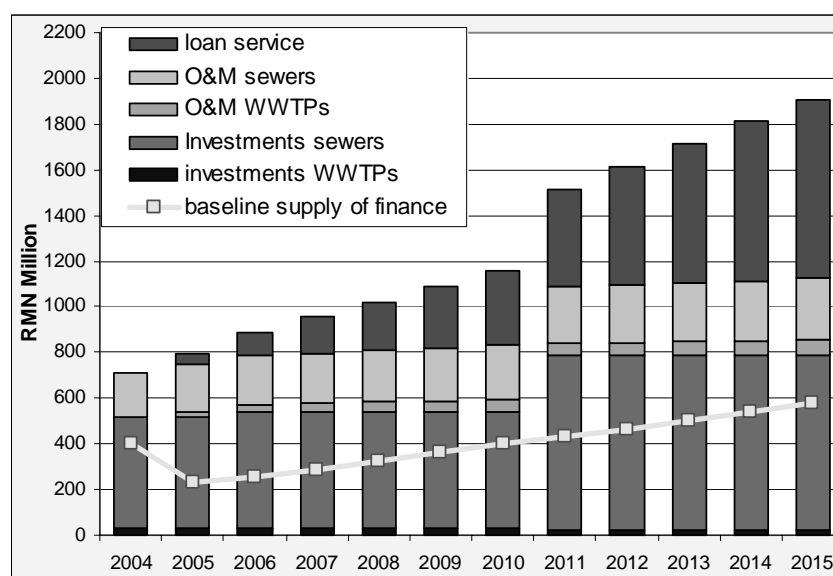
established for major cities, such as provincial capitals and other large cities of special status (e.g. Beijing and Shanghai).

6. In an effort to implement government policies, the 14 municipalities of Sichuan Province have embarked on an ambitious investment program. These targets are equivalent to the MDG target of “*halving by 2015 the proportion of people who do not have access to basic sanitation*”. By 2015 the cities plan to extend the coverage of a modern sewerage network to almost 90 per cent of the population. By 2010, all collected wastewater is planned to be treated biologically. Already in 2001 seven municipalities in the studied group, began construction of secondary wastewater treatment plants, scheduled to be completed in 2004. All municipalities are expected to properly operate and maintain wastewater collection and treatment assets, providing uninterrupted services at the design quality level.

Continuation of present trends would not lead to achievement of the wastewater infrastructure development targets

7. It was estimated with the financial model of the sector that full implementation of the construction programme would require a four to five fold increase of total (capital, maintenance and operational) expenditure per annum by 2010 (compared to 2000), and seven fold thereafter. The largest expenditures are needed for capital investments in renovation and expansion of the sewerage network (see figure I). The construction of wastewater treatment plants is relatively less capital intensive. Operational and maintenance expenditures also need to increase over time as more and more assets are in place. If capital investment were financed by loans or bonds the debt service would become a significant portion of total expenditures over time (the top bars in figure I).

Figure I: Simulation of the levels and structure of expenditure needed to achieve infrastructure development targets and their coverage by the total baseline supply of financing (Millions Yuan¹s in constant 2000 prices)



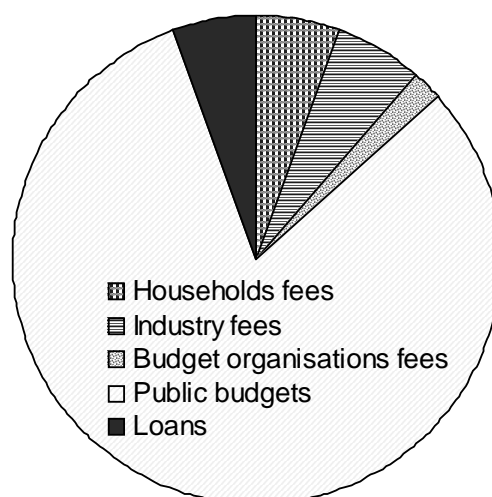
Source: Model simulations by the project team

¹ The Chinese currency is the RenMinBi (RMB), generally pronounced Yuan in written form

8. Simulations of the cash flows of the investment programs, illustrated in figure I, showed that business-as-usual financing is by far not sufficient to cover the volume of expenditure needed to achieve stated targets. It is also not efficiently targeted – construction of sewerage as well as operation and maintenance costs would be particularly under-funded.

9. A fundamental challenge is that financing of the urban wastewater sector in the 14 municipalities relies excessively on public budgets as opposed to user fees or debt (figure II). In particular operations and maintenance of urban wastewater infrastructure is unsustainable, with wastewater charges covering less than 40 per cent of these costs. Wastewater treatment tariffs have been established in only seven municipalities. Fees for the use of sewerage network are not often in place. The regulatory basis for tariff regimes contains loopholes and is not supported by institutions to implement government policies on cost-recovery at the local level. Incentives to enforce self-financing of the sector are insufficient. Tariffs not only remain much below cost recovery levels recommended by central government, but also revenues can not be effectively claimed by wastewater enterprises.

Figure II: Present structure of sources of financing wastewater infrastructure in fourteen cities in Sichuan province (total for the years 2000-2004 in Millions Yuans in constant 2000 prices)



Source: Data provided by municipal governments and estimates made by local experts

10. Local budgets are not filling the financial gaps. Central government transfers are biased towards construction of treatment plants rather than the sewerage network, where most capital expenditure is needed. Private finance is discouraged by the low financial viability of the wastewater sector and the associated institutional and regulatory risks.

Effective financing of wastewater infrastructure depends on regulatory and institutional reforms

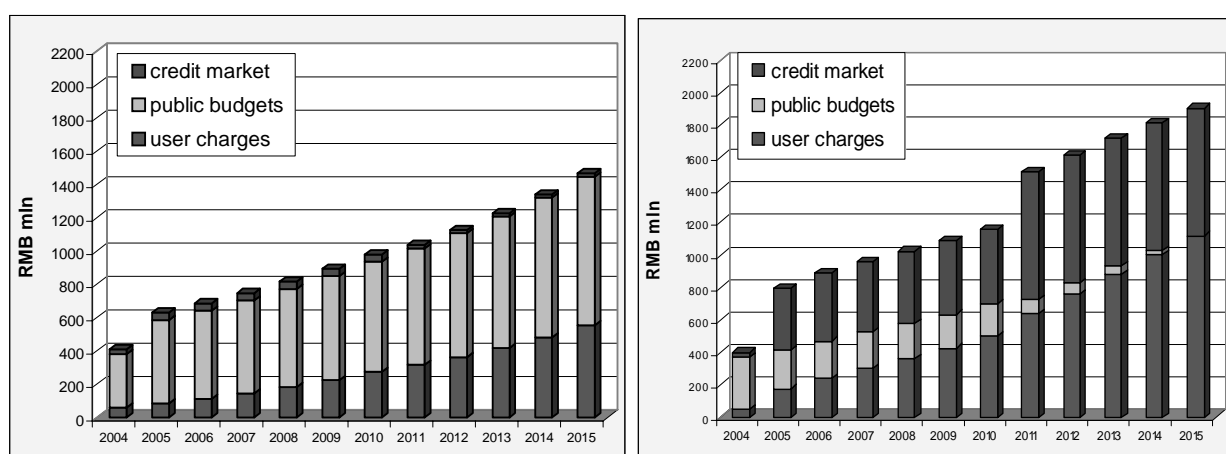
11. To help address these challenges, the OECD secretariat and Chinese counterparts have developed three broad indicative scenarios. It is likely that any financing strategy that is ultimately applied to wastewater infrastructure in Sichuan will be the mix of all of them. These three indicative strategies to increase financing are:

- The “Taxpayers pay” strategy, which would rely on increasing expenditure from public budgets as a cornerstone to financing wastewater infrastructure

- The “Users pay” strategy, which would rely on a steep increase of user fees in order to move rapidly towards full cost recovery, including using operational surplus to pay for capital investments.
- The “Creditors pay” strategy, which would rely on a rapid increase of borrowing on domestic and foreign credit markets to finance capital investments and on user fees to cover debt service.

12. Simulations and analyses showed that none of these strategies would be easy to implement. The “Taxpayers pay” strategy (left chart in figure III) does not seem to be feasible because it relies on significant increases of expenditures from already-stretched local budgets. The macroeconomic and fiscal environment would likely stimulate shrinking rather than expansion of government capital spending on infrastructure in the next few years. This strategy would perpetuate liquidity problems, which could undermine the achievement of program objectives. This strategy would also run against the policies issued by the Central Government.

Figure III: Simulation of the levels and structure of supply of financing the wastewater sector in fourteen cities in Sichuan province: the “taxpayers pay” strategy on the left and the “creditors pay” financing strategy on the right (Millions Yuans in constant 2000 prices)



Source: Model simulations by the project team

13. The “users pay” and the “creditors pay” strategies would be in line with government policies. However their feasibility depends crucially on the social affordability and acceptability of tariffs and on the acceleration of institutional and legal reforms in the urban wastewater sector and in local government finance. These two major risk factors - affordability and institutional capacity - were carefully analysed.

Can users afford to pay for wastewater collection and treatment?

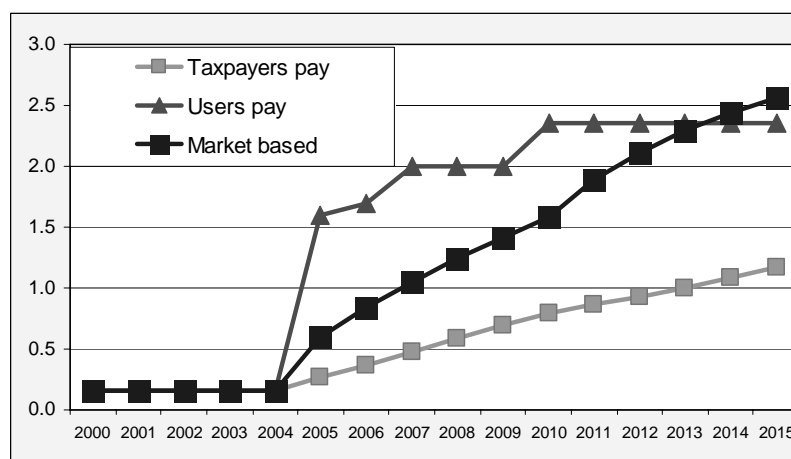
14. The feasibility of all financing strategies depends on the households’ ability and willingness to pay for of wastewater services, and also on the political willingness of local governments to charge people who are able to pay. In order to verify the affordability constraints, the project team compared the annual billed amount of combined water supply and wastewater charges per household with the annual household disposable income for ten income groups. The generic international “rule of thumb” for affordability benchmark was applied, which stipulated that water and wastewater payments should not account for not more than three to five per cent of the average household disposable income in the long run.

15. Households' willingness to pay – which may be higher or lower than generic affordability benchmarks -- was not examined within the scope of this project. The review of available studies indicated however that at least in the short- and medium-term, most households should also be willing to pay the price increases simulated in the taxpayers and creditors pay strategies.

16. The affordability analysis shows that, in the year 2000, affordability was not a real constraint to raising water and wastewater tariffs for households. In all municipalities there was significant room for increasing user charge revenues up to the 3-5per cent affordability benchmark. In eight out of fourteen municipalities even the poorest households could have paid more for water and sanitation services. However, in Gao County and in Neijiang City could up to 30 per cent of the population have found it difficult to pay for water and wastewater in 2000. Existing tariff policies attempt to protect the poor and vulnerable groups of consumers by maintaining water and wastewater charges low. Such policies, however, reward both poor (assuming they have access to the service) and rich households. They also lead to inefficient use of public funds and do not encourage efficient use of water.

17. If stated infrastructure development targets are to be achieved, all fourteen municipalities would ultimately have to increase the wastewater charge rates to about 2.5 Yuan/m³ on average in 2015 (in constant 2000 prices). This would involve an approximate ten times increase in real terms from the present levels of 0.12-0.35. The pace of this increase would, however, vary according to the financing strategy. A “users pay” strategy would imply a rapid growth of charge rates, which would outpace the growth of income in the short and medium term. In the “creditors pay” strategy, if most initial capital investment expenditure were financed with credit, the charge rate increase could be delayed until the time, when the debt repayment was due and when incomes are higher. In all simulations water supply fees were assumed to grow proportionally to GDP in real terms.

Figure 2: Schedules of increase of households' wastewater tariffs in different financing strategies (Yuan/m³, 2000 prices)



Source: Model simulations by the project team

18. The affordability analysis suggests that on average both a “users pay” strategy and a debt financing strategy should be affordable to households in all cities. However, if income distribution was taken into account, the “users pay” strategy would not be affordable for a significant share of poor and vulnerable households. Because of the rapid increase of tariffs, the affordability limits are likely to be exceeded for 30-40 per cent of the poorest families in all cities except Luzhou throughout most of the simulated period. The peak payments would come in the period between 2005 and 2011. This would pose a

significant challenge for social policy. If initial capital investments were financed by debt, affordability would be less of a problem at the beginning of the program implementation, but would become a serious issue after 2012, when the debt repayments are due. In 2007 only 10 – 20 per cent of the population would find it difficult to pay for water and wastewater treatment. However by 2015 the portion of excessively distressed population would have increased to as much as 20 – 30 per cent of households.

19. To reach the stated targets, would require some form of social protection in all scenarios. Failure to address social issues may result either in non-payments or in excessive poverty, to say nothing of social opposition. The size of the social protection budget that would be needed to compensate poor households for the excessive burden of payments for water and sanitation bills would be particularly difficult to finance under the users pay strategy. It would amount to almost one billion Yuan during the entire period 2004-2015 with the peak welfare transfers expected in the years 2005-2012. Under the creditors pay strategy the total volume of welfare transfers would be 40 per cent lower and would amount to about 600 thousand Yuan over the entire period, with the peak occurring after 2013.

20. Under the “users pay” strategy, social protection costs would impose an excessive burden on local finance. With a reliance on debt financing, however, the burden of social protection seems to be financially manageable. Should the government choose cross-subsidization of households by industry and by public organizations as a mean of financing social protection budgets, the wastewater charges paid by non-household users would have to be increased gradually - by five per cent in 2005 and then by 45 per cent of 2004 levels in real terms by 2015. Should the government decide to compensate the poor directly from the budget, the burden of protecting the poor against excessive water and sanitation bills would account for 0.14 per cent of general budget expenditures in 2005 and would gradually increase to slightly over one per cent in 2014-2015. Both vehicles for financing social protection budgets in the debt financing strategy have advantages and risks that would have to be carefully mitigated by the right institutional design. They would be challenging to implement but are realistic under the assumptions made in this scenario.

Is the wastewater sector ready to borrow prudently?

21. The limited financial and operational autonomy of wastewater enterprises, despite their formal status as enterprises (although state owned), appears to be the key obstacle to achieving the self-finance and credit worthiness of wastewater services. Squeezed into a budgetary regime involving permanent scarcity of funds and annual bargaining for budgetary allocations, wastewater enterprises have no incentives to think strategically about development, to provide additional services (e.g. wastewater collection), or to reduce costs and optimise performance of the entire wastewater management system. Higher revenues or savings do not translate into higher profits, salaries or investment funds.

22. According to legislation, municipalities cannot borrow directly from commercial banks, or issue bonds or explicit guarantees to wastewater enterprises. They bypass these restrictions by borrowing through municipal enterprises offering them informal, implicit guarantees. Often debt is de facto assumed and paid by the local government even if the enterprise is the contractual borrower.

23. The government appears to encourage wastewater enterprises to borrow without regulatory and institutional conditions that guarantee their financial viability and capacity to service debt. They do not have predictable access to revenues in order to meet debt service obligations. As wastewater enterprises enjoy the implicit guarantees of the municipalities, their debt becomes the de facto the unsanctioned, non-monitored debt of local governments. Banks must rely on the political commitment of local governments to pay the loans of wastewater enterprises instead of relying on political commitments to reforms enabling these enterprises to pay for themselves, or on the legal, direct and explicit liabilities of municipalities.

24. Massive borrowing by wastewater utilities in the present institutional and legal environment would not be prudent. It could lead to a build-up of a stock of non-performing loans in the sector. With the implicit guarantees of the municipalities, this could be damaging to the fiscal position of the government and could hinder the development of a healthy municipal credit market for water and environmental infrastructure. The urban wastewater sector in secondary cities in China is not sufficiently financially viable to absorb more borrowing without major legal and institutional reforms to improve its credit capacity. Reforms are particularly needed to:

- Clarify the legal status of project owners and property rights to wastewater infrastructure.
- Give wastewater enterprises more financial and operational autonomy (e.g. a more direct access to revenue of wastewater charges) and more responsibilities (e.g. for wastewater collection); this includes ensuring an appropriate linkage between revenues and responsibilities
- Make wastewater enterprises responsible and accountable for the development and operation of infrastructure; clarify division of roles and responsibilities between wastewater enterprises and municipalities through performance contracts;
- Ensure predictable and consistent increase of tariffs for wastewater infrastructure that would allow wastewater enterprises to pay all operating expenses, repairs, taxes and total debt service obligations;
- Introduce charges for using wastewater collection networks;
- Integrate water supply and wastewater management at the municipal level, even by considering mergers between water supply and wastewater management utilities (at least with sewerage operators);
- Ensure better integration of capital and operational expenditure in the preparation of municipal budgets;
- Consider giving explicit borrowing rights to municipalities, based on clear rules, limits, and with effective supervision of sub-national debt;
- Improve the predictability of the legal framework by introducing “hard” laws to regulate municipal service delivery and its finance.

Financing strategy based on increased debt is most feasible, but the risks are profound

25. The real future financing of the urban wastewater sector in Sichuan cities will most likely lie somewhere between the elements of the “creditors pay” and the “taxpayers pay” strategies. Over time, debt financing will probably increasingly substitute for shrinking government funds. This process will not be easy. Prudent borrowing for the municipal wastewater sector hinges upon key institutional and regulatory reforms to make the sector creditworthy. Attracting debt financing to the sector would allow spreading the increase of user fees over time but will be possible only if lenders believe that users will pay later. Affordability problems can be localized and could be financially manageable, but they must be addressed explicitly by targeting of social protection instruments on the poorest families to shield them from excessive poverty.

26. The results and findings of this study depend on several assumptions. Although all these assumptions were discussed with local authorities and experts to ensure their realism, they represent a

rather optimistic set of expectations about the future external and internal conditions of the wastewater sector in China. If any of these conditions do not apply, or apply later than simulated, the ambitious infrastructure development targets will most likely not be achieved in the envisaged time. The major risk factors that need to be monitored include:

- Pace of institutional reforms;
- Income growth;
- Fiscal position of local governments;
- Political commitment to achieve targets;
- Deepening and maturing of the financial markets; and
- Effectiveness of social policy.

Recommendations

27. On the basis of the results of analysis and simulations conducted in this project, the Chinese authorities may wish to consider the following recommendations:

- To assess the implications of implementing the “creditors pay” financing strategy based on tapping domestic and foreign financial and capital markets with those elements of the “taxpayers pay” strategy (government financing) that could be used as a temporary “cushion” before more widespread borrowing is prudent.
- To accelerate the implementation of institutional and legal reforms identified in this report that would make debt financing of wastewater services feasible and sustainable. It is not recommended to encourage significantly more borrowing by wastewater utilities without reforms that would make them more operationally and financially autonomous, more entrepreneurial and accountable;
- To consider key reforms of the local government finance suggested in this report, including measures to develop a healthy municipal credit market;
- To consider how social protection measures could be most efficiently and effectively targeted on the poorest and most vulnerable households when increasing user fees to O&M and debt service cost recovery level.

28. Eventually, municipal and provincial authorities in Sichuan may wish to consider rescheduling the investment program analyzed in this report should the urban wastewater sector reform process be delayed, or should other external conditions become less favourable than assumed in this study. Targets chosen by the local authorities are very ambitious and are at the limit of what would be affordable to households and local budgets. Spreading investments over a longer period of time may be necessary if any of the assumptions made in the simulations prove to be overly optimistic.

ACKNOWLEDGEMENTS

29. This report was prepared by a team of Chinese and OECD analysts and consultants. The main author is Grzegorz Peszko from the OECD Environment Directorate. Co-authors include Mr. Jochem Jantzen from TME, the Netherlands, who did most calculations and supported model simulations, Mr. Yang Jintian and Mr. Ge Chazhong from the Environmental Planning Institute of the Chinese Academy for Environmental Planning (CAEP) in Beijing, who have provided essential input and in-country analyses. In Sichuan, the local team of consultants from the Sichuan Research Institute of Environmental Protection was headed by Chief Engineer Mr. Shi Wei Guang and included Senior Engineers Ms. Luo Meng Hua and Mr. Zhan Chao Kun. Ms. Hongfang Liao from the Foreign Economic Cooperation Centre, Sichuan, has played an invaluable role in co-ordinating input from Sichuan consultants and experts. Zsuzsanna Lehoczki from COWI Hungary provided important input in the project.

30. The project was initiated by the State Environmental Protection Administration of the People's Republic of China and supervised by Mr. Wang Yaoxian, Director General of the Planning and Finance Department and Mr. Zhao Jianzhong, Director of the Division of Comprehensive Affairs. Both of them coached the international and local teams throughout the project implementation, providing invaluable guidance and promptly taking strategic decisions in critical moments of project development.

31. In Sichuan, the work of consultants was guided and overseen by the Steering Committee, headed by the Vice Director of the Environmental Protection Bureau of the Sichuan Province (EPB), Mr. Gu Sheng Wen. The members of the Steering Committee included Mr. Peng Yong, Director of the Planning and Finance Division of the Sichuan Environmental Protection Bureau, Mr. Hu Xiao Jun, Director of Planning and Finance Division of the Sichuan Construction Committee, Mr. Yan Ji Cheng, Deputy Director for Foreign Economic Affairs of the Sichuan Development Planning Commission, Ms. Yang Yan from the Foreign Economic Department of the Sichuan Finance Bureau. Some Steering Committee meetings were also attended by Mrs. Ma Xinjing from the Development Planning Commission and Mr. Fan Hunian from the Financial Bureau. In their capacity as experts the members of the Steering Committee shared their profound knowledge and experience with consultants and made numerous informed expert judgments and estimates. As policy makers, they were effectively ensuring that the work would lead to policy-relevant results and would make a practical contribution to achieving Provincial Government targets for wastewater treatment.

32. Local management of the project was the responsibility of Mr. Du Ming, Director of the International Co-operation Division and Ms. Hongfang Liao, Deputy Director of the Foreign Economic Cooperation Centre, Sichuan Province.

33. The project team owes a lot to the numerous staff members of the World Bank and Asian Development Bank for their insightful comments, invaluable information and data, and for fruitful discussions. The project would not have been possible without the continuous support of Brendan Gillespie, Krzysztof Michalak, and Aki Yamaguchi from the OECD Environment Directorate.

34. The governments of Australia and Japan provided financial support to the project.

1. PROVISION AND FINANCING OF URBAN WASTEWATER COLLECTION AND TREATMENT SERVICES IN CHINA AND IN SICHUAN

Background

35. This study was conducted in the framework of co-operation between the OECD and China. During previous co-operation activities between the OECD Environment Directorate and the State Environmental Protection Administration of China, the Chinese authorities and experts learned about the FEASIBLE approach to investment and financial planning of large scale environmental infrastructure. This approach, developed by the OECD Secretariat and Denmark to meet the needs of the countries undergoing transition to market economies, places particularly strong emphasis on realism and affordability of infrastructure development programmes. Chinese authorities decided to test the FEASIBLE methodological approach on a smaller scale first, in a pilot region, before considering wider-scale studies. The Sichuan Province was identified as a candidate for the pilot study. Altogether fourteen cities and counties (urban zones), relatively small for China, were proposed by Chinese authorities for examination. All of them discharge their wastewater to the tributaries of the Yangtze river, in the impact zone of the Three Gorges Dam. At the request of Chinese authorities, analysis was limited to wastewater collection and systems only. Water supply was excluded from this study.

Environmental context

36. Sichuan Province is a traditionally agricultural region in South-Central China with a population of 110 million people. In recent years Sichuan has begun to catch up with more developed coastal provinces and has entered a path of industrialization and a fast growth of the economy (8-10 per cent p.a.), driven mainly by enterprises and the emerging private sector. The Eastern-Central part of the province is densely populated and industrialized. Several large municipalities, including Sichuan's capital Chengdu City, form an industrial corridor stretching to the municipality of Chongqing, home to the controversial construction of the enormous Three Gorges Dam on the river Yangtze. Chongqing Province was separated from Sichuan in 1997. These urban areas are located in the tributaries of the Min and Tuo rivers, which flow into the Yangtze river upstream of the construction site of the Three Gorges Dam. The Yangtze river is the largest source of fresh water in China. However its tributaries have become heavily polluted by untreated domestic and industrial wastewater discharges and by agricultural run-offs. Most of the urban population is connected to the sewerage system, but collected wastewater is often discharged directly into surface waters without treatment. According to the information provided by the Environmental Protection Bureau of the Sichuan Province, 80 per cent of length of the rivers is excessively polluted.

37. Construction of wastewater treatment facilities in Sichuan was declared as a high priority not only by the Provincial Government, but also by the Central Government in Beijing. The main reason for this is the fact that the Eastern, industrialized part of the Province is located upstream of the Three Gorges Dam. The dam is almost completed, therefore the load of organic effluents discharged upstream to the tributary of Yangtze must be significantly reduced.

Urban wastewater treatment in China

38. Historically, the construction of urban environmental infrastructure in China has lagged behind other infrastructure, including water supply networks. Centralised wastewater treatment is a relatively recent development in urban zones. In the early 1980s, there were only about 20 small-scale wastewater treatment plants nationwide that provided low levels of treatment. Wastewater was disposed of in open drainage ditches, sometimes temporarily collected in septic tanks, and discharged to water bodies without treatment.

39. Between 1990 and 1998 annual capital investments in wastewater collection and treatment increased tenfold. Their share in total fixed capital formation in China increased from 0.21 per cent in 1990 to 0.54 per cent in 1998. As a result, between 1990 and 1998 the treatment capacity increased more than four fold. By 2000 about 400 wastewater treatment plants were completed with an annual treatment capacity of about 10 billion m³ (according to the Asian Development Bank). The ratio of urban wastewater treated increased from 16.2 per cent to about 35 per cent in 2000 and 40 per cent in 2003. Sewage collection networks in cities have been extending continuously.

40. Despite these significant achievements, wastewater treatment in urban areas remains inadequate. The capacity of urban wastewater treatment facilities is still very low. About two thirds of all urban effluents are discharged into the rivers without treatment. Urban water supply (hence wastewater generation) has increased far more quickly than wastewater treatment capacity. For example, between 1990 and 1998 the annual average daily capacity of urban wastewater treatment plants increased eight times more slowly than the capacity of urban water supply networks. Recognizing these problems, in the 10th five-year plan covering the period 2000-2005, the State Council established the target that by 2005 a 45 per cent of the wastewater generated in the cities having administrative level of a County and higher should be treated. All cities having more than 500,000 inhabitants should treat at least 60 per cent of their wastewater effluents by that time. In addition, the Ministry of Construction in 2000 issued guidelines, "Urban Wastewater Treatment and Control Advice", in which the target of 70 per cent treatment rate was established for major cities, such as provincial capitals and other large cities of special status (e.g. Beijing and Shanghai).

Overview of institutional set up for managing urban wastewater

41. The Chinese system for water resource management involves multiple institutions. Ground water and surface water are supervised and controlled separately by the Ministry of Water Resources and irrigation/water-conservation institutions. Irrigation and water conservancy institutions oversee, in particular, water used in agricultural and industrial production. Urban water supply is the responsibility of urban construction committees, although State Development Planning Commissions at different levels of government have an important role to play in programming the development of fixed assets and in allocation of capital investment funds. The environmental protection bureaus of provincial and municipal administrations control wastewater discharge and treatment and can also initiate infrastructure development. However, sometimes a city's Hydrology Bureau is the administrative bureau of the sewage treatment facilities. Overlapping responsibilities and administrative fragmentation are not uncommon in this management system. Some Chinese experts describe water infrastructure management in China as "multiple dragons governing waters".

42. On the provincial level in Sichuan, the supervision of the water utilities and collection of water charges are the responsibility of the Provincial Construction Bureau. The Environmental Protection Bureau (EPB) plays a role in the planning process, especially in taking decisions about where, when, and what treatment plant should be built. Afterwards, the EPB mainly monitors discharge standards. The Sichuan

Provincial Environmental Protection Bureau is responsible for supervising environmental performance of wastewater collection and treatment utilities. The EPB ensures that wastewater treatment plants comply with effluent standards developed by the SEPA. Additional removal of Phosphorus and Nitrogen may be required in order to meet water quality standards in the rivers at the border with the downstream provinces. If not necessary, the Central Government encourages the local authorities to build secondary wastewater treatment plants as more affordable than tertiary treatment.

43. Operation and management of water supply infrastructure is the responsibility of specialised enterprises. Water supply utilities in China are managed as state-owned enterprises with varying administrative intervention. Under central planning, potable water was considered a public good and was not charged. It was politically unfeasible to implement the user-pays approach to recover the costs of constructing, operating, and maintaining urban water supply infrastructure. The government provided the service and paid for everything. Despite the utilities now having the authority to charge user fees and generate modest profits, many of them operate at a loss because of constraints on their pricing policies, especially in poorer provinces.

44. Utilities responsible for wastewater treatment are increasingly being established by Chinese cities as enterprises operating within the structure of municipal administration. They are usually institutionally and managerially separated from water supply companies. Wastewater treatment enterprises are often not responsible for wastewater collection. A separate “company” may operate the sewerage system under supervision also of a construction bureau.

45. Wastewater enterprises do not collect their own revenues from the fees paid by users of wastewater infrastructure. They calculate their unit costs and submit this information to the Provincial Government as an input to calculation of a wastewater charge. The charge is collected by the Construction Department of Municipalities or their water supply utilities. Water companies transfer receipts to the municipal budget through a financial bureau. According to local experts, in Sichuan there is no earmarking of these revenues to the corresponding wastewater budget line on the expenditure side. The preparation of the operation and capital development budget is independent from revenue collection.

46. Joint billing and collection of fees for water supply and wastewater services is common practice in OECD countries and has many advantages. It is a cost-effective solution. The handling fees (a commission) of a water supply company are usually lower than the cost of establishing separate billing and collection systems by the wastewater enterprise itself. ” A one bill - two items system” usually increases the collection rates of wastewater fees, because people are more willing to pay for water supply than for wastewater treatment, as the former gives them direct, private benefits. Moreover, with a consolidated bill, the collection of wastewater fees can be more easily enforced by disconnecting non-paying customers from water supply.

47. There are two crucial conditions, however, that should be met when fees are collected by a third party. The first is to ensure that all revenues collected actually reach the wastewater enterprise after contractually agreed handling fees are deducted. This condition is rarely met in the cities studied. According to interviews, only in Leshan, where the project is co-financed by a World Bank loan, the water supply company transfers revenues directly to the account of wastewater enterprise. In other cases the revenues collected are remitted to the municipal budget. Amounts allocated from the budget to the wastewater enterprise by the Financial Bureau are loosely related to the amounts collected. Local officials perceive these revenues as belonging to the municipality because – as many of them argued – the enterprise is owned by the state, hence their revenues should be too. A standard principle of commercial codes in OECD countries is the separation between the ownership of shares from the ownership of assets, i.e. the owners of a commercialised company own the shares/stocks of the firm but can not claim the assets directly. The firm itself has a property title to all its assets, including receivables. This principle does not

necessarily hold for government unitary enterprises. It was not possible within the scope of this project to clarify the legal issue of ownership of wastewater fees. It is still to be clarified as to who owns the liquid assets of wastewater enterprise, such as cash receivables. From the discussions it appears that most local officials and experts take the position that according to the 1996 revision of the Law “Law on Prevention and Control of Water Pollution”, the municipality has a sovereign power to impose and collect user fees, and to decide how to spend them. Concerning physical assets, it seems that in most cities studied, the local government has written off fixed assets from municipality balance sheets and transferred them to the balance sheet of the wastewater companies, even if they are state-owned.

48. The second condition is to ensure that the third party has incentives to maximise the collection of revenue, or even to collect more than planned. The right incentives can be built into the contract between the wastewater enterprise and the water company through various revenue-sharing provisions.

49. In China, a wastewater treatment charge is paid by all customers connected to a centralised water supply system, often irrespective if their wastewater is being collected and treated. The Policy circular “Enforcement of Levying Wastewater Treatment Fee in Order to Advance the Concentrated Treatment of Wastewater and Better Control the Discharge of Municipal Wastewater”, published in 1999, stipulates that Chinese municipalities are allowed to charge for wastewater treatment before sewage is treated, but only under the condition that the wastewater treatment plant is put into operation within a period of three years after collection of fees has started. This allows, in principle, for the accumulation of investment funds during construction period. It was difficult, however, to determine what sanctions are in place if the municipality does not complete the wastewater treatment plant in time. Because most municipal officials consider financing of construction of wastewater treatment plants to be the duty of the Central Government, it is not clear how this condition is being enforced if Central Government does not provide adequate funding. In one of the fourteen cities, construction seems to have been interrupted halfway to a completion, and municipal officials are waiting until Beijing resumes funding.

2. PRESENT STATE OF WASTEWATER INFRASTRUCTURE IN THE CASE STUDY CITIES

50. The key features of the existing situation in the base year and of the baseline forecast are:

- Fourteen secondary cities and counties in Sichuan are included in the study with in total 2.8 million inhabitants (2000), 4.7 million inhabitants expected in 2010, and 6.2 million in 2015;
- All cities and counties are located in the Yangtze river basin, upstream of Three Georges Dam;
- Urban area covers 19 729 ha in 2000 and is projected to increase to 29 584 ha in 2010;
- Water supply: 72 per cent of the population connected in 2000, 84 per cent (on average) in 2010, 91 per cent in 2015;
- In the cities studied 40-80 per cent of the urban population is connected to centralised sewers (on average 65 per cent), which consists mainly of a combined single pipe system (storm water and sewage are mixed), open ditches, and septic tanks;
- No wastewater treatment plants (WWTs) in any of the 14 cities. All wastewater is discharged to the surface waters without treatment;
- Construction of WWTs is ongoing in seven out of fourteen cities, completion is expected in 2004.

Case study area

51. The following table gives an overview of the case study area and some of the main characteristics of the 14 cities and counties. It includes information on both the actual situation and the forecast for 2010.

Table 1. Overview of the study area in Sichuan Province

City/county	Number of inhabitants [thousands]			Urban-zone [ha]			Connection rates in 2000 [%]		WWTP under construction
	2000	2010	2015	2000	2010	2015	Water supply	Sewerage	
Luzhou City 泸州	303	550	702	2 500	3 500	4 258	69%	80%	Yes
Leshan City 乐山	390	800	1 021	2 200	2 200	2 677	80%	50%	Yes
Meishan City 眉山	128	170	217	1 500	1 650	2 007	71%	70%	Yes
Yibin City 宜宾	356	500	638	2 950	6 195	7 537	58%	40%	Yes
Changning County 长宁	42	50	64	335	685	833	61%	50%	
Gao County 高县	52	100	128	500	1 050	1 277	48%	70%	
zigong City 资中	472	600	766	2 400	2 700	3 285	90%	78%	Yes
Fushun County 富顺	92	200	255	1 200	1 332	1 621	97%	78%	
Neijiang City 内江	325	650	830	1 200	2 520	3 066	50%	66%	Yes
Weiyuan County 威远	129	224	286	1 111	1 444	1 757	96%	65%	
Zizhong County 资中	145	200	255	650	657	800	58%	80%	

City/county	Number of inhabitants [thousands]			Urban-zone [ha]			Connection rates in 2000 [%]		WWTP under constru ction
	2000	2010	2015	2000	2010	2015	Water supply	Sewerage	
Ziyang City 资阳市	162	250	319	1 566	2 336	2 842	70%	75%	Yes
Jiayang City 简阳市	173	200	255	630	1 330	1 618	71%	60%	
Linshui County 邻水县	105	250	319	987	1 984	2 414	88%	58%	
Total	2 876	4 746	6 055	19 729	29 584	35 993	72%	65%	

Source: Data and forecasts provided by the Sichuan expert team and checked by OECD consultants.

52. City-specific data for 2000 were provided by the authorities from individual cities and counties. They were further verified by the Sichuan team of experts consisting of officials from different departments of the Sichuan Provincial Government and Chinese consultants from Chengdu and Beijing. Additional crosschecks were conducted by the OECD team.

53. The number of inhabitants in urban zones is expected to increase significantly between 2000 and 2015, mainly due to the urbanization process and migration from rural areas. The official forecasts of population growth and growth of urban areas were provided by Sichuan government officials or estimated by local experts. The urban area included in the analysis is not the same as the administrative area of the city or county, the reason being that this study focuses on the development of the centralised collective wastewater infrastructure, and therefore rural areas within the administrative boundaries of the cities/counties, where centralised wastewater infrastructure is not envisaged, have been excluded from analysis.

Water consumption

54. Water consumption by connected households varies between 20 and 85 m³ per capita per year (55–220 litres per capita per day – l/c/d). The government target for 2015 is to ensure average water consumption of at least 60 m³ per capita per year (165 l/c/d) in each city. This target was taken as given in modelling.

55. The detailed city-by-city data on water supply to households in 2000 is shown in Table 3. This information is essential in estimating the volume of wastewater generated in each of the 14 cities. Moreover, because wastewater charges are linked to water supply fees, the amount of water supplied determines the revenue of wastewater treatment enterprises.

Existing sewerage system

56. Existing wastewater collection systems consists mainly of traditional, partly-covered ditches along the sides of streets rather than tightly-seated pipelines. According to local engineers, without renovation most of the existing traditional sewerage can not be used to effectively transport wastewater to the wastewater treatment plants that are being built or planned. Modern pipes are present in most cities, however their share in the total length of the system is usually modest. Within the scope of this project, it was not possible to conduct detailed inventories of the sewerage systems in order to obtain more specific, city-by city-data. Therefore local expert judgements on the deterioration rates and renovation needs were used as proxy estimates.

57. Table 2 shows these assumptions city-by-city. The total area included in the study is 19 729 ha. Of this 12 832 ha or 65 per cent was, in 2000, served with some sort of sewerage. On the basis of existing municipal plans for capital repairs and of the estimates of local experts, about 71 per cent of the sewerage needs renovation to meet the needs of the wastewater treatment plants. This means that it is planned to replace 71 per cent of traditional ditches with modern pipelines². In some cities the whole wastewater collection system is going to be redesigned and optimised for hydraulic performance. In terms of land area the renovated collection system will serve an area of 9 137 ha, which equals almost half of the total area under investigation.

Table 2. Assumptions and calculations used for the forecast of renovation of the existing wastewater collection system in the baseline scenario (year 2000)

City	Total land area (ha)	Connection rate to sewerage	Area served with sewerage (ha)	Share of Sewerage needed renovation	Area with renovated sewerage (ha)
Luzhou City 泸州	2 500	80%	2 000	50%	1 000
Leshan City 乐山	2 200	50%	1 100	10%	110
Meishan City 眉山	1 500	70%	1 050	100%	1 050
Yibin City 宜宾	2 950	40%	1 192	54%	644
Changning County 长宁	335	50%	168	91%	152
Gao County 高县	500	70%	350	100%	350
Zigong City 资中	2 400	78%	1 872	80%	1 498
Fushun County 富顺	1 200	78%	936	98%	917
Neijiang City 内江	1 200	66%	797	80%	637
Weiyuan County 威远	1 111	65%	722	40%	289
Zizhong County 资中	650	80%	520	70%	364
Ziyang City 资阳	1 566	75%	1 175	100%	1 175
Jianyang City 简阳	630	60%	378	100%	378
Linshui County 邻水	987	58%	573	100%	573
Total	19 729	65%	12 832	71%	9 137

Source: Data and estimates provided by expert team, Sichuan, and cross-checked by Beijing and OECD consultants

58. Simulations with FEASIBLE conducted in the first phase of this project have shown that a high level of renovation proposed by local experts (71 per cent by 2010) would lead to excessive investment needs. Therefore, it has been decided to assume that a realistic target would be to renovate, on average two per cent of existing sewers per year, which is a regular renovation schedule with estimated lifetime of sewer pipes of 50 years.

59. Data needed to estimate the total amount of waste water collected in the sewerage system in 2000 was provided by the city authorities and verified by local and OECD experts. Table 3 gives an overview of the data needed to estimate the amounts of waste water collected from households and from other sources in 2000. The table shows:

- Amount of water supplied to households (data provided by municipalities and local experts);
- Household connection rate to sewerage (data provided by municipalities and local experts);

² In FEASIBLE technology database there are a few types of modern wastewater collection systems. After consultation with Chinese experts it was agreed what part of the new sewerage would consist of the double pipe system, with a separate collection of storm-water and sewage.

- Estimated wastewater discharge to sewerage by households in 2000, calculated using the amount of water supplied to households, the connection rate to sewerage, and the assumption that the households with water supply and sewerage connection discharge 90 per cent of water supplied to the sewerage;
- Total amount of waste water collected (data provided by municipalities and local experts);
- Estimated wastewater discharge to sewerage by “other sources” (industry, budgetary organisations, storm-water) in 2000. This was calculated as the difference between the total amount collected and the estimated wastewater discharge by households.

Table 3. Estimate of wastewater generation in 2000

City or county	Water supply to households 2000 <i>(Million m3/y)</i>	Sewerage connection rate	Estimated waste water collected from household <i>(Million m3/y)</i>	Total waste water collected 2000 <i>(Million m3/y)</i>	Estimated waste water from other sources <i>Million m3/y</i>
Luzhou City 泸州	8.0	80%	5.7	21.2	15.5
Leshan City 乐山	15.9	50%	7.2	13.7	6.5
Meishan City 眉山	6.0	70%	3.8	5.1	1.3
Yibin City 宜宾	9.6	40%	3.5	20.6	17.1
Changning County 长宁	1.3	50%	0.6	1.1	0.5
Gao County 高县	2.1	70%	1.3	2.2	0.9
Zigong City 资中	19.6	78%	13.7	17.2	3.5
Fushun County 富顺	3.6	78%	2.5	3.4	0.9
Neijiang City 内江	12.0	66%	7.1	10.8	3.7
Weiyuan County 威远	3.5	65%	2.1	5.5	3.4
Zizhong County 资中	4.1	80%	2.9	5.5	2.6
Ziyang City 资阳	2.3	75%	1.5	8.8	7.2
Jianyang City 简阳	6.5	60%	3.5	3.5	0.1
Linshui County 邻水	2.6	58%	1.3	2.9	1.6
Total	97.0	65%	56.9	121.4	64.6

Source: Data provided by Sichuan local experts. Estimates conducted by international consultants (in italics)

Existing wastewater treatment

60. The existing situation with regard to wastewater treatment infrastructure can be summarised as follows:

- There were no wastewater treatment plants (WTPs) in any of the cities;
- Construction of WTPs was ongoing in seven cities (to be completed by 2004).

61. In 2000 none of the cities and counties analysed had wastewater treatment plants in operation. However, in seven out of the fourteen cities, wastewater treatment plants were under construction. According to the local experts all plants under construction are secondary treatment plants. Their completion is scheduled for 2004. The following table shows the treatment capacities of these plants per day.

Table 4. Capacity of plants under construction in 2000

City or county	Capacity of plants under construction (m3/d)
Luzhou City 泸州	50 000
Leshan City 乐山	50 000
Meishan City 眉山	40 000
Yibin City 宜宾	50 000
Zigong City 资中	50 000
Neijiang City 内江	50 000
Ziyang City 资阳	50 000
Total	340 000

Source: Data provided by Sichuan local experts.

3. INFRASTRUCTURE DEVELOPMENT TARGETS

Summary

62. Targets for the development of wastewater collection and treatment infrastructure were determined by the Chinese project partners on the basis of the official policy documents. These targets are summarised in Table 5.

Table 5. Summary of infrastructure development targets used in simulations

Investments and renovation in wastewater collection	<ul style="list-style-type: none"> - All 14 municipalities will extend the length of the sewerage system and service by 2010 in proportion to the expected high growth of population (up to 4.7 million in 2010 and 6.2 million in 2015), and will extend the service area of the sewerage system because of the expected expansion of urban zones from 197 km² in 2000 to 295 km² in 2010, and to 360 in 2015; - In all 14 municipalities, newly developed areas will be almost fully (90 per cent) covered by modern sewerage systems, some of which will separate waste water from storm water; the rest will use septic tanks; - By 2015, in all 14 municipalities, 80 per cent of inhabitants living in existing areas will be connected to sewerage network; the rest will use septic tanks - In all 14 municipalities sewers existing before 2000 will be gradually renovated by two per cent per year throughout the planned period.
Investments and renovation in wastewater treatment	<ul style="list-style-type: none"> - Seven municipalities will complete ongoing construction of wastewater treatment plants by 2004. In other cities wastewater treatment plants will be built between 2004 and 2010; - By 2010 all collected waste water will be treated biologically; - After 2010 the capacity of wastewater treatment plants will be extended in order to keep pace with urbanisation and with the increase in sewage capacity.
Maintenance and operation	<ul style="list-style-type: none"> - All 14 municipalities will properly operate and maintain existing, renovated, and new sewerage systems and wastewater treatment plants (regular, uninterrupted service, quality of service at the design level).

63. All the above targets were entered into the model taking into account the underlying forecast that all municipalities will experience rapid population growth, mainly due to urbanisation.

Construction of new sewerage system

64. It is assumed that both in existing and in newly developed areas, investments in the sewerage network will be made. By 2015, in all 14 municipalities, 80 per cent of inhabitants in existing areas (i.e. that were urbanized already in 2000) will be connected to a centralised sewerage network. The rest will continue using septic tanks.

65. Following the suggestions of the Sichuan government officials the assumption has been made that in all cities, in the newly developed urban zones, as many as 90 per cent of households will be connected to modern sewers, whereas the remaining 10 per cent will make use of septic tanks.

66. The following table shows the increase in city or county areas to be served by new, modern sewerage. This additional area where new sewerage, serving 90 per cent of population, needs to be constructed will cover almost 10 000 ha³ in 2010 and over 16 000 ha in 2015. These figures were derived from data presented in Table 2.

Table 6. Assumptions and calculations used for the forecast of extension of the existing wastewater collection system in the baseline scenario

City/county	Extension of urban area between 2000 and 2015 (ha)
Luzhou City 泸州	1 758
Leshan City 乐山	477
Meishan City 眉山	507
Yibin City 宜宾	4 587
Changning County 长宁县	498
Gao County 高县	777
Zigong City 资中	885
Fushun County 富顺	421
Neijiang City 内江	1 866
Weiyuan County 威远	646
Zizhong County 资中	150
Ziyang City 资阳	1 276
Jianyang City 简阳	988
Linshui County 邻水	1 427
Total	16 264

Source: Data and forecasts provided by Sichuan expert team. Calculations made by OECD consultants.

Connection rates to sewerage systems

67. As a result of the extension of the study area by 16 000 ha, and the assumption that in the new construction areas 90 per cent inhabitants will be connected to centralised sewerage, the overall connection rate to sewerage in the total study area will increase. In addition it is assumed that by 2015, 80 per cent of inhabitants living in areas that were already urbanized in 2000 will be connected to the centralised sewerage network. The following table gives an overview of the way in which the connection rates for 2010 and 2015 have been estimated. The overall connection rates for 2010 and 2015 are calculated by dividing the area served with sewerage by the total area (Table 7). Between 2000 and 2010, the overall connection rate is expected to increase from 65 per cent to 79 per cent and further increase to 82 per cent in 2015. This would be equivalent to achieving the Millennium Development targets of halving the percentage of population not having access to adequate sanitation (from 35 per cent in the year 2000 to 18 per cent in 2015).

³ The FEASIBLE model calculates the costs of urban sewerage construction on the basis of data on land area and land characteristics (e.g. slopes, hardness of the soil, depth of water tables), assuming standard population density, length of pipes of different diameters and number of pumping stations. If local conditions deviate from any of these standard assumptions, cost correction coefficients can be applied in FEASIBLE.

Table 7. Assumptions and calculations of the connection rates to sewerage

	Total area (ha)			Area served with sewerage (ha)			Average connection rate to sewerage		
	2000	2010	2015	2000	2010	2015	2000	2010	2015
Luzhou City 泸州	2 500	3 500	4 258	2 000	2 900	3 582	80%	83%	84%
Leshan City 乐山	2 200	2 200	2 677	1 100	1 540	2 141	50%	70%	80%
Meishan City 眉山	1 500	1 650	2 007	1 050	1 335	1 657	70%	81%	83%
Yibin City 宜宾	2 950	6 195	7 537	1 192	4 661	6 030	40%	75%	80%
Changning County 长宁	335	685	833	168	515	667	50%	75%	80%
Gao County 高县	500	1 050	1 277	350	895	1 100	70%	85%	86%
Zigong City 资中	2 400	2 700	3 285	1 872	2 190	2 716	78%	81%	83%
Fushun County 富顺	1 200	1 332	1 621	936	1 079	1 339	78%	81%	83%
Neijiang City 内江	1 200	2 520	3 066	797	2 148	2 639	66%	85%	86%
Weiyuan County 威远	1 111	1 444	1 757	722	1 189	1 471	65%	82%	84%
Zizhong County 资中	650	657	800	520	526	655	80%	80%	82%
Ziyang City 资阳	1 566	2 336	2 842	1 175	1 946	2 401	75%	83%	84%
Jianyang City 简阳	630	1 330	1 618	378	1 001	1 295	60%	75%	80%
Linshui County 邻水	987	1 984	2 414	573	1 489	1 931	58%	75%	80%
Total	19 729	29 584	35 993	12 832	23 413	29 623	65%	79%	82%

Source: Data and forecasts provided by Sichuan expert team. Calculations made by OECD consultants

Amounts of waste water collected

68. For every year until 2015 the total amount of waste water produced and collected was estimated by local and OECD experts on the basis of the following factors:

- The amount of water supplied to households, industry, and budgetary organisations;
- Patterns of water use (not all water supplied will be discharged as waste water; some of the water will be used in consumption or production, will vaporise, etc.);
- Rate of connection to wastewater collection system;
- Precipitation and amount of rainfall collected by the sewerage system;
- Other special sources (for example industries with their own water source, groundwater pumps, wells, springs).

69. To predict the amount of waste water produced in the future the expert's best estimates had to be made concerning the key factors listed above. For the "other special sources" it is assumed the wastewater generation will increase proportionally to population growth. This is in line with the assumption made for water supply. Wastewater originating from rainfall and ground water is assumed to remain stable at the year 2000 level. This is in line with the assumption in the baseline scenario that in existing urban zones no additional sewerage will be constructed.

70. As shown in Table 8, the amount of water that will be supplied to households in the future was estimated on the basis of the following data and assumptions:

- **Data on the number of inhabitants in each city or county in 2000 and the official forecast for future population growth**, which were provided by city authorities;

- **Household connection rates to centralised water supply.** The connection rates in 2000 were provided by municipalities. The estimates are based on the assumption that by 2015 all cities will have at least 90 per cent of inhabitants connected to a centralised water supply. This was announced as the official government target. Sichuan government officials suggested this target be included in the baseline scenario as a firm commitment by the government. Moreover it is “external” with respect to the wastewater sector. The connection rate for every year until 2015 was calculated on the basis of the assumption that this target will be gradually achieved in linear fashion between 2000 and 2015 for all cities with a connection rate of less than 90 per cent. In cities where the connection rate to the centralised water supply was already higher than 90 per cent in 2000, no changes are envisaged in the future;
- **Average amount of water supplied per inhabitant.** For 2000 the data were provided by municipalities and local experts. For future years it was estimated on the basis of the assumption that by 2010 and thereafter every inhabitant will use 60 m³ of water per year, which is an official government target. This is slightly higher than the average per capita water consumption in OECD households.
- **Total amount of water supplied to connected inhabitants per year.** For 2000 the data were provided by municipalities and local experts. For future years it has been estimated by multiplying the number of inhabitants forecasted in each year by connection rates and average water supply per inhabitant for that year.

Table 8 below illustrates the algorithm used to forecast future water use. The year 2010 is shown as an example.

Table 8: Centralised water supply to households in 2000 (data) and in 2010 (estimates)

City or county	2000				2010			
	Number of inhabitants (thousands)	Connection rate	Water supply to households million m ³ /y	Supply per cap. connect. m ³ /y	Number of inhabitants (thousands)	Connection rate	Water supply to households (Million m ³ /y)	Supply per cap. connect. (m ³ /y)
Luzhou City 乐山市	303	69%	8.0	38.1	550	83%	27.4	60
Leshan City 乐山市	390	80%	15.9	51.1	800	87%	41.6	60
Meishan City 眉山市	128	71%	6.0	65.8	170	84%	8.5	60
Yibin City 宜宾市	356	58%	9.6	46.3	500	79%	23.8	60
Changning County 长宁县	42	61%	1.3	52.7	50	80%	2.4	60
Gao County 高县	52	48%	2.1	85.2	100	76%	4.6	60
Zigong City 资阳市	472	90%	19.6	46.1	600	90%	32.4	60
Fushun County 富顺县	92	97%	3.6	40.5	200	97%	11.6	60
Neijiang City 内江市	325	50%	12.0	74.3	650	77%	29.8	60
Weiyuan County 威远县	129	96%	3.5	28.6	224	96%	12.9	60
Zizhong County 资中县	145	58%	4.1	48.3	200	79%	9.5	60
Ziyang City 资阳市	162	70%	2.3	20.0	250	83%	12.5	60
Jianyang City 简阳市	173	71%	6.5	52.6	200	84%	10.0	60
Linshui County 邻水县	105	88%	2.6	28.0	250	89%	13.4	60
Total	2,874	72%	97.0	46.6	4,744	84%	240.5	60

Source: Data provided by Sichuan local experts. Estimates conducted by international consultants (in italics)

71. Table 8 shows that the total amount of water supplied to households in the area covered by the study will increase two and a half times between 2000 and 2010. By the year 2015 it is expected to grow 3.4 times compared to 2000.

72. Now that future water supply to households has been estimated, it is possible to forecast the amount of waste-water that will be generated in future. Table 9 below illustrates how these estimates of the total amount of waste water to be produced in the future were conducted. Again the year 2010 is shown as an example.

Table 9. Estimates of wastewater generation in the future (example of 2010)

City or county	Water supply to households (Million m3/y)	Sewerage connection Rate	<i>Estimated wastewater collected from households (Million m3/y)</i>	<i>Estimated wastewater from other sources (Million m3/y)</i>	<i>Total waste water collected (Million m3/y)</i>
Luzhou City 泸州市	27.4	83%	20.4	15.5	35.9
Leshan City 乐山市	41.6	70%	26.2	6.5	32.7
Meishan City 眉山市	8.5	81%	6.2	1.3	7.5
Yibin City 宜宾市	23.8	75%	16.1	17.1	33.2
Changning County 长宁县	2.4	75%	1.6	0.5	2.1
Gao County 高县	4.6	85%	3.5	0.9	4.4
Zigong City 资阳市	32.4	81%	23.7	3.5	27.1
Fushun County 富顺县	11.6	81%	8.5	0.9	9.3
Neijiang City 内江市	29.8	85%	22.9	3.7	26.6
Weiyuan County 威远县	12.9	82%	9.6	3.4	13.0
Zizhong County 资中县	9.5	80%	6.9	2.6	9.4
Ziyang City 资阳市	12.5	83%	9.4	7.2	16.6
Jianyang City 简阳市	10.0	75%	6.8	0.1	6.9
Linshui County 邻水县	13.4	75%	9.0	1.6	10.6
Total	240.5	79%	170.7	64.6	235.3

Source: Data provided by Sichuan local experts. Estimates conducted by international consultants (in italics)

73. In the FEASIBLE model the amount of waste-water collected is also calculated per connected inhabitant in litres per day. The results are shown in Table 10. Although in some cities the amounts in 2000, 2010 and in 2015 differ considerably, the average amount of waste water collected per capita per day remains more or less stable at a level of between 130 and 180 litres per day on average. This is broadly on a par with waste water generated per capita in urban areas in OECD countries. Two cities (Luzhou and Yibin), where water consumption seems to have been excessive in the year 2000, will still use over 200 litres per capita per day in 2015, although improvement in efficiency is assumed.

Table 10. Assessment of waste water collected per capita, 2000-2015

City or county	Total waste water collected per connected inhabitant (l/c/d)		
	2000	2010	2015
Luzhou City 泸州市	240	216	205
Leshan City 乐山市	192	160	155
Meishan City 眉山市	155	150	153
Yibin City 宜宾市	392	242	225
Changning County 长宁县	144	155	160
Gao County 高县	166	140	155
Zigong City 资阳市	128	153	148
Fushun County 富顺县	130	158	154
Neijiang City 内江市	137	131	147
Weiyuan County 威远县	179	192	181

City or county	Total waste water collected per connected inhabitant (l/c/d)		
	2000	2010	2015
Zizhong County 资中县	130	161	167
Ziyang City 资阳市	198	218	207
Jianyang City 简阳市	94	125	134
Linshui County 邻水县	132	155	150
Average	178	172	169

Source: Data provided by Sichuan local experts. Estimates conducted by international consultants (in italics)

Wastewater treatment plants

74. Table 11 shows the treatment capacities (per day and per year) of the wastewater treatment plants that were under construction in 2000. These capacities are then compared with the estimated waste water that will be collected in these cities in 2005.

Table 11. Assessment of wastewater production and treatment in the study area in 2005

City or county	Capacity of WWT plants		Completion date	Wastewater collected (m3/y)	Per centage of waste water collected that can be treated
	l/d	m3/y		2005	2005
Luzhou City 泸州市	50 000	18 250	2004	26 650	68%
Leshan City 乐山市	50 000	18 250	2004	20 454	89%
Meishan City 眉山市	40 000	14 600	2004	6 202	235%
Yibin City 宜宾市	50 000	18 250	2004	25 963	70%
Changning County 长宁县				1 591	
Gao County 高县				3 207	
Zigong City 资中市	50 000	18 250	2004	21 669	84%
Fushun County 富顺县				5 592	
Neijiang City 内江市	50 000	18 250	2004	17 530	104%
Weiyuan County 威远县				8 262	
Zizhong County 资中县				7 137	
Ziyang City 资阳市	50 000	18 250	2004	11 670	156%
Jianyang City 简阳市				5 182	
Linshui County 邻水县				5 528	
Total	340 000	124 100		166 637	69%

Source: Data provided by Sichuan local experts. Estimates conducted by international consultants (in italics)

75. Table 11 shows that in most cases the planned (phase I) treatment capacity is smaller than the assessed amount of waste water to be collected already in 2005. In three cases the planned capacity exceeds the assessed amount of wastewater to be collected in this year. In Ziyang the excess capacity of 56 per cent in 2005 is small compared to the expected increase of waste water collected. In Meishan City, however, the excess capacity of 135 per cent may not be fully utilised even so far in the future as 2015. This may be a matter of concern for local authorities, unless there are some other factors that were not known to the project team (for example some large, water intensive industries under development).

76. To treat all sewage collected in 2010 and later, the capacities of wastewater treatment plants need to be extended as Table 12 shows.

Table 12. Assessment of waste water collection and extended treatment capacities in 2010 and 2015 (Million m³/year)

City or county	2010			2015		
	Collected	Needed capacity	Extension 2005-2010	Collected	Needed capacity	Extension 2010-2015
Luzhou City 泸州	35.9	37.7	19.4	44.2	46.4	8.3
Leshan City 乐山	32.7	34.3	16.1	46.2	48.5	13.5
Meishan City 眉山	7.5	14.6	0.0	10.0	14.6	2.5
Yibin City 宜宾	33.2	34.9	16.6	41.9	44.0	8.7
Changning County 长宁	2.1	2.2	2.2	3.0	3.1	0.9
Gao County 高县	4.4	4.6	4.6	6.2	6.5	1.8
Zigong City 资中	27.1	28.5	10.2	34.2	35.9	7.1
Fushun County 富顺	9.3	9.8	9.8	11.9	12.5	2.6
Neijiang City 内江	26.6	27.9	9.6	38.4	40.3	11.8
Weiyuan County 威远	13.0	13.6	13.6	15.8	16.6	2.8
Zizhong County 资中	9.4	9.9	9.9	12.7	13.4	3.3
Ziyang City 资阳	16.6	18.25	0.0	20.3	21.3	3.7
Jianyang City 简阳	6.9	7.2	7.2	10.0	10.5	3.1
Linshui County 邻水	10.6	11.2	11.2	14.0	14.7	3.4
Total	235.3	254.6	130.5	308.8	328.3	73.5

Source: Estimates conducted by international consultants.

77. The wastewater treatment capacity of plants to be built by 2005 (of almost 125 million m³/y) should be more than doubled in the period 2005–2010 to guarantee full treatment of collected sewage. In the period 2010–2015, an additional 75 million m³/y treatment capacity needs to be added in most cities included in the case study in order to keep pace with urbanisation. This will be realised by the extending of already existing wastewater treatment plants.

4. EXPENDITURE NECESSARY TO ACHIEVE INFRASTRUCTURE DEVELOPMENT TARGETS

Correction to local costs

78. The cost functions for wastewater collection and treatment in the FEASIBLE model were derived from Western European cost data (mainly from Denmark). They also reflect the typical distribution to the main cost categories (equipment, materials, design, labour, energy, land, etc.) in European utilities. Therefore in FEASIBLE, each cost centre has its own cost correction coefficient which can be used to adjust the international cost levels to local price levels and cost structures. Table 13 gives an overview of the price assumptions and correction coefficients applied in the Sichuan study.

Table 13. Cost and price assumptions and correction coefficients applied in Sichuan Province

Cost categories	Assumption or coefficient applied	Dimension
Cost of wastewater equipment	20%	% of international
Cost of construction materials	20%	% of international
Average wages of a construction worker	Yuan 2,000	Per month
Average salary for design and administration	Yuan 3,500	Per month
Opportunity price of land	-	Per m ²
Electricity border price	Yuan 0,60	Per kWh
Average price of wastewater treatment chemicals	100%	% of international
Average salary at public utilities	Yuan 2,000	Per month
Labour intensity in construction	1	Local/international
Labour intensity in water utilities	1	Local/international
Labour productivity in design etc	1	Local/international

Source: Data and estimates of Chinese experts from Sichuan Province and international consultants

79. For the correction of investment costs the most critical cost factors are the relative prices of wastewater equipment and construction materials, whereas electricity, labour, and labour intensity play the most significant roles in operational costs.

80. To crosscheck the strength of these cost correction coefficients for wastewater treatment plants, additional data were obtained. Some Sichuan experts estimated that on average the investment expenditure per unit of treatment capacity is about 1 600 Yuan⁴ (\approx 200 US\$) per one cubic metre per day. In the FEASIBLE model the units are expressed in Pollution Equivalents (PE) and the modelling assumption is that one PE is equivalent to a wastewater discharge of 200 litres per day. This means that the treatment capacity of 1 000 litres per day is equivalent to a treatment capacity of five PE. From the FEASIBLE

⁴ The Chinese currency is the RenMinBi (RMB), generally pronounced Yuan in written form

manual it can be seen that for a tertiary wastewater treatment plant with a capacity of 100,000 PE, the unit investment expenditure per PE for is about 125 US\$, or 635 US\$ per 5 PE. This indicates that local investment costs may account for about 30 per cent of the Western European unit costs, used by default in the model. Data provided by the World Bank indicate that investment costs per one m³ of wastewater treatment capacity are even lower. From the experience of the World Bank, investment costs vary from 950 Yuan (Dalian wastewater treatment project) to about 1 400-1 500 Yuan. It was also mentioned that investment costs could easily be 10 per cent lower than initially assessed in feasibility studies if competitive public procurement was used⁵. Other data provided by the local experts show that the investment costs for secondary treatment on average could be as low as Yuan 950 per one m³ of treatment capacity (Yuan 460 for equipment, and Yuan 490 for construction). Finally for Changnin County the total investment for phase one of the planned wastewater treatment plant is estimated at Yuan 54 million, for a projected capacity of 40 000 m³ per day, which gives a unit investment expenditure of Yuan 1 350 per one m³ (information provided by the local experts).

81. Taking into account all above considerations and crosschecks, the estimates made by Sichuan experts were considered realistic. The unit construction and equipment costs for wastewater treatment plants were estimated to be about 20 per cent of it would cost in Western Europe.

82. It proved more difficult to check the strength of the assumptions of the cost correction coefficients for sewerage. The costs of construction and renovation will depend on various factors, for instance the cost of pipes. As we could not obtain data from China that is comparable with the FEASIBLE default input values we made the assumption (supported by some *ad hoc* checks with local prices) that the same factor (20 per cent of European costs) can be applied as for sewage treatment.

Results of expenditure needs estimates

83. On the basis of the data, estimates, and assumptions about existing situations, service level targets, and cost correction coefficients described above, the OECD consultants have calculated the expenditures needed over time to achieve the infrastructure development and maintenance targets. By using the FEASIBLE model it was possible to separately forecast needs for capital investments in new assets, for renovation of existing assets, as well as for proper operation and maintenance of wastewater infrastructure.

84. Although all data and assumptions used to calculate expenditure needed were collected or estimated separately for individual cities and counties, they are presented in aggregate form for all 14 urban zones together. The nature of the costing methodology applied in the FEASIBLE model does not guarantee the same accuracy of cost estimates for individual cities as it does for the group of cities as a whole. With the FEASIBLE approach some particularities of individual cities and projects may not be captured. Therefore detailed feasibility studies can give results that are ± 40 per cent different from model estimates. In large samples, particularities offset one another. Applications of this methodology so far have shown a high degree of accuracy (± 5 per cent) and strength of aggregate cost estimates for larger groups of cities (more than thirty). Because of the relatively small number of cities examined in Sichuan the margin of error in the cost estimates made in this study may be slightly higher. In order to improve accuracy the project team conducted additional cross checks with the MOSES model of the TME company, and additional “reality checks” by comparing model results with the data from the actually implemented projects in China. Estimate of expenditure needed estimates for individual cities can be checked by technical experts in the special intermediary files in the FEASIBLE model. This notwithstanding, policy

⁵ Personal communication with Matts Anderson, the World Bank, 29 November 2002.

makers are not encouraged to treat them as a substitute for cost estimates for the purpose of feasibility studies. Table 14 gives the aggregate forecast of expenditure needed to implement the baseline scenario of development of wastewater infrastructure in all fourteen urban zones in Sichuan Province. This is further illustrated in Figure 1.

Table 14. Expenditure needed to implement the planned investment programme for the wastewater collection and treatment in 14 cities in Sichuan Province

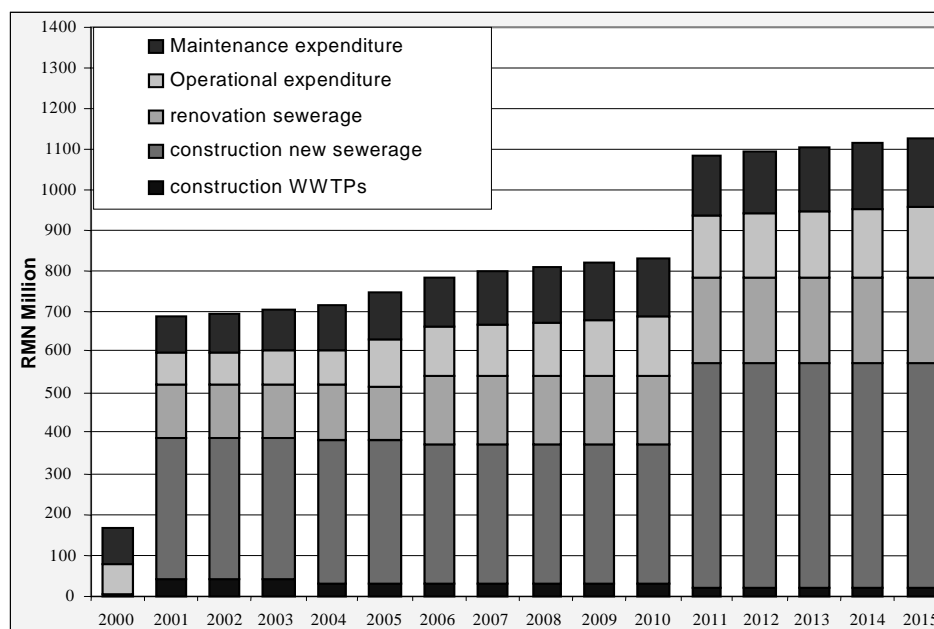
(annual expenditures needs in million Yuan per year, in 2000 prices)

Expenditure Category \ Year:	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
WW treatment:																
investments	5	39	39	39	33	32	32	32	32	32	32	20	20	20	20	20
maintenance					1	6	7	8	9	10	12	13	13	14	15	16
operational costs					4	23	26	29	32	36	39	42	45	48	50	53
Sewerage:																
New construction		351	351	351	351	351	344	344	344	344	344	552	552	552	552	552
renovation		131	131	131	131	131	166	166	166	166	166	213	213	213	213	213
maintenance	87	92	97	102	106	111	116	121	125	130	134	138	142	145	148	151
operational costs	71	75	79	83	87	91	95	97	100	102	104	107	110	113	116	119
Total expenditure needs	163	687	696	705	713	745	785	797	808	819	831	1086	1095	1105	1115	1125

Source: Calculations with the FEASIBLE model

Note: Financial expenditures are excluded; These are model simulations of expenditure needs. Actual levels and distribution of expenditures in the period 2000-2004 may have been slightly different

Figure 1: Expenditure needed to implement the planned investment programme for the wastewater collection and treatment in 14 cities in Sichuan Province (in millions 2000 RMB⁶ per year)



⁶ The Chinese currency is the RenMinBi (RMB), generally pronounced Yuan in written form. In the report we use both forms interchangeably.

Source: Calculations with the FEASIBLE model

Note: Financial expenditures are excluded; These are model simulations of expenditure needs. Actual levels and distribution of expenditures in the period 2000-2004 may have been slightly different

85. The beginning of construction of wastewater treatment plants and the related centralised wastewater collection system in 2001 marked a significant expansion of expenditure. As illustrated in Table 14 and Figure 1, the heaviest expenditures are needed to finance capital investments in new sewerage and for renovation of existing sewerage. The construction of wastewater treatment plants (WWTPs) is relatively less capital-intensive. The volume of operational and maintenance expenditures would also need to increase over time, in particular after completion of the construction of WWTPs in 2005, and later as larger urban areas will be served by sewerage.

86. Having calculated the forecast of the expenditure needed for the baseline scenario, we now will turn to the forecast of the supply of finance to the wastewater treatment infrastructure in all fourteen cities and counties.

5. BASELINE SUPPLY OF FINANCE

Key issues in financing urban wastewater collection and treatment in China and in Sichuan

87. Traditionally, sewerage systems and wastewater treatment plants were regarded as public goods and were financed and built solely by the government. Urban water supply and wastewater utilities would also rely mainly on government financing for their operations and maintenance. Only recently, wastewater utilities began to receive fees from those connected to the supply network. Although the majority of urban wastewater infrastructure is still funded by the government at different levels, increasingly, foreign government and loans from international financing institutions (IFIs) are used as a source of funding for capital improvements. Some provinces have also attracted foreign private equity and credit to mobilise financing of construction of water supply systems. Some sources report cases of private developers and operators of wastewater treatment plants in large cities.

88. Inadequate funding of capital investments in sanitation and wastewater treatment is just part of the problem. Sometimes funding is not available to maintain and operate those plants that have already been built. After completion of construction, the WWT plants are typically registered as state-owned enterprises but funds for their operation and maintenance are still allocated from local and Central Government budgets. Some cities are unable to set aside sufficient funds from the budget and are unable or unwilling to raise user charges to support the necessary operational and maintenance costs of the facilities. As a result it is not uncommon for wastewater treatment plants -- even those recently built -- to be irregularly operated.

89. In most OECD countries revenues from charges imposed on users of infrastructure account for the major share of financing of this infrastructure. In particular, user charge revenues fully cover the costs of proper operation and maintenance. Some OECD countries have moved towards full cost pricing, where user fees also cover the replacement of fixed assets and the costs of financing capital investments. It should be noted, however, that several years ago, when wastewater infrastructure was first constructed in industrialised countries capital investments were usually also funded by the governments.

90. The Chinese government has recognized the importance of user fees and has provided a regulatory basis for their application. The legal basis for the fees for the use of wastewater infrastructure is laid down by the 1996 revision of the "Law on Prevention and Control of water Pollution". The strong impetus for strengthening the financial viability and management of wastewater collection and treatment was provided by Central Government through a series of policy guidelines between 1999 and 2002. These documents, issued jointly by key government departments stipulate, among other things, that wastewater management is to be undertaken by enterprises, which shall adopt corporate-style management and independent accounting. Wastewater tariffs should increase to cover all operations, maintenance, including depreciation, a reasonable margin of profits, and if justified, investment costs, although local government are allowed to phase in tariff increases at a rate that takes into account local circumstances. Full cost pricing is envisaged as an ultimate target for municipalities.

91. Budget management in the public sector may create some structural difficulties in infrastructure investment planning. At all levels of the Chinese government operating budget is separated from capital

budget. The capital budget is not managed by the Ministry of Finance or its territorial equivalents, but rather by the State Development and Reform Commission (SDRC), which passes approved projects on to the Ministry of Finance as a *fait accompli* for financing. The Ministry of Finance has no opportunity to challenge decisions made by the SDPC in this area. The same procedures are mimicked at the lower levels of the government. A separate decision-making procedure for operations and capital expenditure poses a risk of a “disconnect” between the two. Fixed assets may be installed without due consideration for financing their operation and maintenance.

92. In Sichuan the wastewater infrastructure is not very well developed, but has been expanding rapidly in recent years, partly due to the investments financed by the Central Government. According to the Chinese authorities Central Government has committed two Billion Yuan (c. 250 Million USD) per annum over the next 10 years to support investments in sanitation and wastewater treatment in the immediate proximity of the planned reservoir (Chongqing Province) and in the so-called “impact area” (located mainly in Sichuan Province). These commitments are included in the tenth five-year plan, as well as in the long-term development plan for the Yangtze River until 2010. Some Chinese experts envisage that these commitments may be discontinued after 2005. Even if continued – according to the estimates of the local Sichuan experts - Central Government transfers would fall short of total capital investment needs. Chinese government recognizes the need to attract additional finance to this programme. Private finance (debt and equity) is increasingly being considered as the major remedy. There are already a few examples of WTP projects in Sichuan that were financed with loans both from international and domestic banks.

93. It seems that most government transfers to the wastewater sector are earmarked for construction of wastewater treatment plants, rather than for rehabilitation or construction of new wastewater treatment collection systems. This potentially may result in delayed development of sewerage, causing inadequate hydraulic load on WWTPs and their inefficient operation.

94. Following the general policy of the Central Government the Sichuan authorities attach great importance to attracting foreign finance to infrastructure – both grants and long-term credits. Some local experts interviewed have indicated certain supply side barriers to raising foreign finance to wastewater treatment infrastructure in Sichuan, such as tied procurement required by bilateral financiers. Experts said this created additional dependence on expensive working capital (spare parts, chemicals, etc.). Profit margins expected by foreign private investors were often too high to be afforded by local population. This notwithstanding, several bilateral co-operation programmes are active in the wastewater sector in Sichuan, for example Denmark, UK, Italy, Canada, Australia, Japan. Wastewater treatment plant “Chengdu 1” has been completed recently with bilateral loans from Japan and the Netherlands. The World Bank is also financing a multi-city Sichuan Urban Environment Project, which includes wastewater components in Chengdu, Leshan, Deyang, and Zigong.

Baseline financing assumptions at a glance⁷

95. The baseline scenario reflects the most likely development of the present financing trends without significant additional interventions made by municipalities or by the higher levels of government. The main rationale underlying the baseline scenario is that it only includes already committed financing. It

⁷ Readers of the interim report of the first phase of this project will have already noticed that the baseline scenario in the interim report was designed differently than in this final report. Here, we have maintained the earlier assumptions on the supply of finance only. However, the targets for infrastructure development are different than in the interim report. In this study the targets are identical for all scenarios that are simulated (financing strategies), including the baseline scenario and three alternative financing strategies.

is just a hypothetical scenario, which sets the benchmark against which simulations of actions to mobilise additional financing are conducted. The baseline scenario rests on the assumption that the trends prevailing in the period 2000-2004 will continue after the planned period until 2015.

96. The project team has collected and processed data on financing of wastewater infrastructure in all fourteen cities and counties for the year 2000 or later, if available. From the 2000 levels onwards, the forecast for the future supply of baseline finance was conducted and crosschecked with data that became available during project development until 2004. Some forecasts for the future supply of finance were made by the team of consultants outside of the FEASIBLE model and the results were entered into the model as inputs. Other forecasts were generated by the functions built into FEASIBLE, and consultants only specified parameters for these forecasts.

97. The supply of finance is specified on a year-by-year cash flow basis. FEASIBLE distinguishes between the following sources and instruments of financing:

- User charges (from households, industry, or other consumers);
- Public budgets (local, and transfers from the higher levels of government);
- External grants (from several sources);
- Loans (several different loans can be specified);
- Other sources of financing.

98. Supply of finance data for the year 2000 has been collected for each city/county separately. However, the forecast of financial flows is entered into the model in aggregate form. It implies, that for the reasons explained earlier, financial flows and financing gaps will not be calculated for each individual city or county, but for the entire study area. In this section, however, some of the underlying city/county level data and assumptions are also presented.

99. All financial forecasts in the baseline scenario have been adopted through a data analysis and a series of discussions with local consultants and officials from the Sichuan Government, including the Sichuan Environmental Protection Bureau, the Sichuan Development Planning Commission, the Sichuan Construction Committee, and the Financial Bureau. Representatives of financial institutions (international and domestic banks) were also interviewed. All baseline assumptions have been approved by the local experts and the Steering Committee. Every effort was made to verify data quality, but authors realise that in some remaining cases data may represent plans rather than actual facts. In a few instances some double counting may have occurred. However, sensitivity tests confirmed that data are strong enough to support the final conclusions.

100. The baseline scenario assumes, in general, that only financing that was available and committed as of 2004 would be disbursed. No new, additional financing would be provided. Modest increase of wastewater charge rates is assumed to reflect government commitments. Other than that, the revenues of wastewater fees would grow in line with urbanization, water use per capita, and with connection rates.

101. The baseline scenario, defined in this way, was translated into several quantitative, technical variables. The following table gives the main quantitative assumptions of the baseline scenario. Later we will present each baseline element in more detail.

Table 15. Baseline financing of wastewater infrastructure in selected cities in Sichuan Province: Summary of assumptions

FINANCING	
User charges	<ul style="list-style-type: none"> - User charge rates for household will be introduced in all cities after 2004 and will gradually increase to meet the “target” of 0.5 Yuan per cubic metre in 2010; - Revenues from household wastewater charges will additionally grow due to increase in population, increase of the connection rates to water supply, and due to the growth of per capita water use; - Revenues from non-household fees will grow in proportion to the growth of the population.
Local budget	<ul style="list-style-type: none"> - Total municipal budget expenditure on wastewater infrastructure will grow in proportion to the growth of local GDP; - The share of total consolidated budgets of municipalities in Gross Regional Product (GRP) will remain at the 2000 level of six per cent; - The share of expenditure on wastewater infrastructure in total municipal budgets expenditure will remain at the 2000 level (3.2 per cent); - The proportions between operational and investment subsidies will remain at the 2000 level: 38 per cent is earmarked for investments; 62 per cent for operational subsidies.
Transfers from the higher levels of government	<ul style="list-style-type: none"> - Subsidies from the Central and Provincial Government that have already been committed already to the municipalities and earmarked for construction of wastewater treatment plants and mains collectors (about 20 million Euro per year) will be spent until 2004, when these plants will be completed; - After 2004, no Central Government transfers are envisaged.
Loans	<ul style="list-style-type: none"> - Small amounts of “soft loans” have been taken by two municipalities from the higher levels of the government and state owned banks: RMB 20.2 million in 2001; RMB 19 million in 2002; and RMB 21 million in 2003; - All committed loans will be disbursed and paid back according to known schedules; - No commercial loans or private equity are used in the municipalities studied for wastewater management.
- No additional finance will be provided	

Source: Sichuan expert team (Sichuan Environmental Protection Bureau, Project Steering Committee, Chinese consultants), OECD consultants

102. Below all baseline forecasts for different financing are described in details and analysed. City-by-city information is shown in so far as is possible.

User charges

Households user charges - background

103. User charges for wastewater treatment were introduced only a few years ago. During the late 1990s and the beginning of 2000s the Central Government issued a number of policy documents setting the regulatory framework for charging households, industry and state organizations for services provided by wastewater collection and treatment infrastructure. This important step was made in 1999 with the issuance of the "Circular of the State Development Planning Commission, Ministry of Construction and the State Environmental Protection Administration on Strengthening the Collection of Wastewater Tariff and Establishing a Sound Operation Mechanism on the Discharge of Urban Wastewater and Central Treatment". The Circular stipulates, among other things, that wastewater management is to be undertaken by enterprises, which shall adopt corporate-style management and independent accounting. Wastewater

tariffs should be collected by water supply enterprises with the water tariff and transferred monthly to the wastewater management enterprises, strictly limiting exemptions. The tariff should cover all operations, maintenance, including depreciation, a reasonable margin of profits and if justified, investment costs, although local government are allowed to phase in tariff increases at a rate that takes into account local circumstances. Full cost pricing is envisaged as an ultimate target for municipalities.

104. In July 2002 five key government institutions jointly issued a policy document (on Promoting Industrialization of Urban Sewage and Garbage Treatment) that requires wastewater companies to finance operations and investments without government subsidies. It further states that “All the cities with county level cities should charge sewage treatment fees as soon as possible adhering to relative regulations, when cities adjust the prices of urban water supply and sewage treatment fees, the charging standards of sewage treatment fees should be given priority to adjust to the levels of break even and slight profit to meet the needs of sewage treatment construction and operation.” (Pei, X.F. *et al* 2003). More detailed review of legal and regulatory acts related to wastewater treatment finance is included in the Annex.

105. It will take time before these policy guidelines issued by national authorities are implemented at the ground level. Only half of the cities studied have introduced charges for wastewater treatment services. Interviews with municipal officials and with operators of wastewater treatment enterprises in Sichuan Province indicated that even if the charge is in place, the revenues still fall much short of the needs to cover even basic operation and maintenance of wastewater collection and treatment facilities. Discussions with local experts have also helped identify remaining regulatory and institutional reforms that need to be pursued to enable wastewater enterprises to recover costs of services from the users. The major ones are outlined in this section.

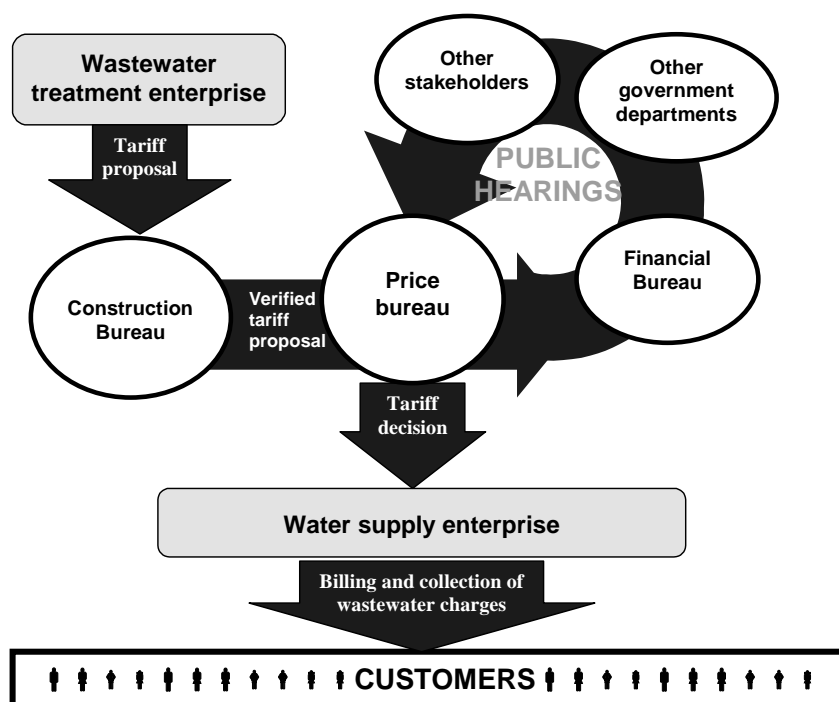
106. In the cities studied there were no charges for using the wastewater collection system. Sewerage user charges were introduced in the beginning of 1990s, but they were abolished later. The financing of sewerage network again became the direct task of the government and a budgetary routine. In Leshan, in the course of the preparation of the project financed by the World Bank, the wastewater enterprise appears to be responsible both for the wastewater treatment plant as well as for collection of wastewater in the city. There, the wastewater charges paid by users are also expected to cover the costs of wastewater collection.

107. The decision cycle and financial flows related to user fees for wastewater treatment are quite complicated by international standards. The cycle begins every year when the wastewater enterprise calculates its costs and develops a budget proposal for the forthcoming year, including wastewater treatment tariffs. The City Construction Bureau verifies the budget developed by wastewater enterprise and submits the proposal to the City Price Bureau for consultations with the other departments⁸. The City Price Bureau verifies the tariff proposals and organizes public consultations that mainly involve other government departments (SDPC, FB) but also non-governmental stakeholders. Following consultations, the Price Bureau revises the tariff proposal and announces the new rates as binding. The Wastewater Enterprise and Construction Bureau often submits two types of tariff proposals for consideration by the city government. At first, they propose the charge rate that would cover full cost, including the capital repairs, system development, and depreciation of fixed assets in line with the Central Government Policy. Another proposal covers so-called “direct business costs” only, which include operational and maintenance costs only (without salaries). The government often approves the rates, which are well below even direct business costs. For example in Luzhou, the WWTP enterprise has recently proposed full cost recovery tariff at the level of 0.95 RMB/m³, and operational and maintenance cost-recovery tariff at 0.4 RMB/m³.

⁸ It is important to note that the wastewater treatment charge proposal does not include the costs of the wastewater collection system, because, usually, the wastewater treatment enterprise neither mentions it on the balance sheet nor is it responsible for its operation.

Following government-wide consultations, the rate approved by the Price Bureau was only 0.2 RMB/m³. There was no accompanying explicit legal commitment as to who and how the resulting deficit of wastewater enterprise will be covered.

Figure 2: Establishing wastewater treatment tariffs in a representative city in Sichuan Province



Source: Authors on the basis of interviews with local governments

108. Development Planning Commissions at the city level play a role in setting tariffs for projects financed by Central Government transfers. If wastewater enterprise applies for receipts from national bonds, the tariff proposal must be submitted to the Development Planning Commission of the city, which passes it over to the rest of the local government for approval.

109. Personnel costs in utilities that have the status of state-owned enterprises (like in the 14 cities studied) are accounted for separately. Typically they are not included in the “direct business costs” and hence are not part of the base for calculation user charge.

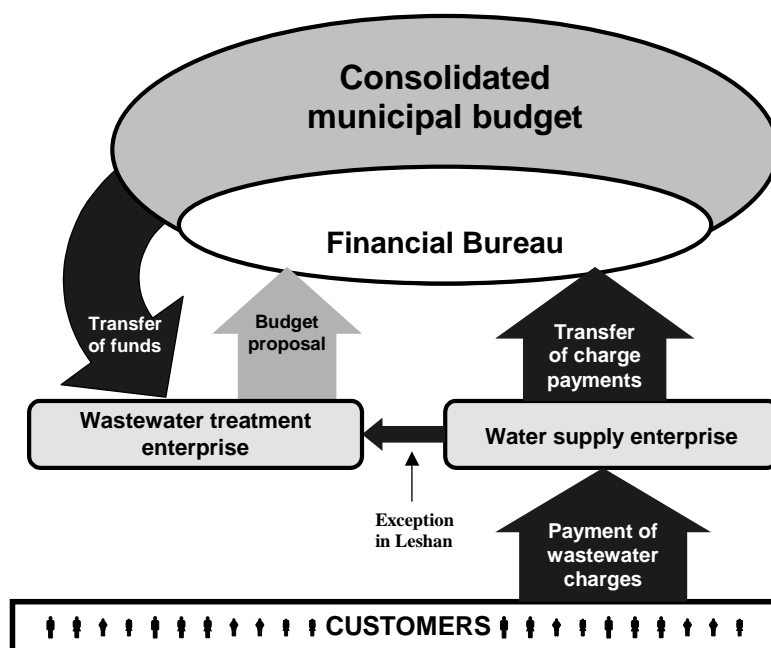
110. Wastewater treatment charges are not collected by wastewater enterprises. The enterprise responsible for water supply collects charges for wastewater treatment, which are piggy-backed to water supply fees. This arrangement should be expected to increase collection rates because the willingness to pay for drinking water is typically higher than willingness to pay for wastewater treatment. This is because fresh water is a private good that benefits users directly, while wastewater treatment generates “external” benefits to other people and to other cities downstream. Moreover linking wastewater charges to water supply bills also decreases the costs of billing and collection. The downside of this system is that wastewater enterprises are disconnected from their customers.

111. The water supply enterprise transfers all revenues to the City Financial Bureau after deducting handling fees. The Finance Bureau adds receipts to the comprehensive city budget. All inhabitants connected to the centralized water supply pay a wastewater charge, irrespective if their wastewater is treated or not.

112. The wastewater enterprise does not automatically receive the wastewater charge revenue⁹. Expenditures on the operation of wastewater treatment plants are determined year-by-year through regular budget bargaining, rather than through business-like decisions under the self-financing principle. To receive operational revenue for running the company the wastewater enterprise prepares its annual and quarterly expenditures budget plan and submits it to the Financial Bureau of the local government. Just like all government departments, the wastewater enterprise has to prepare a budget proposal that consists of two separate parts. The first part covers the personnel expenditures (salaries plus some administrative costs) calculated in a very bureaucratic way, as the number of people on the payroll of the WTTP enterprise multiplied by the per capita rate established by the government for local government employees taking full consideration of local conditions. For example in 2003 it was 10 000 RMB per person per year in Sichuan. The non-personal budget covers payments for electricity, water, spare parts, etc. The Financial Bureau verifies these expenditure budget proposals and usually approves just a portion of what was proposed.

113. Operational expenditures appropriated by the Financial Bureau are loosely related to the revenue from the wastewater charge. Appropriations are often lower than collected revenue. Financial bureaus argue that this is because wastewater charges are paid by all people connected to the water supply, who usually outnumber the inhabitants connected to the wastewater treatment plant. For example, in Luzhou in 2002 the revenue of wastewater charges amounted to 4.2 million RMB, but the local government budget appropriated only 200 000 RMB to the WTTP company to cover some direct costs. Hence, the cost of providing the service is not a decisive factor in determining the revenue of the wastewater enterprises. The figure below shows a financial flow of user fees in a representative city in Sichuan Province.

Figure 3: Financial flow of user fees for wastewater treatment in a representative city in Sichuan Province



⁹ Leshan seems to be the exception among the 14 cities studied. In the course of the preparation of the wastewater project co-financed by the World Bank, the wastewater enterprise seems to have been given the right to receive direct transfers.

Source: Authors on the basis of interviews with local governments

114. If the financial bureau does not give appropriation to cover full operations and maintenance costs, the wastewater enterprises are not left with many viable options. They can either reduce the volume of wastewater treated or reduce the level of treatment (*e.g.* bypass the biological treatment), or eventually cease to treat wastewater at all. The level of treatment also decreases over time as the spare parts deteriorate if financial bureaus do not allocate enough expenditure for regular maintenance (small repairs, replacement of worn-out spare parts, etc.).

115. This established practice deprives wastewater enterprises from their financial autonomy and creates a situation where despite their formal status as commercial (though state-owned) companies, in practice **they have a very limited ability to determine their expenditures and revenues**. Their financial flows are managed according to a rigid budget process, as with any other government bureaucracy. This perpetuates the lack of “corporate culture” and seems to be one of the major obstacles to achieving self-financing of wastewater services.

116. In this context it is hardly surprising that the managers of wastewater treatment companies are not even interested in operating and maintaining main collection pipes, to say nothing of the upstream wastewater collection systems. As interviews showed, they preferred this responsibility to rest on the shoulders of the municipal government. With this lack of operational and financial autonomy, these formally independent enterprises perceive additional assets as an additional burden, rather than as a commercial opportunity. Squeezed into a budgetary regime where there is a permanent scarcity of funds and annual bargaining for budgetary allocations, the wastewater enterprises can not generate additional revenue to cover the costs of additional services. Under budgetary appropriation of funds (which is political, bureaucratic, short term, and uncertain by nature), wastewater enterprises have no incentives to reduce costs and to optimise the performance of the entire wastewater management system, as savings do not translate into higher profits, salaries, and investment funds for development. Still much needs to be done in order to fulfil the guidelines of Central Government and expectations of financial institutions, such as those expressed by the World Bank back in 1999 (see box below).

Increased revenue from user charges as a condition to attract international loans to wastewater enterprises in Sichuan Province

In 1999 the World Bank expected that given shrinking public investment budgets and subsidies, water supply and wastewater treatment companies would rely increasingly on user charges to finance their operational costs and debt service requirements. The project appraisal document for *Sichuan Urban Environment Project* reads *inter alia*:

“The wastewater components of [the loan to] Chengdu, Deyang, Leshan and Zigong would be implemented by the cities through recently created financially autonomous wastewater companies. The establishment of financially autonomous water utility enterprises to develop and manage urban services is a long-standing Chinese practice and avoids many of the management difficulties of publicly owned utilities in other countries. However, wastewater collection and treatment services have only recently been given the same autonomy [as water supply companies], generally by absorbing the existing drainage bureaus and construction management units already active in the sector into separate enterprises. The prior technical experience of these bureaus would undoubtedly permit a smoother transition, but high levels of technical assistance would be needed to strengthen the new enterprises’ managerial, financial and operational capacities.

The self-funding, self-accounting, state-owned wastewater enterprises in Chengdu, Deyang, Leshan and Zigong were established during project preparation; this represents a major step in utility reform, consistent with stated national policy, and a model for the rest of Sichuan Province. The staff of these companies was transferred from the existing municipal engineering administration departments responsible for sewerage and drainage services. Therefore, while the wastewater companies would start with operations experience, they as yet lack a “corporate” culture.”

Source: World Bank: project appraisal document on a proposed loan in the amount of US\$150 Million and a proposed credit of SDR 1.5 Million to the People's Republic of China for a Sichuan urban environment project, May 14, 1999

Modelling households user charges

117. The current tariff policy and institutional set up for the management of charge revenue make it difficult to realistically forecast the future flows of user charges available to wastewater infrastructure. For example there is no direct and clear rule that would link the charges collected from households with charges transferred to wastewater enterprises, although such links are stipulated in the policy guidelines issued in the last few years by Central Government. Therefore, for modelling purposes we usually make a rough assumption that amounts collected equal the amounts available for the wastewater infrastructure. This section describes in detail the step-by-step process of deriving the baseline forecast of the revenues of user charges in all cities under study.

118. The detailed calculations of the flow of revenue of user charges in the baseline scenario was derived from the city-by city data provided by local experts and officials for 2000 or later years if available. These base years data were used to design the baseline forecast. The baseline scenario by definition assumes only minor policy reforms, which would be the continuation of trends observable in recent years. In the analysis of alternative financing strategies, the baseline will be used as a benchmark against which the impacts of reforms will be demonstrated.

119. The total flow of revenue of user charges collected from households was estimated on the basis of the following raw data collected for the years 2000-2004 in each city:

- Amount of water sold to households (water consumption);
- Rate of user charge for wastewater collection and treatment services;
- Collection efficiency of user charges (ratio of charges actually collected to charges billed).

120. The total **amount of water sold to households** was assumed to be equal to the total water consumption. Water consumption data for 2000 were collected from each city (see Table 16). The forecast of future water consumption by households was conducted by consultants on the basis of parameters and assumptions given by the local experts and government officials. These parameters and assumptions were already discussed in the chapter on expenditure needs (see Table 7). In Table 16 below, we present the 2000 data and the forecast of annual quantities of water to be sold to households for sample years in the period until 2015.

Table 16. Forecast of annual quantity of water sold to households (million m³/year)

City or county	2000	2005	2010	2015
Luzhou City	8.0	15.2	27.4	40.0
Leshan City	15.9	25.9	41.6	61.9
Meishan City	6.0	7.2	8.5	10.6
Yibin City	9.6	15.4	23.8	32.0
Changning County	1.3	1.8	2.4	2.9
Gao County	2.1	3.2	4.6	7.5
Zigong City	19.6	25.4	32.4	36.5
Fushun County	3.6	6.6	11.6	17.1
Neijiang City	12.0	19.4	29.8	49.6
Weiyuan County	3.5	7.2	12.9	17.0
Zizhong County	4.1	6.3	9.5	12.7
Ziyang City	2.3	6.2	12.5	16.8

City or county	2000	2005	2010	2015
Jiayang City	6.5	8.1	10.0	11.6
Linshui County	2.6	6.3	13.4	20.8
Total	97.0	154.3	240.5	337.1

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

121. Data on **user charge rates** for wastewater treatment were collected in each city/county for the year 2003 or 2004. As Table 17 shows, only half of all municipalities studied have begun to charge for wastewater treatment services. In those that have the actual rates were, in all but one case, lower than envisaged in the engineering designs according to the Chinese norms. Usually the charges were imposed by the cities that have been constructing wastewater treatment plants. Only one city (Yibin) did not introduced a household wastewater charge during the construction period.

Table 17. Wastewater treatment charge rates for households in the case study cities/counties

City or county	User charge rates envisaged in engineering studies Yuan / m3	Actual households' charge rates in 2000/2004 Yuan / m3	Wastewater treatment plant under construction?
Luzhou City	0.20	0.20	YES
Leshan City	0.47	0.12	YES
Meishan City	0.50	0.12	YES
Yibin City	0.30		YES
Changning County	0.30		
Gao County	0.30		
Zigong City	0.35	0.25	YES
Fushun County	0.30		
Neijiang City	0.40	0.35	YES
Weiyuan County	0.50	0.30	
Zizhong County	0.50		
Ziyang City	0.50	0.30	YES
Jiayang City	0.30		
Linshui County	0.50		
Weighted average	0.39		

Source: Data provided by Sichuan local experts.

122. The **collection efficiency** of user charges determines what share of billed value of charges on the account receivables becomes cash revenue and is available for financing. The billed value of user charges has been entered to FEASIBLE model as an aggregated flow of potential revenue for all the 14 cities/counties taken together. In 2000, the reported average collection efficiency of households' charges in the entire study area amounted to 96 per cent, which was high even by OECD standards. It was calculated and entered into the model as the weighted average of collection efficiencies in all 14 cities. The quantity of water sold in a given city as a share of total water sold in all municipalities has been used as weigh. Due to the lack of comprehensive data on handling fees charged by water supply companies, their commissions were ignored and not deducted from the revenue of wastewater enterprises.

123. Wastewater treatment user charges were levied on the basis of water consumption and paid by all households which were connected to the piped water supply system regardless of whether they were connected to the sewage system or not.

124. As discussed earlier the revenues from household fees are assumed to grow only modestly in the baseline scenario. After 2004 we assume that wastewater fees will be introduced in all cities/counties and gradually increased to reach the "target" of 0.5 yuan per cubic meter in 2010. This level would be maintained thereafter. According to the Chinese experts such a schedule of the tariff increase is very realistic and easy to achieve.

Table 18. Baseline forecast of household wastewater tariffs in case study cities/counties (RMB/cubic meter)

Wastewater treatment price for households (RMB/m ³)	2004	2005	2006	2007	2008	2009	2010
Luzhou City	0.20	0.25	0.30	0.35	0.40	0.45	0.50
Leshan City	0.12	0.18	0.25	0.31	0.37	0.44	0.50
Meishan City	0.12	0.18	0.25	0.31	0.37	0.44	0.50
Yibin City		0.08	0.17	0.25	0.33	0.42	0.50
Changning County		0.08	0.17	0.25	0.33	0.42	0.50
Gao County		0.08	0.17	0.25	0.33	0.42	0.50
Zigong City	0.25	0.29	0.33	0.38	0.42	0.46	0.50
Fushun County		0.08	0.17	0.25	0.33	0.42	0.50
Neijiang City	0.35	0.38	0.40	0.43	0.45	0.48	0.50
Weiyuan County	0.30	0.33	0.37	0.40	0.43	0.47	0.50
Zizhong County		0.08	0.17	0.25	0.33	0.42	0.50
Ziyang City	0.30	0.33	0.37	0.40	0.43	0.47	0.50
Jianyang City		0.08	0.17	0.25	0.33	0.42	0.50
Linshui County		0.08	0.17	0.25	0.33	0.42	0.50

Source: Project team assumptions agreed with local experts

125. In addition, throughout the period 2004-2015 the revenue will also grow in proportion to the increase in population, increase of the connection rates to water supply, and due to the growth of per capita water use. The forecast of the billed amount of the households' wastewater charge revenues by city is shown in Table 19.

Table 19. Estimated billed value of payments for wastewater treatment by households in the baseline (million RMB/year)

City or county	2000	2005	2010	2015
Luzhou City	2.7	3.8	13.7	20.0
Leshan City	2.8	4.7	20.8	30.9
Meishan City	0.8	1.3	4.3	5.3
Yibin City		1.3	11.9	16.0
Changning County		0.2	1.2	1.5
Gao County		0.3	2.3	3.7
Zigong City	6.0	7.4	16.2	18.3
Fushun County		0.5	5.8	8.6
Neijiang City	6.2	7.3	14.9	24.8
Weiyuan County	1.9	2.4	6.5	8.5
Zizhong County		0.5	4.8	6.3
Ziyang City	1.6	2.1	6.3	8.4
Jianyang City		0.7	5.0	5.8
Linshui County		0.5	6.7	10.4
TOTAL	22.1	33.0	120.2	168.5

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

126. By multiplying the total billed value of user charges by the average collection efficiency, the FEASIBLE model calculates the forecast of the cash revenue that can be generated from households. The results of this calculation are illustrated in Table 20 below. This table illustrates that the combined effect of a modest increase of charge rates, growth of the population and higher connection rates to water supply would boost household user charge revenues almost eight times in real terms between 2004 and 2015.

Table 20. Total estimated billed value and revenue stream to wastewater infrastructure from household user charges in the baseline scenario (million RMB/year in 2000 prices)

	2000	2005	2010	2015
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	2000	2005	2010	2015
Total billed amount	22.1	33.0	120.2	168.5
Collection efficiency	96%	96%	96%	96%
Total revenue	21.2	31.7	115.4	161.8

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

Present affordability of water and wastewater user charges to households

127. Official policy guidelines issued by the Central Government in China recommend to set user charge rates at a level where revenue would at least cover operational and maintenance costs of wastewater infrastructure. Eventually user charges should also cover capital costs and reasonable rate of return for investors. These policy guidelines, however, also recommend that local conditions must be taken into account. Local conditions include what households can afford and what they are willing to pay. Measuring willingness to pay was beyond the scope of this project (later in this section we will refer to available estimates conducted a few years earlier for the World Bank project). We have undertaken, however, an attempt to make a rough assessment of affordability by comparing the charge payments as a share of households' income with internationally acknowledged benchmarks. Our affordability analysis takes into account income distribution among different income groups of households. In this section we analyse whether the billed values of user charges already created affordability problems at the time the study was done. Later, we will conduct affordability analysis for each scenario. In the scenario analysis we will also calculate the volume of "social protection budgets" – the total value of compensation payments that would have to be transferred to the poorest households in order to ensure that nobody pays more than an internationally acknowledged benchmark.

128. Assessment of affordability of wastewater charges **alone** is not possible because of the lack of international benchmarks and because wastewater charges in China are paid by households together with the water supply charge in one integrated bill. Thus in our analysis we compare the annual billed amount of combined water supply and wastewater user charges per household with the annual household disposable income. The generally accepted international "rule of thumb" for affordability limit implies that water and wastewater payments should not account for not more than three to five per cent of the average household disposable income in the long run. Actual thresholds depend on local conditions, such as water availability and the level of income – the more scarce the water is and the lower the income the higher the affordability limit is. Consultants to the Asian Development Bank (ADB) stipulate that in Asia the highest affordability limit is five per cent of income (ADB, 2004). In all 14 cities studied, we have calculated the ratio of user charges paid by households to their income for ten income groups – beginning from the poorest ten per cent (1st decile), up to the richest 10 per cent (10th decile). The process of these calculations is shown step by step below.

129. Detailed income and income distribution data for each city/county has been provided by municipalities and by local experts. Average household expenditure on water and wastewater services was calculated on the basis of per capita water consumption, average family size, and combined rate of charge for water supply and wastewater service (see Table 21). These data have also been collected by the local experts.

Table 21. Calculation of average household expenditures on water supply and wastewater treatment, 2000

City or county	Per capita water consumption (m ³ /y)	Average number of persons in the family	Combined WS/WWT charges* (Yuan/m ³)	Average water and wastewater expenditure (Yuan/year/household)	Average income per households (Yuan/year)
Luzhou City	38.1	3.0	1.6	181	19,520
Leshan City	51.1	3.2	1.4	294	18,874

City or county	Per capita water consumption (m ³ /y)	Average number of persons in the family	Combined WS/WW charges* (Yuan/m ³)	Average water and wastewater expenditure (Yuan/year/household)	Average income per households (Yuan/year)
Meishan City	65.8	3.5	1.3	392	18,543
Yibin City	46.3	3.1	1.3	226	17,606
Changning County	52.7	3.2	1.4	286	13,197
Gao County	85.2	3.3	1.3	450	11,814
Zigong City	46.1	3.0	2.1	304	13,900
Fushun County	40.5	3.0	1.6	231	12,588
Neijiang City	74.3	3.2	2.1	499	16,400
Weiyuan County	28.6	3.2	1.2	128	17,200
Zizhong County	48.3	3.3	1.7	351	13,481
Ziyang City	20.0	3.5	1.8	140	14,938
Jianyang City	52.6	3.2	1.5	303	13,286
Linshui County	28.0	3.1	1.1	140	11,825

Note *: Combined charges include wastewater and water supply price components.

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

130. In the next step, the estimates of average expenditure on water and wastewater services per household is compared with average household income in each city (first column in Table 22). This comparison shows that, on average, existing water-related charges are within affordability limits in all urban zones. The fact that, on average, water charges are affordable does not mean, however, that everybody in the city can pay so much. Therefore, we have made an attempt to estimate the impact of these charges on the poorest groups of society. We have analysed what per centage of the population may be the most affected by water and wastewater prices. The results of this analysis are also presented in Table 22. Shaded cells indicate the deciles (10 per cent portions) of the population, for which the affordability limit may already have been exceeded in 2000. This indicates household income groups, which may need some form of support to enable them to pay for water and wastewater services.

Table 22. Affordability of combined water and wastewater bills to different income groups in selected cities in Sichuan Province in 2000

City or county	Share of water and wastewater expenditure										
	... in average income	... in incomes of different income groups (by decile)									
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Luzhou City	0.9%	2.3%	1.7%	1.4%	1.2%	1.0%	0.8%	0.8%	0.7%	0.6%	0.5%
Leshan City	1.2%	4.4%	3.3%	2.6%	1.7%	1.3%	1.1%	1.0%	0.8%	0.8%	0.6%
Meishan City	1.6%	6.1%	4.6%	3.8%	2.3%	1.7%	1.5%	1.3%	1.1%	1.0%	0.8%
Yibin City	1.0%	3.7%	2.8%	2.3%	1.4%	1.1%	0.9%	0.8%	0.7%	0.7%	0.5%
Changning County	1.8%	5.0%	3.8%	3.1%	2.5%	1.9%	1.5%	1.3%	1.0%	0.9%	0.7%
Gao County	3.1%	8.9%	6.8%	5.5%	4.3%	3.3%	2.8%	2.0%	1.8%	1.6%	1.3%
Zigong City	2.1%	5.7%	4.3%	3.5%	2.9%	2.2%	1.8%	1.5%	1.3%	1.1%	0.8%
Fushun County	1.5%	4.0%	3.3%	2.9%	2.1%	1.6%	1.4%	1.1%	0.8%	0.7%	0.6%
Neijiang City	3.0%	9.3%	7.1%	5.7%	4.1%	3.2%	2.7%	2.3%	1.9%	1.7%	1.4%
Weiyuan County	0.6%	1.9%	1.5%	1.2%	0.8%	0.7%	0.6%	0.5%	0.4%	0.4%	0.3%
Zizhong County	2.0%	5.4%	4.1%	3.4%	2.3%	2.1%	1.8%	1.5%	1.1%	1.0%	0.8%
Ziyang City	0.8%	2.5%	1.9%	1.5%	1.2%	0.9%	0.8%	0.7%	0.5%	0.4%	0.4%
Jianyang City	1.9%	4.9%	3.8%	3.1%	2.6%	2.0%	1.7%	1.4%	1.0%	0.9%	0.7%
Linshui County	0.8%	2.3%	1.8%	1.4%	1.1%	0.8%	0.7%	0.6%	0.4%	0.4%	0.3%

Note: Shaded cell indicates the household income deciles, where water and wastewater bills exceeded five per cent of disposable household's income, which is an affordability benchmark recommended by consultants to the Asian Development Bank for China.

Source: Simulations by project team

131. The affordability analysis shows that in the year 2000 affordability was not a real constraint to raising water and wastewater tariffs for households. In all municipalities there was significant room for

increasing user charge revenues up to the limits of what households could afford. In eight out of fourteen municipalities even the poorest households could have paid more for water and sanitation services. In six cities/counties affordability limits seem to have been exceeded for the small proportion of the poorest families. Only in Gao County and Neijiang City up to thirty per cent of the population could have found it difficult to pay for water and wastewater in 2000. This finding does not imply that charge rates should not have been raised in these two cities. After all, the majority of households (70 per cent) could have paid more. It indicates, however, that if water or wastewater prices were to be raised, some form of social protection should be provided to the poorest families to help them pay without leaving them in difficulty to pay other expenses essential for subsistence.

132. Existing tariff policies maintain low user charges in order to avoid affordability problems for poor and vulnerable groups of consumers. Such a policy rewards both poor and rich households and does not encourage efficient use of water. If wastewater charges were increased for all households, some of the incremental revenues could be used to compensate the most poor ones, for whom the monthly water and wastewater bill would exceed five per cent of their income. Such transfers to the poorest families to compensate their income for the payments for communal services above their affordability limits are usually recommended in OECD countries as the most efficient way of providing access to low income families to water and sanitation services. In the scenario analysis we will calculate the amounts of these social protection budgets for each city for different financing strategies, as the aggregate water and wastewater payments above five per cent of disposable income for all households. The results of these calculations are shown in Chapter 7. A separate issue – how to finance these social protection budgets – is also discussed there.

133. **Willingness to pay (WTP)** for water and waste water can be higher or lower than affordability benchmarks. Charges for wastewater treatment are relatively new to residents, hence not all are willing to pay for such services, even if they can afford it. According to the survey conducted for the World Bank loan for the Sichuan Urban Environment Project, however, there is some willingness to pay for water. While the respondents typically were much less willing to pay for waste water, there was acceptance of a reasonable figure suggested that was similar to the water tariff. The World Bank estimates of willingness to pay for wastewater collection and treatment (about one Yuan/m³) are in line with the opinions expressed by some local experts from Sichuan, who said that the wastewater treatment charge, which exceeds one Yuan per m³ may not be tolerated by many households. But they also recognized that environmental awareness, and hence willingness to pay has increased after SARS outbreaks. Willingness to pay may also increase over time, as incomes will grow. A promotion campaign conducted by governments and by wastewater enterprises and friendly billing and collection systems could additionally increase the peoples' willingness to pay for wastewater services.

Table 23. Willingness to pay (WTP) for water supply and wastewater treatment in cities of Sichuan Province

City – project type	Proposed charge rate (Y/m ³)	Per cent willing to pay this rate	WTP best estimate
Chengdu wastewater	0.7	61%	0.9
	1.4	24%	
	2.1	7%	
Leshan water	0.9	78%	1.0
	1.8	21%	
	2.7	1%	
Leshan wastewater	0.8	89%	1
Luzhou water	1.14	87%	1.1
	2.28	5%	
	3.24	1%	

Source: World Bank, Project Appraisal Document on a Proposed Loan in the Amount Of US\$150 Million and a Proposed Credit Of SDR 1.5 Million To the People's Republic of China for A Sichuan Urban Environment Project, 14 May, 1999.

Charges paid by industry and budget organisations

134. The data on wastewater user charge rates and collection efficiencies for industry and budgetary organisations has been provided by each city/county included in the study. The aggregate billed amount was calculated as the sum of the billed amounts of user charges from industry and budgetary organisations in 14 cities/counties. The aggregate user charge collection efficiency was estimated as the weighted average of the user charge collection efficiencies in all municipalities.

135. For the purpose of the baseline scenario we have assumed no change in the user charge rates and payment collection efficiency in future. However, due to the rapid growth of the scale of economic activity in China, industry, as well as many budget organisations, is expected to increase water consumption. Due to the lack of any credible forecast of the future quantity of wastewater produced by industry and budgetary organisations, we have assumed that the water use by these groups of users and thus revenues (with unchanged fee rates) will keep pace with the growth of the population. For industry this assumption implies that the likely growth of output will result in a less than proportional increase of the total water demand, due to expected water-efficiency gains. These assumptions result in the revenue forecast presented in Table 24 below.

Table 24. Total baseline billed value and revenue stream from charges on non-household users

	2005	2010	2015
Industry			
Total billed value (million RMB/year)	23	29	39
Collection rate (%)	96%	96%	96%
Total revenue (million RMB/year)	22	28	37
Budgetary organisations			
Total billed value (million RMB/year)	7.2	10.3	13.4
Collection rate (%)	97%	97%	97%
Total revenue (million RMB/year)	7	10	13

Source: Data provided by Sichuan local experts.

Local public budget expenditure in the wastewater sector

Background

136. In the cities studied, local governments are responsible for direct financing of wastewater collection networks (sewers), including investments, maintenance, and operations. Local governments often also pay out of the local budgets for operations and maintenance of wastewater treatment plants (WWTPs) by providing annual transfers to wastewater enterprises (see Fig. 3). Local governments are reluctant to appropriate their budgets for construction of WWTP plants. They expect central and provincial government to finance initial capital investments in WWTPs and in main collectors.

137. Several experts pointed out that in various provinces of China, city governments often find it difficult to allocate enough funds to regularly operate and maintain wastewater treatment plants, including those built with Central Government funds. Local budgets also do not cope with the financial needs for constructing and operating sewer networks in time - it is not uncommon that the development of a wastewater collection network lags behind the construction of treatment plants. As a result, new WWTPs receive only a fraction of the waste water assumed in the technical specifications and are very costly to operate and maintain. Hence, even some recently built wastewater treatment plants may stay idle for several years, indicating inefficient use of scarce public investment funds. This is the problem identified in

many Chinese cities, not specifically in Sichuan (see *e.g.* Pei Xiaofei *et al.* 2003 and Ge Chazhong *et al.*, 2003).

138. Local budgets receive a share of the revenue from several general taxes, such as VAT, sales tax, or a surcharge on the consumption tax on luxury goods. City budgets have a few sources of local quasi-tax revenue, which are earmarked for financing urban infrastructure (so called “financing channels” in the jargon of Chinese experts). These include urban construction and maintenance tax, charges for users of urban infrastructure and pollution levies, and a few other quasi-fiscal instruments.

139. Local government can generate some additional revenues due to the increase of the value of local land and government-owned real estate. If local governments sell the right to use the land to developers, the lease price includes the value of the sewerage network if it exists on the land. If the right to use unconnected land is bought by real estate developers the local government requires contractually that developers construct a local wastewater network and connect all buildings to it.

140. China’s aggregate public expenditure has been rising very rapidly in recent years, averaging an annual growth of 19 per cent between 1998 and 2002. On-budget expenditures amounted to 21.4 per cent of GDP, up from 13.8 per cent in 1998, but are still low by international standards. International comparisons may be misleading, however, because of the high share of off-budget revenues and expenditure in China’s public sector, including spending by various para-state bodies and utilities. According to some unofficial, rough estimates provided to the OECD experts, the total public spending could be as high as 30 per cent of GDP, which is not low in an emerging market economy like China. According to published figures, the two most rapidly growing categories of public expenditure in recent years have been public administration – a heterogeneous category that includes salaries of public workers in wastewater utilities – and infrastructure investment.

141. Many analysts of Chinese economy suggest that public spending is likely to slow somewhat in the medium term in absolute terms, although may rise a little relative to real GDP. The prospective slowing down of public spending can be related to concerns about the budget deficit (which was three per cent in 2002) and less need for fiscal stimulus of domestic demand, given the rapid economic growth that China is continuously enjoying. Some government officials and analysts are particularly worried about the rapid growth in investment spending by local governments. This can lead to excess capacities in some sectors of infrastructure and of productive facilities. It can also build up excessive and unsanctioned local authority debt, depending on how the investments are financed.

142. Another factor that may slow down public investment spending is the challenge that China is now facing to rapidly increase spending on social welfare outlays, including public pensions, unemployment insurance, and medical insurance. Education spending is also expected to grow. These under-funded government mandates are likely to pose a problem to public investment expenditure in the medium term. Some experts say that this may (and perhaps should) be partly offset by the growing role of private capital in infrastructure spending. Private investments are stimulated somewhat by relaxation of government restrictions on non-state investment in infrastructure. We will analyse the role of private finance in the chapter on debt financing.

143. Municipal budget management may create some structural difficulties in effective financing infrastructure development. The local budgets are divided into separate operating and capital budgets. The capital budget is not managed by the Financial Bureau, but rather by the State Development and Planning Commission (SDRC). A separate decision-making procedure for operations and capital expenditure poses the risk of a “disconnect” between the two. Fixed assets may be installed without due consideration for financing their operation and maintenance. Chinese municipalities also do not use a dynamic mid-term budget framework for capital spending, such as the rolling mid-term investment plans.

Modeling local budgets

144. Locally generated economic product (GDP) and its growth rate are key input data for predicting government budget contribution to the wastewater sector in the FEASIBLE model. Other variables used in these estimates include those related to the future changes of the public budget expenditures as a share of economic output and changes of the wastewater expenditures as a share of the total budget expenditures.

145. The GDP figure in the model for the year 2000 is the sum of the gross economic products generated in each municipality included in the study. This data was provided by municipal and provincial authorities. In conducting the forecast of GDP we have used the official forecasts of local GDP growth rates provided by local experts until the year 2005. After that year, a constant eight per cent growth rate was assumed. This growth rate forecast has been suggested by representatives of the Sichuan Development Planning Commission and is in line with forecasts by international institutions for the whole country.

146. The public budget expenditure in the model is the sum of the on-budget municipal budget spending. The actual public expenditure figures for the year 2000 have been collected by local experts from municipalities. The international project team did not have resources to verify these figures, although significant efforts and crosschecks were made to ensure consistency of local data with OECD definitions and classifications. On this basis the project team has calculated the respective relative indicators. The forecast of future public on-budget expenditure was derived from these data. The project team calculated that in 2000 public budget expenditure accounted for 6.2 per cent of locally generated GDP. It was very low even in comparison with other emerging economies with a similar level of development. It was also very low compared to the whole of China (21.4 per cent of GDP in 2002). With such a low share of the public sector in GDP, public spending should be expected to grow relatively to GDP. However, as discussed above, the budget statistics provided by municipalities have probably not included significant off-budget public expenditure. Therefore, in the absence of a better alternative, we have assumed that in the baseline financing scenario, public spending will remain at 6.2 per cent of the reported GDP figures until 2015. The data and assumptions about local GDP and its growth rate are shown in Table 25 below.

Table 25. Locally generated economic product and assumed growth rate

	2000	2001	2002	2003	2004	2005	2010	2015
GDP volume (million RMB)	57 039	61 602	66 530	71 919	77 817	84 198	124 058	182 281
GDP growth (%)	8 %	8 %	8.1 %	8.2 %	8.2 %	8.3 %	8 %	8 %
Public budget (million RMB)	3 523	3 783	4 085	4 416	4 778	5 170	7 618	11 193
Public budget share in GDP (%)	6.17 %	6.17 %	6.17 %	6.17 %	6.17 %	6.17 %	6.17 %	6.17 %

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

147. This hypothesis was reinforced by the observation of seemingly high environmental expenditures as a share of total public expenditure. In 2000 they accounted for 17 per cent of the total on-budget public expenditure (see Table 26). This looks very high compared to the OECD countries, where public environmental expenditures rarely reach 3.5 per cent of total government expenditures (not counting expenditures on natural resources management, such as water supply and treatment). In addition to the exclusion of many off-budget expenditures from the public sector accounts there are other factors that may shed additional light on these high shares. In Sichuan the salaries of all workers employed in local utilities seems to be paid from the budget, even if the utility is a formally independent state-owned enterprise, with its own income statement. Moreover, in most cities studied, local budgets paid directly for capital investments, repairs, and operation of the sewerage systems. Such expenditures in OECD municipalities would be incurred by financially autonomous utilities and hence would not be included in budget spending. Instead they would be recorded as extra-budgetary expenditure of local utilities (“specialised producers” according to OECD expenditure classification) and clearly reported separately from the on-budget expenditures.

148. But these above factors alone can not explain such high environmental expenditure as a share of local budgets. Therefore, we believe that a significant portion of off-budget expenditure, not related to wastewater, was not included in the local budget data. The combined impact of all of the above makes , the share of environmental expenditure in public budgets look so large. After correcting for all those biases the divergence from international benchmarks would be much smaller.

149. Within the category of public environmental expenditure, 19 per cent accounted for spending related to wastewater management (Table 26). Thus, local public expenditures on wastewater infrastructure in 2000 were 3.2 per cent of the total local budget expenditure. This again seems very high by international standards, but mainly due to the data reporting standards discussed above.

150. We also collected the data about the distribution of local spending between capital investment and operational categories. It appeared that local budgets covered mainly operation and maintenance expenditure, which amounted to 62 per cent of the total wastewater expenditure. The rest accounted for capital repairs and investments, mainly in sewers. In the baseline scenario we assumed that expenditures from local budgets will grow in proportion to the growth of the local GDP.

151. Since the concept of the baseline scenario implies no changes in policy except those that are “external” to the wastewater sector and firmly committed, we have assumed that the share of wastewater expenditure in the public budget expenditure will be kept constant in the baseline scenario. Furthermore, we assumed that the division of public expenditure in this sector between capital investments and operational expenditures will also be fixed at 2000 levels. The assumptions and the final estimate of public expenditure for wastewater services in the whole area under study are presented in Table 26.

Table 26. Estimates of the baseline volumes and the structure of local public budget expenditure for wastewater services

	2000	2001	2005	2010	2015
Share of environmental expenditure in total budget expenditure(%)	17%	17%	17%	17%	17%
Share of wastewater expenditure in environmental expenditure (%)	19%	19%	19%	19%	19%
Share of wastewater expenditure in total budget expenditure (%)	3.2%	3.2%	3.2%	3.2%	3.2%
Total budget expenditure on wastewater (million RMB)	114	122	167	246	362
Share of investment expenditure in wastewater expenditure (%)	38%	38%	38%	38%	38%
Budget investment expenditure on wastewater (million RMB)	43	46	50	63	93
Budget operational expenditure on wastewater (million RMB)	71	76	82	104	153

Source: Data for 2000 provided by Sichuan local experts. Forecast conducted by international consultants

152. No separate financial contributions were identified from local environmental protection funds. Their expenditures have been integrated into local budget expenditures.

Transfers from higher levels of government

Background

153. According to the SEPB officials, the Provincial Government would not provide funds for construction of wastewater treatment plants in cities from the Provincial budget. However, Provincial Government plays an important role as a broker of financial transfers from Central Government and from abroad. Transfers from Central Government are almost exclusively targeted at the construction of wastewater treatment plants and a few miles of main sewerage collectors.

154. In recent years most WWTPs in Sichuan cities have been financed with Central Government funds, which were raised by issuing national treasury bonds. According to provincial officials, Sichuan

Province received receipts from two major national bonds - the bond for the development of Central-Western Region (2001), and the bond for infrastructure development (available since 1998).

155. Before 2001 most transfers provided to the provincial and local governments from the issuance of national bonds were a debt financing, thus they had to be paid back by the cities to the Central Government via the provincial budget. Interest rates on these inter-government loans were equivalent to bank interest rates, but procedures and collateral were simpler. Several cities contracted these loans, but very few ever paid them back. In 2001 the Central Government wrote off non-performing loans to some poorer provinces. Sichuan Province was eligible for this debt reduction and all debtor municipalities had their debt forgiven. This gave these cities short-term cash flow relief, but on the other hand indicated poor debt management, which did not help them build a reputation as credible borrowers. Since that time all inter-governmental transfers are provided as grants. The Sichuan Province Government expects that this Central Government policy will be maintained in the foreseeable future, although some local experts envisage otherwise.

156. In the second half of the 1990s the National Government pursued an aggressive bond expansion in order to stimulate domestic demand, which was considered the main driver of maintaining economic growth threatened by the Asian financial crisis in 1997. Studies point out that this policy was highly successful in the aftermath of external financial crisis. However, in the near future, fiscal stimulus financed by massive issuances of national bonds will be considered a factor that is no longer necessary. Some analysts are even worried that it may overheat the economy. An abundance of national bonds may also slow down the development of private capital and financial markets. National data shows that there has been a marked slow down in the pace of government infrastructure spending in 2003. Therefore in the baseline scenario no significant increase of national bonds and related transfers from Central Government is expected in the 11th Five Year Plan and beyond.

Current Central Government transfers to wastewater treatment in Sichuan Province

In the year 2003 the Central Government transfers for investments in WWTTPs in Sichuan Province amounted to 397 million RMB. An additional 144 million was transferred for sewerage systems, mainly for main collectors. Altogether, in the whole province, thirty wastewater management projects were financed with Central Government support in 2003. For 2004 a total of 40 projects were submitted for funding under Central Government grants. Normally Central Government pays between 25 per cent and 65 per cent of the total project costs. Transfers from Central Government are committed for the next two to three years. Availability of grants in the more distant future is uncertain.

Source: Interview with a representative of the Sichuan Construction Committee.

157. According to the information provided during interviews by the officials of Provincial Government, provinces are legally allowed to issue bonds, but Central Government policy discourages them from doing so. Hence, the Sichuan Provincial Government does not plan in the predictable future to issue bonds to finance infrastructure development in cities.

Modelling transfers from Central Government

158. Local officials and experts have calculated that the total transfers from the higher levels of the government committed already to wastewater services in the fourteen cities/counties amounted to 663 million RMB. Disbursement was planned in equal trenches over four years between 2001 and 2004. This amounted in 165 million RMB or about 20 million Euro a year over four years.

Table 27. Baseline transfers from the higher levels of governments to the wastewater sector (million RMB)

	2000	2001	2002	2003	2004	2005
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	2000	2001	2002	2003	2004	2005
Transfers from Central Government	0	165.5	165.5	165.5	165.5	0

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

159. These sums have been dedicated to capital investments in construction of the seven wastewater treatment plants and main collectors. Since this public budget source was earmarked for this special purpose, we could not assume the continuation of these transfers after 2004 in the baseline scenario¹⁰. Government officials from Sichuan Province have not heard of upcoming transfers from the Central Government to the cities under study.

Other grants

160. No international or other grants have been identified as financing sources until 2000. In line with the concept of the baseline scenario, we have assumed that no international grants will be provided in the entire planning period.

Credit financing

161. The Chinese banking system consists of the so-called “policy banks” and “commercial banks”. The largest policy bank lending to municipal infrastructure is the National Development Bank of China. Commercial banks most active in lending for wastewater infrastructure in Sichuan Province include provincial branches of the “Construction Bank” and the “Agricultural Bank”. Chinese banks enjoy quite high liquidity, due to stable economic growth over several years, stable local currency, and the very high domestic savings rate. Macroeconomic and fiscal stability contributed to relatively low interest rates and relatively long maturities of bank loans available for municipal infrastructure compared to most emerging market economies. Yet financing of municipal wastewater infrastructure in China with bank loans or bonds is still in its infant stage. This is because there are other barriers that prevent municipalities and wastewater enterprises from tapping on large potential that exists on the Chinese domestic financial and capital markets. Some of them will be discussed in this section.

162. Chinese cities can not assume explicit and contingent financial liabilities. This means that municipal governments can not directly contract bank loans or issue bonds. Any borrowing for municipal infrastructure has to be done through state-owned enterprises established by municipalities. Local governments are prohibited from acting as legal, explicit guarantors for their enterprises (Pei Xiaofei *et al.*, 2003, p.99).

163. Wastewater enterprises, in principle, can borrow from the banks without sovereign or municipal guarantees. They, in principle, can issue enterprise bonds to raise investment funds. However, as state-owned enterprises controlled by the local government they usually enjoy multiple **implicit** guarantees from municipalities, not surprisingly given their limited operational and financial autonomy. Often bank loans taken by municipal enterprise have to be approved by municipal authorities. Wastewater enterprises have to bargain every year in the budget process for the money to pay the loan back. Sometimes municipalities allow wastewater enterprises to offer municipal land or the right of use of municipal land as collateral, not being formally party to the loan agreement. It was not clear to the project team how the bank can collect such collateral. The example of Luzhou described in the box below shows that loan repayment and debt service are explicitly or implicitly paid by the government even if the enterprise is the borrower.

¹⁰ The estimates of additional government transfers that would be needed to close future financing gaps will be included in the simulations of alternative scenarios in the second phase of the project.

Case: Mixed financing of a wastewater treatment plant in Luzhou

The wastewater treatment enterprise has the corporate status of a limited liability company. It is a subsidiary of the Singdu Investment Company (SIC). Other subsidiaries of SIC include a natural gas company, a water supply enterprise, and a road construction enterprise. The stated rationale for merging several local government enterprises into the capital group (financial holding) was to enhance their borrowing capacity. Several revenue earning enterprises are together more creditworthy than taken individually. Moreover municipal enterprises with corporate status are allowed to borrow from banks or issue enterprise securities with implicit guarantees from the local government. This is the way to bypass the constraints imposed by Central Government on explicit borrowing and other financial liabilities by local governments.

The wastewater treatment plant was built with the 53 Million RMB grant from the Central Government. In addition, Singdu Investment Company (SIC) obtained a 14 million RMB loan from the Bank of China, most likely to cover working capital needs. The terms of the loan were commercial, with the market interest rate, four years maturity, and no grace period.

The loan was paid back from the wastewater charge revenue, but not directly by the wastewater enterprise or its mother company, because they have no right to collect and retain revenue. The allocation for debt repayment was included in the budget plan that the Wastewater Enterprise submitted to the Financial Bureau every year. The Financial Bureau of the City appropriated expenditures for debt repayment through a regular budget process and transferred it to the Singdu Investment Company to pay back its debt.

The World Bank had also prepared a loan for the construction of a wastewater treatment plant in Luzhou. However both sides could not find mutually acceptable terms of transaction under present institutional arrangements.

Source: Interviews with stakeholders in Sichuan.

164. There are no formally established borrowing limits for municipal state-owned enterprises. Their credit activity is *de facto* the way to bypass the borrowing constraints imposed by legislation on municipalities. It is a common practice in emerging market economies to control debt incurred by sub-national public entities, including local governments and government-owned enterprises. Imprudent borrowing and contingent and implicit liabilities of local governments are often constrained in the transition period, during which credit market institutions and fiscal controls gain maturity and public borrowers gain experience necessary for sound debt management. International experience shows that explicit borrowing limits for municipalities, based on clear rules and effective supervision of sub-national debt, represent a more viable option than non-transparent implicit contingent liabilities incurred through third parties owned and controlled by local governments. Implicit liabilities of local governments may quietly build up an unsanctioned, unsustainable fiscal deficit of the general government. In the longer run this could hinder the development of a healthy credit market for water and environmental infrastructure.

165. Public debt in China in 2002 accounted for about 20 per cent of GDP by IMF definitions. However, some government and independent experts estimate that if all contingent liabilities were included, public debt would rise to between 50 and 100 per cent of GDP. These forewarning estimates still do not fully include unsanctioned debt incurred by local governments, whose amount is unknown, but which is thought to be quite large. Chinese government and many experts acknowledge that contingent liabilities incurred by local governments pose a great risk to public deficit and to public debt in China. These implicit, hidden liabilities include those likely to be incurred to recapitalise the banking system and to deal with the debt of municipal utilities in relation to their investment expansion. Local governments have been using their state-owned land to attract private and public investment in infrastructure and productive facilities. The bulk of this investment growth was financed by bank loans, with encouragement from various levels of government. Some analysts indicate that at least some of these investment and circumstances surrounding it are reminiscent of the even stronger investment boom in the early 1990s, in which massive over investment by local government led to massive non-performing loans in the banking

sector. All these situations would be aggravated if banks accumulated a substantial amount of non-performing loans to local governments or municipal state-owned enterprises, *e.g.* in order to finance local water and wastewater infrastructure without a solid cost recovery basis.

166. Imprudent debt may to some extent be corrected by the market itself. It should be expected that the banks would not be willing to lend to municipal enterprises if they see that their debt is excessive and unsustainable. In the past, however, encouraged by the government at different levels to lend to state owned enterprises, Chinese banks have built up large portfolios of non-performing loans. In recent years commercial banks became more prudent and risk averse.

167. In the absence of formal guarantees by the local or provincial guarantees the banks will probably be reluctant to lend significantly more to wastewater enterprise unless they believe that these enterprises are willing and able to meet their total debt service obligations alone. The decisive factor is whether it will be possible for the lenders and other investors to make a reasonable forecast and determine – with high probability – that the cash flow of these enterprises will allow them to pay all operating expenses, taxes, and the total debt service during the entire period of loan repayments. If future operating revenues appear too low or too unpredictable compared to the forecasted operational costs and the costs of servicing previous loans, a significant increase of loan portfolio in the sector will be unlikely unless explicit, legally allowed guarantees are provided by the government.

168. Sichuan branches of several commercial banks interviewed during this study consider the potential market in the wastewater sector as significant but also recognize the risks involved. As of 2003, loans to wastewater treatment enterprises represented less than one per cent of investment credit portfolios in all banks interviewed. Many banks expressed interest to lend more to wastewater treatment companies. According to the representatives of the Chinese commercial banks interviewed during the project, the main problems with financing wastewater treatment plants from bank instruments are as follows:

- The legal status of the project owners and property rights to infrastructure are not always clearly established. Some wastewater enterprises are *ad hoc* established investment companies with ambiguous ownership titles to the fixed assets (*e.g.* WWTPs). With this heterogeneity of borrowers and stakeholders involved it is difficult to ensure who will pay back the loan and how to structure the pay-back scheme;
- Wastewater charges are too low to ensure safe debt coverage. They are not calculated and not established in a transparent and predictable manner. They are also collected by third parties (water supply), thus the revenues can not be controlled effectively by the borrowers. The banks lost confidence in a wastewater treatment charge as a source of debt service or collateral, hence banks must rely on local governments to pay the loans. This involves significant political risk and uncertainty if the future local budgets will include adequate allocations for debt repayments;
- Laws and regulations are not predictable. The finance of the sector is governed by “soft” government policies and guidelines, rather than “hard” laws and regulations adopted by the State Council or National People's Congress as appropriate;
- Borrowers and project developers (wastewater enterprises) often do not have their own capital to co-finance investments (minimum 20 per cent of own co-financing required by the bank);
- National bonds had overtaken bank loans and destroyed credit discipline, because they often did not have to be paid back by local governments. After 2001 all national government bonds are given to municipalities as grants. This improved the climate and decreased risks to banks. But some banks still

fear that in future Central Government policy may change again and municipalities and their enterprises may continue to enjoy “soft budget constraint” through government-to-government lending;

- Project developers sometimes have too short concessions for operation of infrastructure (e.g. even 10 years) to recover costs with a debt service.

169. The Provincial Government in Sichuan has issued several policies to encourage private investments, bank loans and international funding of the municipal wastewater sector. New policy related to urban infrastructure encourages municipalities to issue concessions to individual private developers to build and operate wastewater treatment plants. Government can guarantee private investors acceptable profits through so-called “policy guarantee”, which means creating favourable conditions for the state-owned utilities. In practice it often means paying return on investments from municipal budgets. Hence it is the trust in the local politicians rather than the power of the contract that influences many investment decisions.

170. Wastewater utilities can borrow indirectly from international development banks, such as the World Bank or the Asian Development Bank. Such borrowing is only possible with sovereign guarantee by the national government. The direct borrower is the People's Republic of China. The proceeds of the loan are onlent by the Central Government to the municipality through the Provincial Government on the same terms and conditions as the bank loan to China. Municipalities then onlent the loan proceeds further to the municipal enterprises. The maturity of onlent loans are usually a bit lower than the maturity of the master loan to China, but other terms and conditions are typically similar. The loan contract often stipulates that additional debt can be incurred by the enterprise only with the agreement of the international bank, unless reasonable forecasts show that the wastewater company would have a debt service coverage of at least 1.3 times¹¹. If the municipal utility defaults on the loan service, public budgets take over the repayment burden. During the development of this study the World Bank loan for a Sichuan Environmental Project became effective. The project originally covered five municipalities and included wastewater components in Chengdu, Leshan, Denyang, and Zigong. Eventually not all municipalities decided to borrow or could not meet the bank's requirements.

Modelling bank lending in Sichuan Province

171. Until the final report was written, only a few of the fourteen municipalities had borrowed for the construction of wastewater treatment plants and collection systems. It was rather difficult to get information on the specific terms for the loans. The lending agency was sometimes central government, which raised money through issuing treasury bonds and then on-lent receipts to municipalities on concessional terms. Some loans seem to have been provided by state-controlled development banks. Following extensive discussions, the representative terms of the loans were defined for the baseline scenario: 15 years maturity; five years grace period and three per cent interest rate. The repayment of these loans will begin in 2006. The table below gives the details of the assumed disbursements of these loans according to information provided by local Sichuan experts. If the detailed disbursement schedule was not known, a linear disbursement in the period reported by local experts was assumed.

¹¹ Debt service coverage ratio is the ratio often used by the bank officers when making loans to prospective income generating enterprise. It is calculated as Net Operating Income/Total Debt Service. Net Operating Income is the company's operating income minus income taxes and minority interest. The debt service coverage ratio should be over one as a minimum. That would mean the enterprise is generating enough income to pay its debt obligations.

Table 28. Bank loans to the wastewater sector in 14 cities (million RMB)

	2000	2001	2002	2003	2004	2005	2006
Old soft loans disbursed		20.2	19	21			
World Bank loan		16.6	16.6	16.6	16.6		
New commercial bank loans				12.5	12.5		

Source: Data provided by Sichuan local experts. Forecast conducted by international consultants.

172. During the development of this study new information came from the municipality of Leshan. The wastewater component of the Sichuan Environmental Project implemented in this municipality in 2001 is financed partly by a World Bank loan and by a loan from a commercial bank. Leshan Municipal Wastewater Treatment Co. Ltd. received a Yuan equivalent of USD 8.1 million (approximately 66.5 million Yuan) of the World Bank loan guaranteed by the government. As of the beginning of 2004, as much as 54 million Yuan were already disbursed. The loan carries the standard interest rate for LIBOR-based US dollar single currency loan (about 1.5 per cent as of the beginning of 2004) plus 0.75 per cent service fee. The loan onlent to enterprise has 15 years maturity and a five years grace period. In 2003 the Leshan Municipal Wastewater Treatment Co. Ltd also received a commitment of 25 million Yuan commercial bank loan with 11 years maturity and 5.76 per cent fixed interest rate.

Baseline summary of the supply of finance to wastewater management

173. Table 28 below presents the summary of the baseline forecast of financing of wastewater infrastructure in all 14 cities under study.

Table 28. Total baseline forecast of supply of finance to the wastewater services in 14 cities/counties (million RMB, 2000 prices)

Supply of finance	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
User charges												
Paid by households	22	33	46	61	78	98	120	129	138	147	157	169
Paid by industry	21	22	23	24	26	27	28	30	32	33	35	37
Paid by budget organizations	7	7	8	8	9	9	10	10	11	11	12	13
Public budgets												
Operational subsidies	96	104	113	122	132	142	153	166	179	193	209	225
Investment, renovation	224	63	68	74	79	86	93	100	108	117	126	136
Foreign grants	0	0	0	0	0	0	0	0				
Loans	29											
Total supply of finance	399	229	258	289	323	362	404	434	467	502	539	580

Source: Calculations with the FEASIBLE model.

174. The structure of the sources of financing in the municipalities included in the study relies very heavily on public budgets as opposed to user fees. This is in contrast to most OECD countries, where user fees dominate the structure of financing. Operational subsidies from public budgets are usually much smaller. Public funds blended with loans are typically focused on financing capital investments. It should be stressed, however, that at the times when OECD countries began developing wastewater infrastructure the role of public budgets was much more significant than now.

6. BASELINE FINANCING DEFICITS

175. In the last step of modelling, the estimated expenditure requirements were compared with forecasted levels and sources of finance. FEASIBLE compares the expenditure needed with the supply of finance on a year-by-year basis and computes cash flow forecast, i.e. financing deficits or surpluses, both annual and accumulated. FEASIBLE computes not only the magnitudes of total annual cash flow balances, the structure of the financing gaps is also shown, e.g. coverage of capital investment expenditure or operational expenditure by relevant financing sources. Such a presentation of financing gaps helps policy makers see better where the main bottlenecks are, as well as where, when, and what additional policy interventions are needed to facilitate effective financing of infrastructure development. The main types of financing gaps computed by the FEASIBLE model are described in the box below.

FEASIBLE results - types of financing gaps

Total financing gap: Comparing the total annual expenditure need with the total annual supply of financing reflects the balance between expenditures needed to achieve the targets and financing available.

Operational and maintenance (O&M) cost recovery gap: Difference between operational and maintenance expenditure needed on the one hand, and revenue from user charges on the other, reflects the extent to which tariff payments by the users are sufficient to cover operation and maintenance costs of infrastructure.

Investment expenditure gap: reflects the extent, to which operational surplus from user charges (after covering operational and maintenance costs), public budgets, and external grants and loans could cover investment expenditure needs (new investments and renovations). The investment financing gap is computed by comparing the expenditure needs for renovation, upgrading, and extension of the fixed assets with the supply of finance targeted at capital expenditure.

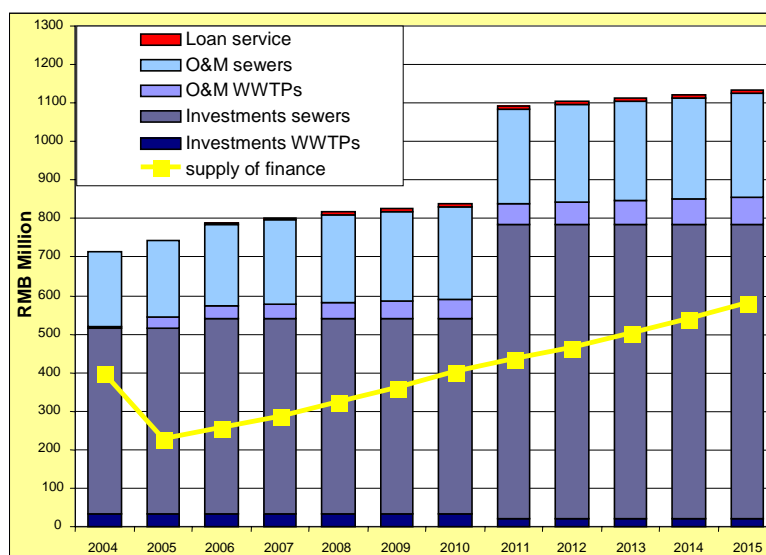
176. All data and assumptions described in previous chapters were introduced into the FEASIBLE model. For each year the model calculated the differences between what would be needed and what would be available if present trends continue. The results of the simulation of financing gaps for the baseline scenario of developing wastewater infrastructure in the fourteen urban areas in Sichuan Province are shown in the Table 29 and illustrated in Figure 4 below.

Table 29. Simulation of financing gaps for the baseline scenario of developing wastewater infrastructure in the fourteen urban areas in Sichuan Province (million RMB, 2000 prices)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total expenditure need	713	745	788	802	816	827	839	1094	1103	1113	1123	1133
Baseline supply of finance	399	229	258	289	323	362	404	434	467	502	539	580
Total financing balance	-314	-516	-531	-514	-493	-466	-434	-659	-637	-611	-584	-553
O&M cost recovery balance*	-148	-168	-167	-162	-154	-144	-130	-131	-130	-128	-125	-121

Note: *O&M cost recovery balance is understood here as the difference between the total revenue of user charges and the operational and maintenance expenditure needs.
 Source: Calculations with FEASIBLE model.

Figure 4. Coverage of the total expenditure needed by the total supply of finance in the baseline scenario

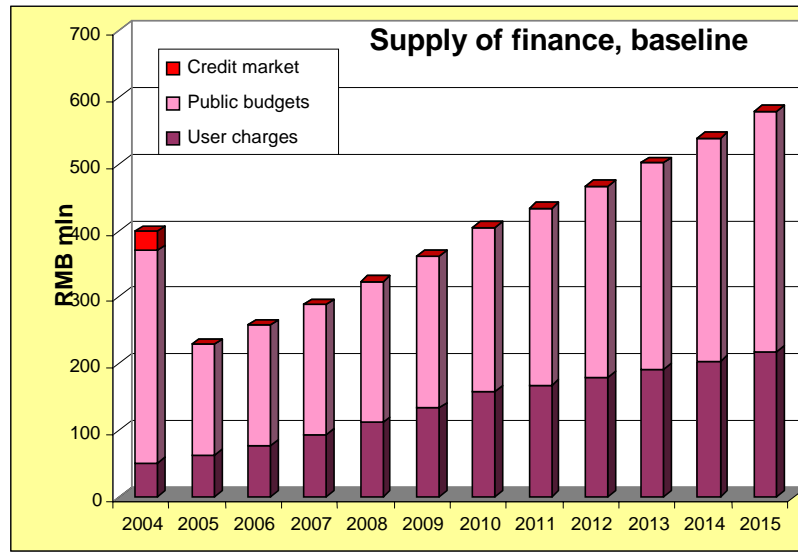


Source: Model simulations by the project team

177. As seen in Figure 4, without significant changes of the baseline trends of financing wastewater infrastructure, the fourteen cities in Sichuan Province are unlikely to achieve the targets of developing urban wastewater infrastructure. Total supply of committed (“business-as-usual”) financing in the baseline scenario will not ensure effective coverage of expenditures where and when they are needed. Less than a half of required financing would be provided in the period 2004–2015.

178. Figure 5 below illustrates the structure of the sources of financing of the wastewater services in the municipalities included in the study under the baseline scenario. It is visible that present financing relies very heavily on the public budgets as opposed to user fees to say nothing of debt financing. This may not be sustainable given the fact that local budgets already experienced difficulties with funding regular operational and maintenance of a very modest wastewater infrastructure. The pressures on local budgets can only be aggravated by the increasing competition of other government mandates, such as social welfare, health, water supply, flood control, education, etc.

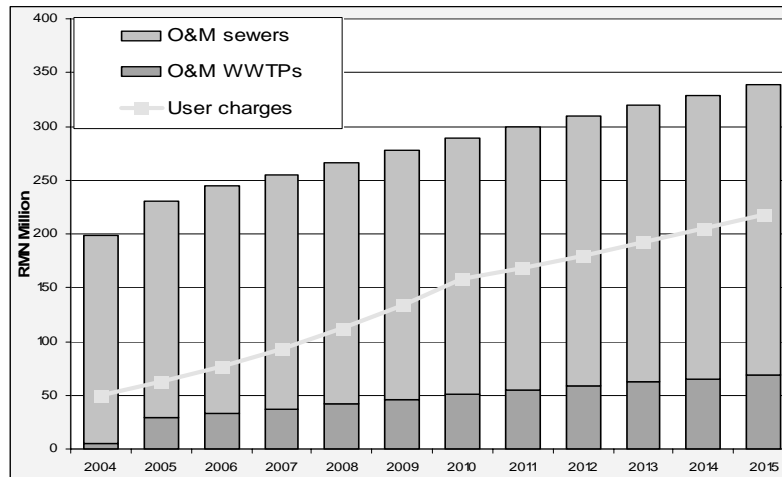
Figure 5: Structure of the supply of finance in the baseline scenario



Source: Model simulations by the project team

179. **Operations and maintenance** of urban wastewater infrastructure stand on an unsustainable basis. The baseline forecast of user charge revenues (light line in Figure 6) envisages an insufficient increase of user fees revenues. As seen in Figure 6 in 2004 user charge revenues covered merely about a quarter of operational and maintenance costs of existing, very limited infrastructure (vertical bars). If all people connected to the water supply paid wastewater charges, the revenue would be sufficient to cover the operational and maintenance costs of wastewater treatment (lower dark bar) even with the modest level of charge rates. This apparent operational surplus appears due to the fact that in some cities households are paying for wastewater treatment even if wastewater treatment plants is not yet operated. They would, however, fall much short of covering the costs of proper operation and maintenance of the entire system, including sewerage (both bars taken together). This means that while some parts of the system would be rehabilitated, others might be quickly run down, unless local budgets could make up for the remaining deficit in the recurrent costs of wastewater enterprises.

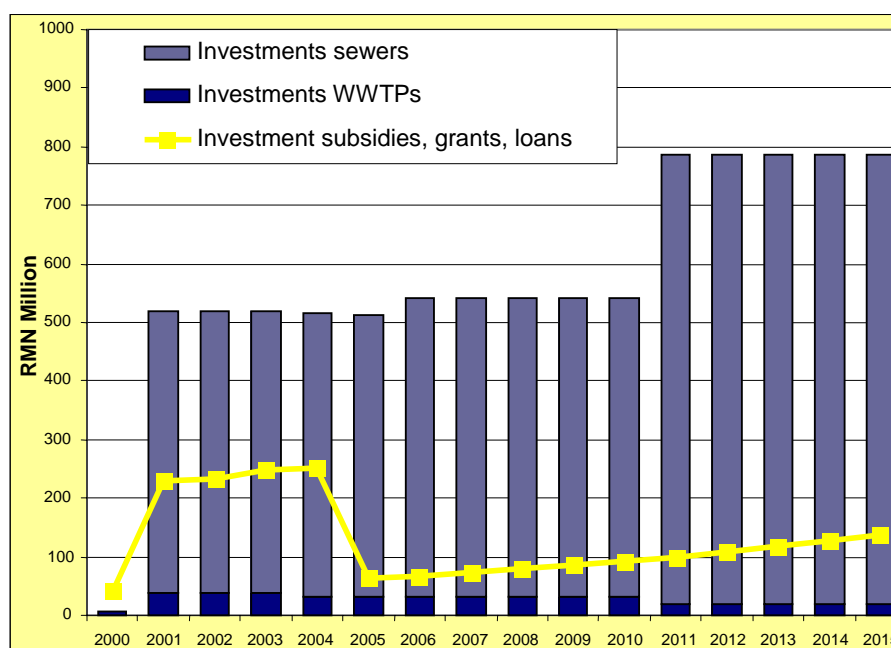
Figure 6: Coverage of O&M costs by baseline user charge revenues



Source: Model simulations by the project team

180. Concerning **financing capital investments** (Figure 7 below) the supply of finance would be sufficient for construction of wastewater treatment plants but would fall short of covering investment costs of rehabilitation and extension of sewers. If present trends continued there would be a mismatch between capital investment needs and the earmarking of available financing. Construction and rehabilitation of sewerage will cost much more than construction of wastewater treatment plants. Nonetheless, external financing available for capital investments (mainly transfers from higher levels of government) are usually earmarked for wastewater treatment plants and mains collectors rather than for sewerage. Local governments, which are responsible for financing sewers, rarely can afford to pay for capital costs from the operational budget revenues. They are particularly reluctant to provide financing for capital investments in wastewater treatment plants. With constraints on borrowing by local government and low creditworthiness of wastewater enterprises the deficit of financing of capital investments would be significant. If things do not change the investment programme may not be fully implemented.

Figure 7: Coverage of capital needs by baseline financing earmarked for capital expenditures



Source: Model simulations by the project team

181. Because the baseline financing is not enough to cover baseline expenditure needs, the model helps identify tasks that authorities could undertake in order to close financing gaps and achieve desired targets. This could be done either by creating effective incentives to mobilise additional financing and/or by rescheduling some investment targets. The results of the baseline analysis also reinforced the need for reforms of the institutional system of planning and financing wastewater infrastructure in Sichuan Province. This includes needed reforms of utility management and local government finance.. The reform agenda is outlined at the end of the report.

182. The results of simulations of the baseline scenario indicate that without a significant increase in financing, the targets set by the municipalities and the government are unlikely to be achieved. From the analysis of expenditure needed and financing available the following conclusions have been drawn:

- If present trends continue, there will be enough funds available to complete the ongoing construction of seven wastewater treatment plants and perhaps a few more, but the development of the necessary wastewater collection system would be significantly under-funded;
- The structure of the sources of financing relies heavily on the public budgets as opposed to user fees or credit markets. This may not be sustainable given scarcity of public budgets and high and increasing demand for public financing of other social services (such as social welfare, health, water supply, flood control, education, etc.);
- Wastewater fees cover only a fraction of the costs of operation and necessary maintenance of the baseline infrastructure. In most OECD countries user fees cover almost (or more than) 100 per cent of operations and maintenance expenditures of water and wastewater services;

- All domestic sources of finance (user fees and public budgets) are enough to cover the costs of operation and necessary maintenance of the baseline infrastructure. However, if public budgets continue to subsidise O&M costs on such a scale, there will be not enough funds to finance investment expenditure;
- There seems to be significant room for an increase of tariffs within the affordability limits.

183. Analysis of these challenges and proposed reforms will be the focus of the scenario analysis included in the remaining part of this report.

7. FINANCING STRATEGIES TO ACHIEVE TARGETS OF DEVELOPMENT OF WASTEWATER INFRASTRUCTURE

184. Three alternative strategies (scenarios) of increasing financing were simulated:

- **Taxpayers pay strategy;**
- **Users pay strategy;**
- **Creditors pay strategy.**

185. These strategies are hypothetical “what if?” scenarios designed for illustrative purposes. In particular the taxpayers pay and users pay scenarios are built on extreme assumptions that may not be fully realistic. Yet, they illustrate the consequences of different choices that the Sichuan municipalities can make. The key features of each strategy are summarized in Table 30 below.

Table 30. Alternative strategies of financing wastewater infrastructure in cities of Sichuan Province

	Taxpayers pay	Users pay	Creditors pay
User charges	<ul style="list-style-type: none"> • From 2005 increase in proportion to GDP growth 	<ul style="list-style-type: none"> • From 2005 cover total O&M expenditures, total debt service; • From 2007 additionally cover investment in WWTPs; • From 2008 additionally cover capital investments in renovation of existing sewers; • From 2011 cover also 40 per cent of capital expenditures in new sewers. 	<ul style="list-style-type: none"> • Since 2005 users cover full debt service and those O&M expenditures that are not covered by operational subsidies from public budgets.
Local budgets	<ul style="list-style-type: none"> • From 2005 increase 2 times compared to baseline. 	<ul style="list-style-type: none"> • In period 2005-2006 increase 2 times compared to baseline; • From 2007 at the baseline level (grow in proportion to GDP). 	<ul style="list-style-type: none"> • In the period 2005-2015 gradually phased out in a linear fashion; • In the period 2005-2010 the share of operational subsidies will linearly grow to 100 per cent at the expense of the investment expenditures (which will be phased out in 2010).
Transfers from higher government	<ul style="list-style-type: none"> • 2005-2015 maintained at the average 2001-2004 level (up to 165.5 million RMB p/a). 	<ul style="list-style-type: none"> • In period 2005-2006 at 50 per cent of average 2001-2004 level (83 million RMB p/a); discontinued afterwards. 	<ul style="list-style-type: none"> • In the period 2005-2010 would be maintained at 50 per cent of the baseline level (83 million RMB p/a), of which 32 million per year would be allocated to cover the investment expenditure in wastewater treatment and 51 million would support investments in sewerage; • After 2010 phased out.
Private financing	<ul style="list-style-type: none"> • In period 2005-2010 commercial borrowing will 	<ul style="list-style-type: none"> • In 2005-2006 65 commercial borrowing from local banks will amount to 65 million RMB p/a to 	<ul style="list-style-type: none"> • Commercial loans* finance investment expenditures in sewerage minus investment subsidies from

	remain at a similar level to the period 2002-2004 (25 million RMB p/a); <ul style="list-style-type: none"> • In period 2005-2015 IFI loans equivalent to 20 million RMB p/a on average will be disbursed. 	cover investment expenditure deficit; <ul style="list-style-type: none"> • In period 2007-2010 commercial borrowing from local banks will amount to 40 million RMB p/a (similar level than average borrowing in the period 2001-2004); • In the entire period 2005-2015 IFI loans equivalent to 40 million RMB p/a on average will be disbursed. 	local and central budgets and minus IFI loans*; <ul style="list-style-type: none"> • Since 2011 all investment expenditures financed by commercial loans (sewerage and WWTs) minus IFI loans; • In period 2005-2015 IFI loans equivalent to 40 million RMB p/a on average will be disbursed.
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Notes:

***Commercial loan:** 11 years maturity, no grace period, 6 per cent interest.

* **IFI loan:** 20 years maturity, five years grace period, LIBOR+0.75 per cent interest.

186. For all scenarios the total water and wastewater bill was compared to the household disposable income for ten income groups. For each year the social protection budget was also calculated – the sum of payments that would need to be transferred to the poorest households in order to ensure that not a single household pays more than five per cent of its disposable income for water and wastewater. Since the forecast of water supply bills is not easily available and was beyond the scope of this analysis, it was assumed that water fees would increase in real terms at the same rate as GDP.

Taxpayers pay strategy

187. This strategy assumes that an increase of allocations from public budgets (local and central) would continue to be a cornerstone in financing wastewater infrastructure in the municipalities studied. Revenues from user fees are assumed to increase only modestly, on par with the growth of income in real terms. This strategy also assumes that borrowing on commercial terms would on average stay at similar levels to the period 2000-2004. Build up of IFI projects is assumed to be slower compared with other scenarios because of the slow pace of sector reforms in this scenario.

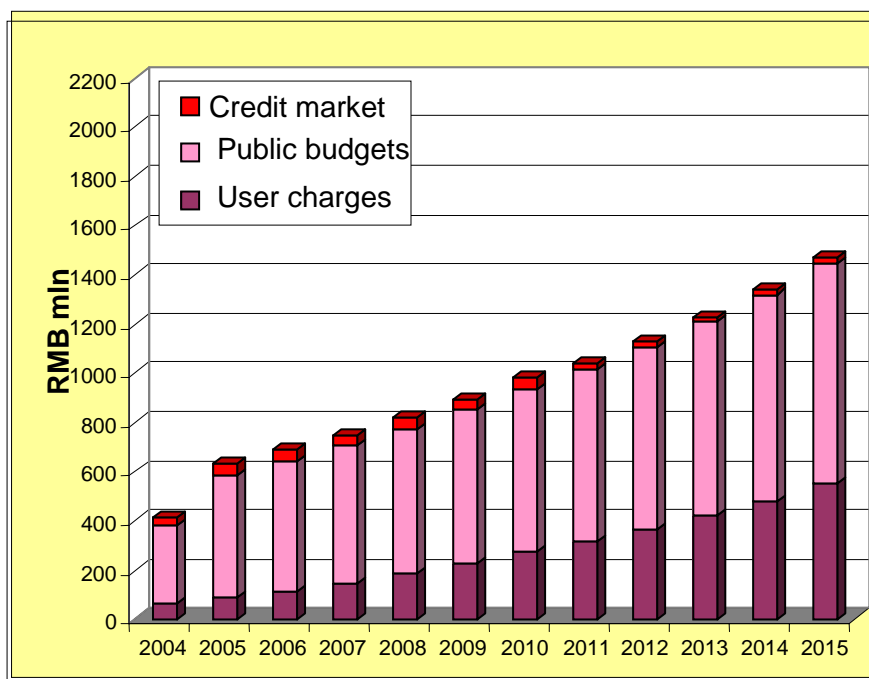
188. The following specific assumption about various sources of financing constitute the taxpayers pay strategy.

Table 31. Summary of the assumptions constituting the taxpayers pay scenario:

User charges	<ul style="list-style-type: none"> • From 2005 increase in proportion to GDP growth.
Local budgets	<ul style="list-style-type: none"> • From 2005 increase 2 times compared to baseline.
Transfers from higher government	<ul style="list-style-type: none"> • 2005-2015 maintained at the average 2001-2004 level (up to 165.5 million RMB p/a).
Private financing	<ul style="list-style-type: none"> • In period 2005-2010 commercial borrowing will remain at a similar level to the period 2002-2004 (25 million RMB p/a); • In period 2005-2015 IFI loans equivalent to 20 million RMB p/a on average will be disbursed.

189. The taxpayers pay financing strategy would further strengthen dependence of the wastewater infrastructure on public budgets. As can be seen in Figure 8 below the share of user fees and loan financing would be small compared to allocations from local budgets and transfers from the Central Government.

Figure 8: Taxpayers pay strategy: Simulation of the levels and structure of supply of financing the wastewater sector in fourteen cities in Sichuan province (million 2000 Yuan)



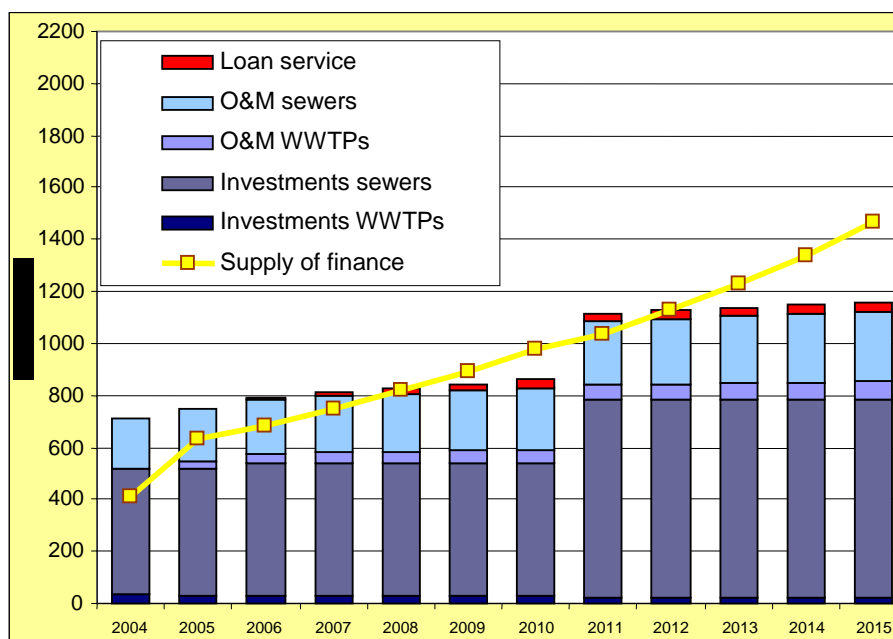
Source: Model simulations by the project team

190. Such a modest increase of user fees and low level of borrowing are considered feasible even without major institutional reforms in wastewater enterprises. Without these reforms wastewater enterprises and municipalities would find it very difficult to raise finance on the credit market. As can be seen from the last row column in Table 32 the debt service coverage ratio would be at a very high level throughout the simulated period. This indicates an under-utilized potential for borrowing. However, because in this scenario the operational revenues are generated mainly from public budgets rather than from users of infrastructure, the lenders and investors would continue to perceive the sector as very risky. This would limit the access to credit. Without improving financial autonomy and financial viability, wastewater enterprises would continue to have restricted access to credit markets.

191. The assumed increase of public financing in the “taxpayers pay” scenario is considered ambitious, if not completely unfeasible. As discussed earlier, it is unlikely that the Central Government would maintain a high level of transfers for local investments in this sector, as occurred in the period 2000-2004. It is also very unlikely that local budgets would be able to double their already high allocation for investments and subsidies for operation and maintenance of wastewater collection and treatment infrastructure. As was discussed in the chapter on the baseline scenario, local budgets already struggle hard to keep up with the financing needs of proper operation and maintenance of existing sewers.

192. Yet, even with this radical “stretching” of local budget expenditures and attracting large grant funds from the Central Government, financial deficits are predicted to appear in most years until 2015, as illustrated in Figure 9 and Table 32 below. Liquidity problems would likely continue disrupting implementation of the programme until 2014 when accumulated financial deficit becomes positive. This renders the financing strategy that relies mainly on public budgets unfeasible. Without more radical increase of user fees and/or borrowing, the practice of delayed investments, irregular operation, and neglected maintenance of wastewater infrastructure would inevitably continue.

Figure 9: Taxpayers pay strategy: Simulation of the levels and structure of expenditure needed in the wastewater sector in fourteen cities in Sichuan Province and coverage by the total supply of financing (million 2000 Yuan)



Source: Own calculations

Table 32. Simulations of expenditure needed, financing available, and cash flow deficits in the taxpayers pay financing strategy

Tax payers pay scenario	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Investment expenditure WWTPs	33	32	32	32	32	32	32	20	20	20	20	20
Investment expenditure sewers	482	482	509	509	509	509	509	766	766	766	766	766
O&M expenditure WWTPs	5	29	33	38	42	46	50	55	58	62	65	69
O&M expenditure sewers	193	202	211	218	225	232	238	245	251	258	264	270
Debt service		4	9	14	19	23	30	31	31	32	33	34
Total expenditure needed	713	749	794	811	826	842	860	1116	1126	1137	1148	1158
User charges	60	84	112	144	182	225	275	316	363	418	481	554
Public budget	321	501	529	558	590	624	661	700	743	789	839	893
Loans	29	45	45	45	45	45	45	20	20	20	20	20
Total supply of finance	410	631	686	748	817	894	980	1036	1126	1227	1340	1467
Current financing balance	-303	-118	-108	-63	-10	52	120	-80	0	90	192	309
Cumulative financing balance	n.a.	-118	-226	-289	-298	-246	-126	-206	-207	-117	75	384
Coverage of O&M costs with user charges	0.30	0.36	0.46	0.57	0.68	0.81	0.95	1.05	1.17	1.31	1.46	1.63
Debt service coverage ratio		4	9	14	19	23	30	31	31	32	33	34

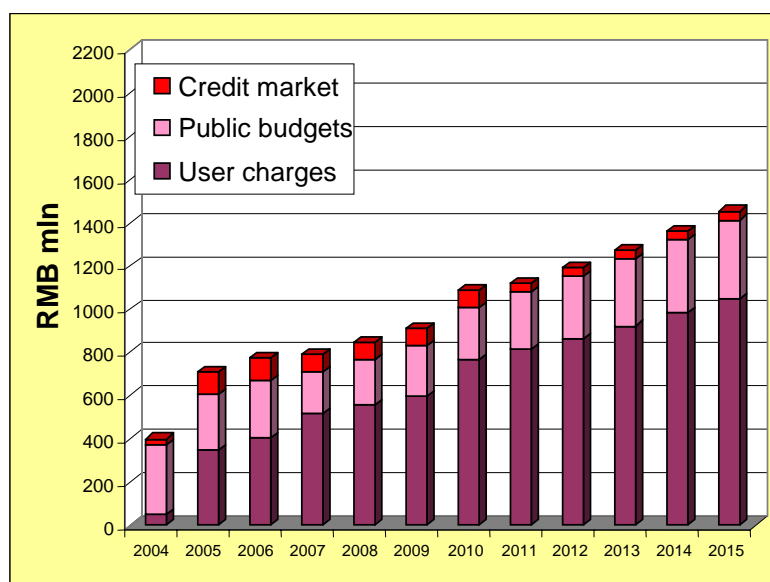
Users pay strategy

193. This strategy assumes a steep increase of user fees in order to move rapidly towards implementing government policy guidelines on full cost recovery. The simulation shows what would happen if most expenditure, including capital investments, were gradually financed from user fees on a “pay-as-you-go” basis. It also assumes a temporary increase of allocations from local budgets that would be offset by a decrease of Central Government transfers. Borrowing would increase only modestly. Table 33 contains the main assumptions of the users pay strategy and Figure 10 illustrates the structure of financing this strategy.

Table 33. Summary of the assumptions constituting the “users pay” scenario:

User charges	<ul style="list-style-type: none"> • From 2005 cover total O&M expenditures and total debt service; • From 2007 additionally cover investment expenditures on WWTPs; • From 2008 additionally cover capital investments in renovation of existing sewers; • From 2011 additionally cover 40 per cent of capital expenditures in new sewers.
Local budgets	<ul style="list-style-type: none"> • In initial period 2005-2006 increase 2 times compared to baseline; • From 2007 at the baseline level (and grow in proportion to GDP)
Transfers from higher government	<ul style="list-style-type: none"> • In period 2005-2006 at 50 per cent of average 2001-2004 level (83 million RMB p/a)
Private financing	<ul style="list-style-type: none"> • In 2005-2006 65 millions RMB p/a to cover investment expenditure deficit; • In period 2007-2010 commercial borrowing will amount to 40 million RMB (similar level to average borrowing in the period 2001-2004); • In period 2005-2015 IFI loans equivalent to 40 million RMB p/a on average will be disbursed.

Figure 10: Users pay strategy: Simulation of the levels and structure of supply of financing the wastewater sector in fourteen cities in Sichuan Province (million 2000 Yuan)

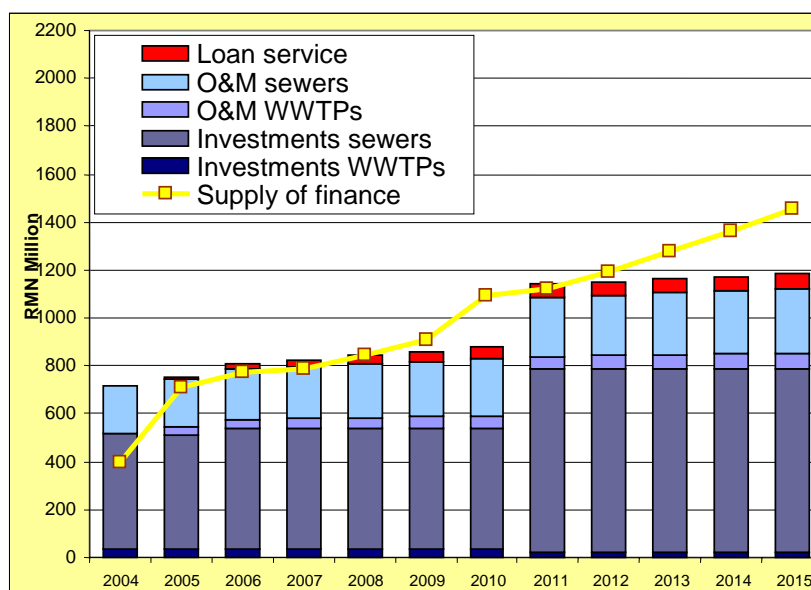


Source: Model simulations by the project team

194. The distinctive feature of this strategy is that not only user fees would rapidly climb to cover operational, maintenance, and debt service expenditures, but also that increasingly investment expenditure would be financed from retained earnings on a pay-as-you go basis. With this financing strategy user charges would already cover all O&M costs since 2005. From 2007 user fees would additionally cover

investment expenditures on wastewater treatment plants and a year later, also capital investments in renovation of existing sewers. From 2011 users would also pay for 40 per cent of capital expenditures on new sewers. In order to achieve these very ambitious cost recovery targets we have simulated three steps of radical rises of charge rates: one in 2005, one in 2007, and one in 2010 (see Figure 14). Because by 2010 infrastructure is assumed to have been more or less completed, after 2010 an increase in charge rate, other than corrections for inflation would therefore not be necessary, unless new investment targets are adopted in the meantime.

Figure 11: Users pay strategy: Simulation of the levels and structure of expenditure needs in the wastewater sector in fourteen cities in Sichuan Province and coverage by the total supply of financing (million 2000 Yuan)



Source: Model simulations by the project team

195. With all these measures implemented on time there would be almost enough financing to implement the programme and cover all financing gaps, as shown in Figure 11 and Table 34, below. However, minor liquidity problems may slightly affect programme implementation until 2010, when the cumulative financing balance becomes strongly positive. It is worth noting that this strategy is slightly more expensive than the taxpayers pay strategy, because of the costs of servicing higher debt than in the taxpayers pay scenario.

Table 34. Simulations of expenditure needed, financing available and cash flow deficits in the users pay financing strategy

Users pay scenario	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Investment expenditure WWTPs	33	32	32	32	32	32	32	20	20	20	20	20
Investment expenditure sewers	482	482	509	509	509	509	509	766	766	766	766	766
O&M expenditure WWTPs	5	29	33	38	42	46	50	55	58	62	65	69
O&M expenditure sewers	193	202	211	218	225	232	238	245	251	258	264	270
Loan service		9	20	27	33	39	52	54	56	57	59	61
Total expenditure needed	713	755	806	824	841	858	882	1139	1151	1162	1174	1185
User charges	50	351	403	513	555	600	763	812	866	923	985	1050
Public budget	321	251	265	196	212	229	248	267	289	312	337	364

Loans	29	105	105	80	80	80	80	40	40	40	40	40
Total supply of finance	400	707	773	790	847	909	1090	1120	1195	1275	1361	1454
Current financing balance	-313	-48	-33	-34	6	51	208	-19	44	113	188	269
Cumulative financing balance	n.a.	-48	-81	-115	-109	-58	150	131	175	288	476	745
Coverage of O&M costs by users	0.25	1.52	1.65	2.01	2.08	2.16	2.64	2.71	2.80	2.89	2.99	3.10
Debt service coverage ratio		24	13	14	13	12	12	13	13	14	15	15

Source: Model simulations by the project team

196. The modest increase of commercial financing assumed in this strategy should be prudent even without significant reforms of utility and local government finance. Yet, with very high debt service coverage ratio (double digit levels), this financing strategy would also be a good basis to increase borrowing. Wastewater enterprises would generate sufficient operating income to pay much higher debt service. This should attract lenders and investors. As we discuss in this study, however, surplus “on paper” is necessary, but not sufficient condition to increase borrowing. Other factors (discussed under the creditors pay strategy) are essential to increase lenders confidence.

197. Feasibility of this strategy is disputable, however. Its implementation is not realistic without strong political consensus in all municipalities studied to radically and rapidly increase user charges and to face the political opposition that this would inevitably trigger. Even if political consensus was reached it would be necessary to ensure that the increase of user fees revenue is conducted in a way that would be **affordable and acceptable** to households. High prices should not deprive the poorest and most vulnerable groups of society from access to basic sanitation. In order to ensure self-financing and social protection at the same time, an effective social safety net would have to be established in all municipalities. We analyse affordability issues in detail in the next chapter.

198. Another major challenge with the users pay strategy would be to **make the user charge revenues work for the wastewater infrastructure**. International experience shows that it may be difficult to implement the rapid increase of tariffs if users can see that the revenues are buried in a general municipal budget. They will suspect that this is just another tax burden on people. Users are usually more willing to pay if they see that their money is strictly dedicated to improving the level and quality of infrastructure services. Hence, this strategy may not be possible without major reforms in the financial management of local budgets and wastewater enterprises. In particular, utilisation of this large flow of funds may not be effective and efficient without giving wastewater utilities more predictable access to the user charge revenue and without giving them more comprehensive responsibilities for managing expenditure budgets (both capital and recurrent). During interviews, several utility managers and local policy makers expressed expectations that institutional and legal reforms will enable wastewater utilities to be truly self-financed, commercially driven, and operated independently from ad hoc political preferences. Some said that in the present legal and institutional system utility managers can hardly be held accountable for delivery of services and for how they utilise money paid by the customers. The main directions of legal and institutional changes that would make the users pay strategy feasible are discussed in the last chapter.

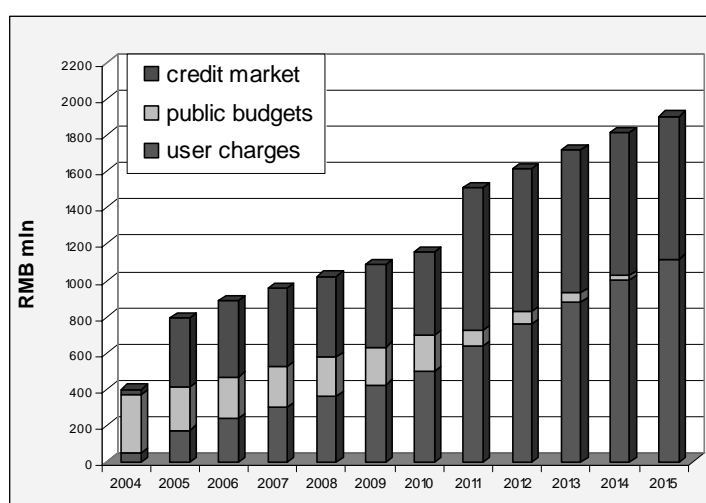
Creditors pay strategy

199. The creditors pay strategy assumes aggressive and rapid borrowing on domestic and foreign credit markets (e.g. through taking loans or issuing enterprise and municipal bonds) and a steep rise in private direct investments. User fees will have to increase to pay all related debt service obligations, but this increase can be delayed. Public budgets will need to increase financing compared to the baseline level only to the extent necessary to leverage commercial finance and would be phased out in linear fashion until 2015. The main quantitative assumptions are presented in Table 35 and Figure 12 below.

Table 35. Summary of the assumptions constituting the “creditors pay” scenario

User charges	<ul style="list-style-type: none"> From 2005 users cover full debt service and those O&M expenditures, which are not covered by operational subsidies from public budgets.
Local budgets	<ul style="list-style-type: none"> In the period 2005-2015 gradually phased out in a linear fashion; In the period 2005-2010 the share of operational subsidies will linearly grow to 100 per cent at the expense of investment expenditures (which will be phased out in 2010).
Transfers from higher government	<ul style="list-style-type: none"> In the period 2005-2010 would be maintained at 50 per cent of the baseline level (83 million RMB p/a), of which 32 million per year would be allocated to cover the investment expenditure in wastewater treatment and 51 million would support investments in sewerage; After 2010 Central Government transfers would be phased out.
Private financing	<ul style="list-style-type: none"> Commercial loans finance investment expenditures in sewerage minus investment subsidies from local and central budgets and minus IFI loans; From 2011 all investment expenditures financed by commercial loans (sewerage and WWTps) minus IFI loans; In the period 2005-2015 IFI loans equivalent to 40 million RMB p/a on average will be disbursed.

Figure 12: Creditors pay strategy: Simulation of the levels and structure of supply of financing the wastewater sector in fourteen cities in Sichuan Province (million Yuan)

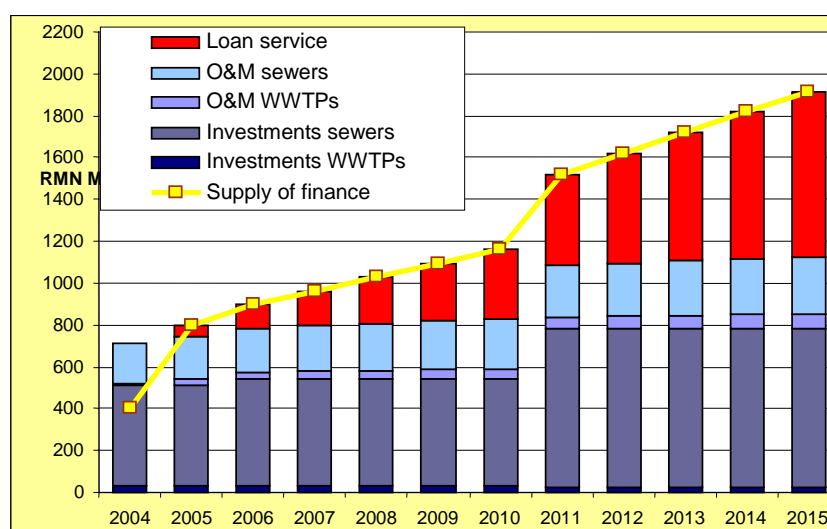


Source: Model simulations by the project team

200. One distinctive difference between the “users pay” and the “creditors pay” financing strategies is the time profile of the increase of user charges. In the “users pay” scenario, wastewater charges would have to grow very steeply in the years 2004-2010 because users would have to cover a significant share of investment expenditures (see Figure 14). Delaying the rise of user charges would result in higher bills having to be paid later to cover the costs of the debt service. Financing initial capital investments through loans increases the total costs of the infrastructure development programmes by the value of the debt service, which ultimately would have to be paid by users (otherwise financial institutions would not lend and private sector would not invest) and/or taxpayers. Therefore, household user charges under the “creditors pay scenario” would be lower than under the “users pay” scenario until 2013, but would have to be higher afterwards. As we shall analyse later, the social impact could be mitigated by delaying increase of user charges because households can expect their income to increase, and hence their ability to pay can be expected to increase as well. With financing of initial capital investments from bank loans, bonds and private equity, user fees may be increased more smoothly at a pace that could be adjusted to increasing affordability limits over time.

201. With these assumptions, municipalities included in this study would have to mobilise enough financing to cover the capital and recurrent (operational and maintenance) costs of wastewater infrastructure in a timely manner. As Table 36 and Figure 13 show, current financial deficits would not occur during the 2005–2015 period. From 2007, user charges would generate operational surplus to pay increasing debt service obligations. The debt service coverage ratio would be maintained at unity, which indicates that throughout the period the wastewater sector would be at the edge of creditworthiness. Hence, the borrowing expansion assumed in this scenario should be perceived as very optimistic.

Figure 13: Creditors pay strategy: Simulation of the levels and structure of expenditure needed in the wastewater sector in fourteen cities in Sichuan Province and coverage by the total supply of financing (million 2000 Yuan)



Source: Model simulations by the project team

Table 36. Simulations of expenditure needed, financing available and cash flow deficits in “creditors pay” financing strategy

Creditors pay scenario	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Investment expenditure WWTPs	33	32	32	32	32	32	32	20	20	20	20	20
Investments expenditure sewers	482	482	509	509	509	509	509	766	766	766	766	766
O&M expenditure WWTPs	5	29	33	38	42	46	50	55	58	62	65	69
O&M expenditure sewers	193	202	211	218	225	232	238	245	251	258	264	270
Loan service		52	110	166	222	275	333	432	526	617	703	785
Total expenditure needs	713	797	895	963	1029	1094	1163	1517	1622	1722	1818	1910
User charges	50	176	238	299	362	427	501	637	758	879	998	1118
Public budget	321	235	232	226	218	208	195	87	70	51	27	
Loans	29	383	421	432	442	451	459	785	785	785	785	785
Total supply of finance	400	795	891	956	1021	1085	1155	1509	1614	1715	1811	1903
Current financing balance	313	0	0	0	0	0	0	0	0	0	0	0
Cumulative financing balance	n.a.	0	0	0	0	0	0	0	0	0	0	0
Coverage of O&M costs by users	25%	76%	97%	117%	136%	154%	174%	212%	245%	275%	303%	330%
Debt service coverage ratio		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Source: Model simulations by the project team

202. Without a credible, long-term commitment to increase tariffs and to allocate revenue fully to wastewater enterprises it will be difficult to access financial and capital markets in the near future. Lenders and investors have to believe that in future they will be able to recover their investments with adequate return to compensate for their risk. In the long run the users are perceived as a more predictable source of revenue than governments. Building trust in predictable future recovery of investment costs from user fees is the key challenge that Chinese local and regional policy makers will face if they want to attract private finance to this sector.

203. This financing strategy is not necessarily feasible. It is not realistic to expect significantly more borrowing from financial and capital markets with the present financial viability and autonomy of the wastewater sector and with its past borrowing record. Most officials and experts interviewed recognized that acceleration of legal and institutional reforms of local government finance and the urban wastewater sector are prerequisites to establishing sustainable access to local credit markets. Rapid and aggressive borrowing and direct investments require significant reforms of the management of wastewater enterprises to make them credible. In addition, this financing strategy may not be feasible without creating an efficient municipal credit market i.e. by giving municipalities a direct right to borrow, albeit under clear rules and effective fiscal supervision.

204. Massive borrowing by wastewater utilities in the present institutional and legal environment may lead to build up of a stock of non-performing loans in the sector. As wastewater enterprises enjoy the *de facto* guarantees of the municipalities, their debt should in fact currently be considered as an unsanctioned local government debt. The consequences of an uncontrolled surge of implicit liabilities of municipalities could be damaging not only to the fiscal position of the Chinese Government but above all to the borrowing capacity for local infrastructure. Hence, it should be stressed that this financing strategy would be very risky if pursued without fundamental reform of the legal and institutional basis for municipal and utility finance. The compelling need for such a reform is well recognized by the Chinese Government, as illustrated by the recent regulatory initiatives (see annex).

205. Some international and Chinese experts interviewed seemed to have excessive expectations concerning the role private finance can play in the wastewater sector. The experience of OECD countries shows that nowhere has the private sector been the primary source of finance for the primary development of urban wastewater infrastructure. Public funds have always played a key role in primary infrastructure development. This can be explained by the externalities and natural monopoly prevailing in this sector.

Affordability of financing strategies

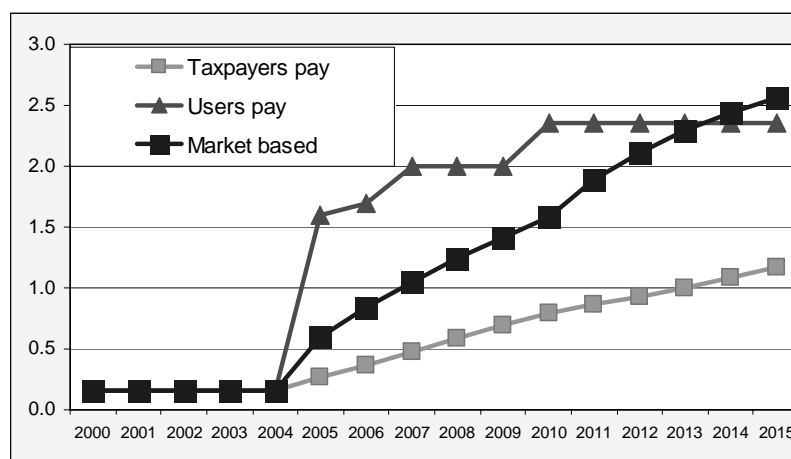
206. Implementation of an ambitious investment programme and its financing strategies may face social and political opposition. Any significant increase of user tariffs will be difficult to realize without accompanying measures to protect the poor and vulnerable households from an excessive increase of water and wastewater bills beyond what they could possibly afford. Failure to address social issues may result either in non-payments or in excessive poverty. This would backfire on city budgets and on the level and quality of sanitation services.

207. User fees would also have to be accepted by the users i.e. households and industries. They would have to be “willing to pay” for treating their wastewater.¹² International experience shows that households

can sometimes willingly accept even very high user charges if they understand the related benefits and if they face effective incentives. In addition, the billing and collection system should be efficient and “user friendly”.

208. In all municipalities studied, the user charge rates for wastewater treatment would have to increase in any scenario that aims at effective achievement of infrastructure development targets. The pace and time profile of this increase will differ, however, depending on the scenario. Figure 14 below shows the time profile of the increase of average WWTP user charge rate for households in all 14 cities studied.

Figure 14: Schedules of increase of household wastewater tariffs in different financing strategies (2000 Yuan/m³)



Source: Model simulations by the project team

209. In the “taxpayers pay” scenario the user charge rate could grow very modestly – at only the rate of the income growth in real terms. It would stay below one Yuan per m³ in real terms throughout most of the forecasted period. Such an increase should be easy to accept by the households, but will not ensure achievements of the infrastructure development targets. In the “users pay” scenario the user charges will have to be increased steeply and early on in order to rapidly reach almost full cost recovery levels in 2007. This scenario assumes that even the bulk of investment expenditures would be financed on a “pay-as-you-go basis” by the users.

210. In the “creditors pay” financing strategy the user charges have to grow more rapidly than in the “taxpayers pay” scenario. Otherwise wastewater enterprises would not be attractive investments. Yet, with more debt financing in this scenario, the pace of tariff growth can be initially smoother and slower than in the “user pays” scenario. Financing most initial capital investment expenditure with debt allows to delay a rate increase until the time when the debt repayment is due. As can be seen from Figure 14 above, the tariff increase will exceed the charge rates envisaged in the “users pay” strategy in about 2013. This marks the main difference in the time profile of wastewater rates between the “users pay” and “creditors pay” financing strategies. In the entire 2004-2015 period the total, undiscounted revenues from user charges is 5.8 billion Yuan in the users pay scenario and 5.3 billion Yuan in the creditors pay strategy. The difference in present value terms is a bit more significant - four billion Yuan in the users pay scenario and 3.5 billion Yuan in the creditors pay scenario, at a five per cent discount rate.

¹² Willingness to pay can be lower or higher than the ability to pay measured by the benchmark share of household income that could be devoted to paying for water and sanitation services

211. Although knowing the pace of tariff increases is a necessary condition to answering the question, "Will user charges be affordable to the population?", it is in itself not a sufficient condition. Over time the incomes of households will also grow, which means that people will be able to afford higher tariffs in the future. There is a commonly acknowledged rule of thumb that helps predict if the water and wastewater charges are likely to pose a significant payment burden to households. This rule specifies that no problems with charge collection should be expected if the combined water and wastewater bill is less than four to five per cent of household disposable income. Consultants to the Asian Development Bank stipulated that, in Asia, households normally tolerate water/wastewater bills of as much as five per cent of their income. Table 37 below illustrates a combined water and wastewater bill as the share of average disposable household income in all 14 cities for each financing strategy. The results are shown for the year 2007 and 2010 because these years are peak years for bill increases. In order to illustrate the ability to pay with respect to wastewater fees, the water supply charges are assumed to grow in proportion to real incomes (GDP) in all scenarios.

Table 37. Share of combined water and wastewater bills in average disposable household income for each financing strategy in 2007 and in 2015

City or county	% share of combined water and wastewater bills in average disposable household incomes					
	2007			2010		
	TP	UP	MB	TP	UP	MB
Luzhou City	1.2%	1.9%	1.4%	1.4%	2.1%	1.8%
Leshan City	1.3%	2.1%	1.5%	1.4%	2.1%	1.8%
Meishan City	1.8%	2.9%	2.1%	1.9%	2.7%	2.3%
Yibin City	1.1%	2.0%	1.4%	1.4%	2.1%	1.7%
Changning County	1.8%	3.1%	2.1%	2.0%	3.1%	2.6%
Gao County	2.2%	4.0%	2.7%	2.2%	3.4%	2.8%
Zigong City	1.8%	2.9%	2.1%	2.0%	3.0%	2.5%
Fushun County	1.7%	2.9%	2.0%	2.1%	3.1%	2.6%
Neijiang City	1.9%	2.9%	2.2%	1.8%	2.6%	2.2%
Weiyuan County	1.1%	1.9%	1.3%	1.4%	2.2%	1.8%
Zizhong County	2.0%	3.3%	2.4%	2.4%	3.4%	2.9%
Ziyang City	1.6%	2.5%	1.8%	2.0%	3.0%	2.5%
Jianyang City	1.9%	3.1%	2.2%	2.1%	3.2%	2.6%
Linshui County	1.9%	3.1%	2.2%	2.5%	3.6%	3.1%

Source:

212. Table 37 suggests that, **on average**, all financing strategies should be affordable to households in all cities. Even under the "users pay" financing strategy the highest average burden on households does not exceed 4 per cent of their average income. The highest burden could be expected in Gao County in 2007.

213. Average figures can be misleading however, because there are usually significant differences in income between different households. It is useful to divide households into different income groups and check affordability for each of group, paying special attention to the poorest families. The following three tables — numbers 38, 39 and 40 — show the user charge payments as the share of households income under the "users pay" and "creditors pay" financing strategies. The households are divided into ten income groups (so-called "deciles"). For clarity of presentation only the five poorest deciles are shown (for the 50 per cent of richer households affordability is not a problem). The results are shown for the year 2007 in Table 38, for the year 2010 in Table 39, and for the year 2015 in Table 40. Shaded cells indicate the household groups that may find water and wastewater bills unaffordable (once again we recall the assumption that water supply fees are assumed to grow in line with real income in all scenarios).

Table 38. Affordability of combined water and wastewater bills to different income groups in selected cities in Sichuan Province in 2007 under the “users pay” and “creditors pay” financing strategies

City or county	Share of water and wastewater expenditure in the income groups (by decile) in 2007									
	Users pay scenario					Creditors pay scenario				
	1st	2nd	3rd	4th	5th	1 st	2 nd	3rd	4th	5 th
Luzhou City	4.9%	3.7%	3.0%	2.7%	2.0%	3.5%	2.7%	2.2%	1.9%	1.5%
Leshan City	7.5%	5.7%	4.6%	2.9%	2.3%	5.2%	4.0%	3.2%	2.0%	1.6%
Meishan City	10.7%	8.2%	6.6%	4.0%	3.1%	7.8%	6.0%	4.9%	2.9%	2.2%
Yibin City	7.2%	5.5%	4.4%	2.8%	2.2%	4.8%	3.7%	3.0%	1.9%	1.5%
Changning County	8.6%	6.6%	5.3%	4.2%	3.3%	5.9%	4.5%	3.6%	2.9%	2.2%
Gao County	11.4%	8.7%	7.0%	5.5%	4.2%	7.6%	5.8%	4.7%	3.7%	2.8%
Zigong City	7.8%	5.9%	4.8%	4.0%	3.0%	5.7%	4.4%	3.5%	2.9%	2.2%
Fushun County	7.5%	6.2%	5.4%	4.0%	3.1%	5.2%	4.3%	3.7%	2.8%	2.1%
Neijiang City	9.2%	7.0%	5.6%	4.1%	3.1%	6.8%	5.2%	4.2%	3.0%	2.3%
Weiyuan County	5.8%	4.4%	3.5%	2.3%	2.0%	4.1%	3.1%	2.4%	1.6%	1.4%
Zizhong County	8.9%	6.8%	5.5%	3.8%	3.5%	6.3%	4.8%	3.9%	2.7%	2.5%
Ziyang City	7.4%	5.7%	4.6%	3.5%	2.7%	5.4%	4.1%	3.3%	2.5%	1.9%
Jianyang City	8.1%	6.2%	5.1%	4.3%	3.3%	5.6%	4.3%	3.5%	3.0%	2.3%
Linshui County	9.3%	7.2%	5.8%	4.3%	3.3%	6.5%	5.0%	4.1%	3.1%	2.3%

Note: Shaded cells indicate the household income deciles, where water and wastewater bills exceeded five per cent of disposable household income, which is an affordability benchmark recommended by consultants to the Asian Development Bank for China.
Source: Own calculations.

Table 39. Affordability of combined water and wastewater bills to different income groups in selected cities in Sichuan Province in 2010 under the “users pay” and “creditors pay” financing strategies

City or county	Share of water and wastewater expenditure in the income groups (by decile) in 2010									
	Users pay scenario					Creditors pay scenario				
	1st	2nd	3rd	4th	5th	1 st	2nd	3rd	4th	5th
Luzhou City	5.3%	4.0%	3.3%	2.9%	2.2%	4.5%	3.4%	2.8%	2.4%	1.9%
Leshan City	7.6%	5.8%	4.6%	3.0%	2.3%	6.3%	4.8%	3.8%	2.5%	1.9%
Meishan City	10.1%	7.7%	6.2%	3.8%	2.9%	8.6%	6.6%	5.3%	3.2%	2.5%
Yibin City	7.4%	5.7%	4.6%	2.9%	2.3%	6.1%	4.7%	3.8%	2.4%	1.9%
Changning County	8.6%	6.6%	5.3%	4.2%	3.3%	7.2%	5.5%	4.4%	3.5%	2.7%
Gao County	9.8%	7.4%	6.0%	4.7%	3.6%	8.1%	6.2%	5.0%	3.9%	3.0%
Zigong City	8.1%	6.2%	5.0%	4.1%	3.2%	6.8%	5.2%	4.2%	3.5%	2.7%
Fushun County	8.0%	6.6%	5.8%	4.3%	3.3%	6.7%	5.5%	4.8%	3.6%	2.8%
Neijiang City	8.3%	6.3%	5.1%	3.7%	2.8%	7.0%	5.3%	4.3%	3.1%	2.4%
Weiyuan County	6.6%	5.1%	4.0%	2.6%	2.3%	5.4%	4.2%	3.3%	2.1%	1.9%
Zizhong County	9.2%	6.9%	5.7%	3.9%	3.6%	7.8%	5.9%	4.8%	3.3%	3.1%
Ziyang City	8.9%	6.8%	5.5%	4.2%	3.2%	7.5%	5.7%	4.6%	3.5%	2.7%
Jianyang City	8.2%	6.2%	5.1%	4.4%	3.4%	6.8%	5.2%	4.3%	3.7%	2.8%
Linshui County	10.7%	8.2%	6.6%	5.0%	3.8%	9.1%	7.0%	5.6%	4.2%	3.3%

Note: Shaded cells indicate the household income deciles, where water and wastewater bills exceeded five per cent of disposable household income, which is an affordability benchmark recommended by consultants to the Asian Development Bank for China.

Source: Model simulations by the project team.

Table 40. Affordability of combined water and wastewater bills to different income groups in selected cities in Sichuan Province in 2015 under the “users pay” and “creditors pay” financing strategies

City or county	Share of water and wastewater expenditure in the income groups (by decile) in 2015									
	Users pay scenario					Creditors pay scenario				
	1st	2nd	3rd	4th	5th	1 st	2nd	3rd	4th	5th
Luzhou City	4.5%	3.4%	2.8%	2.5%	1.9%	4.6%	3.6%	2.9%	2.5%	2.0%
Leshan City	6.4%	4.8%	3.8%	2.5%	1.9%	6.6%	5.0%	4.0%	2.6%	2.0%
Meishan City	8.6%	6.6%	5.3%	3.2%	2.5%	8.9%	6.8%	5.5%	3.3%	2.6%
Yibin City	6.2%	4.7%	3.8%	2.4%	1.9%	6.4%	4.9%	3.9%	2.5%	1.9%

Changning County	7.2%	5.5%	4.5%	3.5%	2.7%	7.5%	5.7%	4.6%	3.7%	2.8%
Gao County	8.1%	6.2%	5.0%	3.9%	3.0%	8.4%	6.4%	5.2%	4.1%	3.1%
Zigong City	6.9%	5.2%	4.3%	3.5%	2.7%	7.1%	5.4%	4.4%	3.6%	2.8%
Fushun County	6.8%	5.6%	4.9%	3.6%	2.8%	7.0%	5.8%	5.0%	3.8%	2.9%
Neijiang City	7.0%	5.4%	4.3%	3.1%	2.4%	7.2%	5.5%	4.5%	3.2%	2.5%
Weiyuan County	5.5%	4.2%	3.3%	2.1%	1.9%	5.7%	4.3%	3.4%	2.2%	2.0%
Zizhong County	7.8%	5.9%	4.8%	3.3%	3.1%	8.1%	6.1%	5.0%	3.4%	3.2%
Ziyang City	7.5%	5.7%	4.6%	3.5%	2.7%	7.8%	5.9%	4.8%	3.6%	2.8%
Jiayang City	6.9%	5.2%	4.3%	3.7%	2.8%	7.1%	5.4%	4.4%	3.8%	2.9%
Linshui County	9.1%	7.0%	5.6%	4.2%	3.3%	9.4%	7.2%	5.8%	4.4%	3.4%

Note: Shaded cells indicate the household income deciles, where water and wastewater bills exceeded five per cent of disposable household income, which is an affordability benchmark recommended by consultants to the Asian Development Bank for China.

Source: Model simulations by the project team

214. The tables above indicate that under the “users pay” strategy affordability limits are likely to be exceeded for 20–40 per cent of the population in all cities except Luzhou both in 2007 and 2010. Although the majority of households (about 70 per cent) will be able to pay more, the share of households for whom the water and waster bills would be excessive poses a significant challenge to social policy. This challenge would be the greatest in the short to medium term (until 2010), where user fee rates grow much faster than incomes. Later incomes catch up with the increased water/wastewater utility bills. With “creditors pay” financing, the affordability would be less of a problem at the beginning of the programme implementation, but would become a serious issue after 2010 when the largest debt payments are due. In 2007 only 10–20 per cent of the population would find it difficult to pay for water and wastewater treatment. Affordability would not be a problem even for the poorest 10 households in Luzhou, Yibin, and Weiyuan. In all cities there would room for increasing user charge revenues within the limits of what households could afford. However, over time when debt service payments “kick-in”, water and wastewater bills would increase faster than income. In 2015 as much as 20–30 per cent of households in all but three cities would have to pay in excess of five per cent their income. In all scenarios some form of social protection would have to be provided to the poorest families if these strategies were to be socially and politically feasible.

215. On the basis of the simulations of affordability and income distribution we have calculated the size of the **social protection budgets** that would compensate the poor households for the payments for water and sanitation bills in excess of five per cent of their income. As can be seen from Table 41 below, the value of the social protection budget varies from year to year and depending on the financing strategy. As expected, the highest social protection budget can be expected with the “users pay” strategy. During the entire period 2004–2015 it would amount to almost one billion Yuan. The largest social protection burden in this scenario can be expected in the years 2005–2012, when rapid growth of user fees will outpace the growth of income. After 2013 the largest social protection budgets could be expected under the creditors pay strategy, because in this scenario the household wastewater bills would need to rise more rapidly to pay for debt service falling due.

Table 41. Size of social protection budget for different financing strategies

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total 2004-2015
Taxpayers pay strategy	2	3	4	5	6	9	12	14	15	18	20	23	130
Users pay strategy	2	55	60	83	80	78	111	108	104	101	97	94	974
Creditors pay strategy	2	4	8	14	22	32	47	66	82	95	106	114	590

Source:?

216. Table 42 below, shows the size of the social protection budget by city. The highest transfers to compensate the poor are likely in low income municipalities, such as Gao County, Neijiang City, Linshui County, and Leshan City. As can be expected, these cities also have very low budget revenue, and may find it difficult to finance incremental social protection out of the local budget.

Table 42. Size of social protection budget by city/county under “market pays“ financing strategy (million 2000 Yuan)

City or county	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total 2004-2015
Luzhou City	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leshan City	0.0	0.0	0.0	0.4	1.4	2.5	3.8	5.4	7.0	8.3	9.2	9.7	47.9
Meishan City	0.3	0.7	1.2	1.7	2.3	2.9	3.6	4.7	5.6	6.2	6.8	7.2	42.8
Yibin City	0.0	0.0	0.0	0.0	0.4	1.2	2.0	2.8	3.4	3.8	4.1	4.3	22.0
Changning County	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	0.9	5.1
Gao County	0.6	1.6	3.5	5.4	7.3	9.1	10.7	15.6	19.5	23.0	25.8	28.1	149.7
Zigong City	0.0	0.0	0.4	1.2	2.0	3.0	4.7	6.6	7.9	8.9	9.5	9.9	54.2
Fushun County	0.0	0.0	0.0	0.1	0.4	0.9	1.7	2.6	3.4	4.0	4.5	4.8	22.2
Neijiang City	0.9	1.5	2.2	3.1	4.0	4.9	5.6	8.1	10.1	11.9	13.3	14.5	79.3
Weiyuan County	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.0	2.6	3.1	3.4	3.6	15.9
Zizhong County	0.0	0.0	0.3	0.6	1.1	1.9	2.8	3.6	4.4	4.9	5.3	5.6	30.6
Ziyang City	0.0	0.0	0.0	0.2	0.7	1.4	2.7	3.7	4.5	5.1	5.6	6.0	30.0
Jianyang City	0.0	0.0	0.0	0.3	0.6	0.9	1.5	2.1	2.5	2.8	2.9	3.0	16.8
Linshui County	0.0	0.0	0.2	0.7	1.7	3.3	6.1	8.3	10.3	12.3	14.2	16.0	73.1
Total	1.9	3.9	7.9	13.8	22.2	32.4	46.9	66.4	81.9	95.1	105.7	113.5	589.6
As % of collected industry and budget org. revenue	7%	5%	8%	13%	20%	28%	39%	44%	46%	46%	46%	45%	
As % of municipal budget expenditures	0.04%	0.07%	0.14%	0.23%	0.34%	0.46%	0.61%	0.80%	0.92%	0.99%	1.01%	1.01%	

Source:

217. The compensations for the loss of disposable income can be conveyed to households either directly (as an income subsidy) or through wastewater enterprises (as a price subsidy). Vehicles for financing these transfers can also differ. For example if the prices to poor households were to be kept low, the charges paid by industry would need to grow proportionally higher, so that incremental revenue could make up for the losses of wastewater enterprises on poor customers. This cross-subsidization would be like a tax on industry earmarked to compensate poor households. Such a solution has certain flaws because it rewards all households – also the rich ones, who do not need any compensation – and often it fails to reach the poorest ones. It also keeps the water prices low for households, encouraging them to use water inefficiently. It may also threaten competitiveness in industry. Eventually, companies may seek opportunities to disconnect from centralised water supply systems and have alternative access to water supply and wastewater treatment. This could undermine not only the financing of social protection budgets but the financial viability of wastewater enterprises. Economists usually recommend lump-sum transfers to poor people *e.g.* through the social security system. Such a vehicle is more efficient because it allows for the compensation of only those who are really needy and for the provision of price incentives to use water efficiently. The challenge of this system is that it requires additional government tax revenue, whether paid by all taxpayers or by industrial water users. It also can not function without relatively mature and well-established social security institutions, which would effectively identify the poorest households and would transfer income compensations in a targeted and transparent way. According to interviews conducted in Sichuan such a social protection system is not yet fully developed in the Province, although appropriate departments have been established in the provincial government. Provincial and municipal officials were realistic in their expectations that establishing a well-functioning social welfare system takes time. Social protection programmes can be fully financed from local taxes and/or supported by the central budget. In many countries higher levels of government intervene in funding social protection measures, in order to facilitate redistribution of wealth from the rich to the poor regions and in order to help the poorest cities cope with financing ambitious wastewater treatment programmes. After all, treating waste-waters yields benefit to other, often richer cities downstream.

218. The last two rows in Table 42 illustrate the feasibility of two different vehicles of financing social protection budgets related to water and sanitation services. The first ratio of social protection budgets to the forecasted revenue of user charges paid by industry and public organizations illustrates the scale of increase of non-household charges that would be needed in this scenario if cross-subsidization was chosen as an instrument for protecting poor households. It implies that if water and wastewater tariffs were maintained at affordable levels for poor households (less than five per cent of their income) the average tariffs paid by non-household users would have to be gradually increased by an additional five per cent in 2005, up to additional 45 per cent in 2015. These incremental revenues would cover the deficit of wastewater enterprises caused by subsidised pricing for poor household customers. The second ratio of social protection budgets to the general local government expenditures shows the hypothetical incremental burden to local taxpayers if they were chosen to be the source of financing for the compensatory transfers to poor households. The simulations show that the burden of protecting the poor against excessive water and sanitation bills would gradually increase from the very small amount of 0.14 per cent in 2005 to slightly over one per cent in 2014-2015. This reflects the fact that in this financing strategy the growth of user fees would ultimately exceed the fiscal expansion of local governments. Both vehicles of financing social protection budgets seem to be challenging but realistic under the assumptions taken in this scenario.

CONCLUSIONS

219. Achievement of the stated targets compatible with the Millennium Development Goals related to urban sanitation would require a four to fivefold increase of total (capital, maintenance, and operational) expenditure per annum until 2010, compared to 2000, and sevenfold thereafter. The heaviest expenditures are needed for capital investments in renovation and expansion of sewerage. The construction of wastewater treatment plants would be relatively less capital intensive. Operational and maintenance expenditures also need to increase over time, in particular after completion of the construction of treatment plants, and later as larger urban areas will be served by sewerage.

220. Without significant changes in the baseline trends of financing, the fourteen cities in Sichuan Province are unlikely to achieve the targets for developing urban wastewater infrastructure. Less than a half of the required financing would be provided in the period 2000–2015. In particular the development of the necessary wastewater collection system would be significantly under-funded.

221. Operations and maintenance of urban wastewater infrastructure do not rely on sustainable finance. In 2000-2004 wastewater charges covered only 40 per cent of the costs of operation and necessary maintenance of wastewater infrastructure. Continued reliance on the public budgets as opposed to user fees and credit may not be sustainable given the observable trend to shrink government investment spending on infrastructure in China and given the increasing demand for public financing of competing government mandates (such as social welfare, health, water supply, flood control, education, etc.). The affordability analysis showed that in all municipalities there is room for increasing revenues from wastewater user charges without exceeding the limits of what households could afford. Social concerns are limited to a very small per centage of the population. Between 70 and 100 per cent of households currently pay less than five per cent of their income for water and sanitation. According to the Asian Development Bank consultants, households in Asia usually tolerate water/wastewater bills of as much as five per cent of their income.

222. Three possible broad strategies (scenarios) to increase financing were simulated:

- “Taxpayers pay” strategy (increase of allocations from public budgets as the cornerstone of financing wastewater infrastructure);
- “Users pay” strategy (steep increase of user fees in order to move rapidly towards full cost recovery, including capital investments);
- “Creditors pay” strategy (rapid increase of borrowing on domestic and foreign credit markets).

223. None of these strategies will be easy to implement. The “taxpayers pay” strategy does not seem to be feasible because it relies on a significant increase of expenditures from already stretched local budgets. The macroeconomic and fiscal environment is likely to stimulate the shrinking rather than the expansion of government capital spending on infrastructure over the next few years. Hence this strategy would involve perpetuation of liquidity problems, which could undermine achievement of programme objectives. This strategy would also be in opposition to the policies issued by the Central Government.

224. The “users pay” and “creditors pay” strategies would be in line with the government policies. However their feasibility depends crucially on the acceleration and actual implementation of institutional and legal reforms of the urban wastewater sector and of the local government finance. Moreover, their feasibility would be constrained by a limited ability to pay by the poor households and by the local budgets.

225. In all municipalities studied, the user charge rates for wastewater treatment would have to increase significantly in the “users pay” and “creditors pay” strategies. If most initial capital investments were financed with credit, the charge rate increase could be delayed until the time when the debt repayment is due and when incomes are higher.

226. Massive borrowing by wastewater utilities in the present institutional and legal environment would not be prudent. It could lead to a built-up of a stock of non-performing loans in the sector. As wastewater enterprises enjoy implicit municipality guarantees, this could be damaging to the fiscal position of the general government and could hinder the development of a healthy municipal credit market for water and environmental infrastructure. At the time this report was written the urban wastewater sector in secondary cities in China was not financially viable to absorb more borrowing without major legal and institutional reforms to improve its credit capacity. The reforms are particularly needed to:

- Clarify the legal status of the project owners and property rights to wastewater infrastructure;
- Give wastewater enterprises more financial and operational autonomy (*e.g.* a more direct access to revenue of wastewater charges) and more responsibilities (*e.g.* for wastewater collection); ensure linkage between revenue and responsibilities;
- Make wastewater enterprises responsible and accountable for development and operation of infrastructure; clarify division of roles and responsibilities between wastewater enterprises and municipalities through performance contracts;
- Ensure predictable and consistent increase of tariffs for wastewater infrastructure that would allow wastewater enterprises to pay all operating expenses, repairs, taxes, and the total debt service obligations;
- Introduce charges for using wastewater collection networks;
- Integrate water supply and wastewater management on the municipal level, even by considering mergers between water supply and wastewater management utilities (at least with sewerage operators);
- Ensure better integration of capital and operational expenditure in the preparation and execution of municipal budgets;
- Consider giving explicit borrowing rights to municipalities, based on clear rules, limits, and with effective supervision of sub-national debt;

227. Taking into account income distribution it seems that under the “users pay” strategy, affordability limits are likely to be exceeded for the 30 or more per cent of poorest families in all cities except Luzhou throughout most of the simulated period. In most cities as much as 30 per cent of the population may find it difficult to pay for water and wastewater between 2005 and 2011. This would pose a significant challenge to social policy. With “creditors pay” financing, affordability would be less of a problem at the beginning of the programme implementation, but would become a serious issue after 2012, when the largest debt

payments are due. In 2007 only 10–20 per cent of the population would find it difficult to pay for water and wastewater treatment. However in 2015 this would increase to as much as 20–30 per cent of households. In all scenarios some form of social protection would have to be provided to the poorest families if these strategies were to be socially and politically feasible.

228. The size of the social protection budgets that would compensate the poor households for the payments for water and sanitation bills in excess of five per cent of their income would be particularly difficult to finance in the users pay strategy in the years 2005-2012, when rapid growth of user fees would outpace the growth of income. During the entire period 2004-2015 it would amount to almost a billion Yuan. After 2013 the largest social protection budgets could be expected under the creditors pay strategy, because in this scenario, the household wastewater bills would need to rise more rapidly to pay for debt service falling due.

229. Should the government choose cross-subsidization of households by industry and by public organizations as a means of financing social protection budgets, the revenues by non-household users would have to be increased gradually from an additional five per cent in 2005 to additional 45 per cent in 2015. Should the government decide to compensate the poor from the general budget expenditures, the burden of protecting the poor against excessive water and sanitation bills would gradually increase from the very small amount of 0.14 per cent in 2005 to slightly over one per cent in 2014-2015. Both vehicles for financing social protection budgets seem to be challenging but realistic under the assumptions taken in the credit financing scenario.

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ANNEX - LEGAL BASIS OF CHARGING FOR WASTEWATER TREATMENT¹³

1. Water prevention and control Law of the Peoples' Republic of China (1996 amendment)

The main legal foundation that enables relevant bodies to charge users for provision of wastewater collection and treatment services was laid in 1996, with the amendment of the “Water prevention and control Law of the Peoples' Republic of China”. Article 19 of this Law stipulates that urban wastewater should be treated in centralized facilities. It also stipulates that the relevant departments of the State Council and governments of provinces, cities, and counties should incorporate the protection of city water sources and the treatment of urban wastewater into the urban construction master plan. Construction and improvement of urban sewage networks and of urban wastewater treatment facilities should be an integral part of the comprehensive urban water management plan.

Under the same provision, the centralized urban wastewater treatment facilities can charge polluters for the wastewater treatment services in accordance with relevant national policies. They can also collect wastewater treatment charges to ensure their normal operation. The revenue collected from wastewater treatment charges must be spent on the construction and operation of the centralized urban wastewater treatment facility and should not be used for other purposes. The Law stipulates that detailed methods for the management of collection and the use of wastewater treatment charges for centralized wastewater treatment facility should be established by the State Council.

2. Circular: Enforcement of levying wastewater treatment fee in order to advance the concentrated treatment of wastewater and better control the discharge of municipal wastewater (1999)

In November 1999, the State Development and Planning Commission (SDPC) of the Ministry of Construction (MOC), jointly with the State Environmental Protection Administration (SEPA) issued a policy circular entitled the “Enforcement of levying wastewater treatment fee in order to advance the concentrated treatment of wastewater and better control the discharge of municipal wastewater” (SDPC code (1999) 1192). This circular includes four major provisions:

- **To include wastewater treatment surcharge in the water supply tariffs.**

This provision stipulates that the wastewater treatment charge is an integral part of the water tariff. It should be collected as a surcharge to the water tariff and paid by users according to their water consumption. The agencies operating wastewater treatment facilities should adopt corporate management. They should have independent accounting, be responsible for losses and profits, and pay taxes according to the national laws. The wastewater treatment charge should be collected by water supply enterprises together with water tariffs and transferred to the wastewater enterprises to cover the costs of operation and maintenance of sewerage and wastewater treatment plant. This circular also stipulates that the wastewater treatment charge can be collected in cities before the WWTP is built, under the condition that it will be constructed within three years. No sanctions, however, are envisaged if municipality fails to meet this condition within three years.

¹³ This annex was prepared by Mr Chazhong Ge from the Chinese Academy of Environmental Sciences

- **To set principles and to assign authority for establishing wastewater tariffs.**
The circular states that the wastewater treatment charge should ultimately be set up in accordance with the cost-recovery principle and should cover operation and maintenance costs of sewage networks and wastewater treatment facilities along with a reasonable profit. The costs of operation and maintenance in the circular refer to such items as power, materials, transfer and discharge, maintenance, wages, social welfare, and taxes. Depreciation of fixed assets is also included in the cost-recovery principle. The rate of the wastewater treatment charge can be progressively increased by the municipal authorities to the necessary cost-recovery level, taking into account local conditions, including affordability of all local parties involved.
- **To improve supervision of wastewater treatment plants and revenue collection.**
According to the circular the enterprises responsible for wastewater treatment plants should ensure normal operation and service quality in compliance with wastewater discharge standards. Local construction departments should be responsible for the supervision of the day-to-day operation of wastewater treatment plants. Local environmental protection bureaus are responsible for the monitoring of quality of the effluents discharged by wastewater treatment plants. The enterprises, which find it difficult to pay the wastewater treatment charge can delay the payment but cannot be exempted from paying the charge. The instruments for enforcing payments of wastewater surcharges by the water supply enterprise (e.g. the right to disconnect non-paying enterprises from the water supply) are not specified however in this policy document.
- **To harmonize wastewater user charges with other related fees.**
After the wastewater treatment charge is introduced, the charges for construction, operation, and increased capacity for sewage should be abolished. An effluent discharge levy charged on the polluting enterprises (institutions) should be suspended if they are connected to the centralized treatment facility.

Some provinces and cities had begun to charge a municipal wastewater treatment fee before the Central Government issued the above document. Since this document was issued however, collection of municipal wastewater treatment charges became widespread nationwide.

The principle that the wastewater treatment charges should also cover depreciation costs remains purely theoretical so far, since the charge rate is usually too low to cover even the operation and maintenance cost, let alone to include depreciation costs. Only in a few Chinese cities can the charge recover some of the capital cost (depreciation) of the sewerage network. Moreover, charging for depreciation costs will be difficult as long as the ownership of fixed assets remains ambiguous, because only the owner of the fixed assets has the authority to invest in capital improvement and collect depreciation funds.

The circular envisages that the revenue collected from wastewater treatment fees by water supply companies should be earmarked for financing the capital investment, operation, and maintenance of wastewater treatment facilities, along with other government budget expenditures.

In addition to setting the wastewater treatment charges right, the government could implement supplementary policies that would encourage enterprises to engage in wastewater treatment projects. Examples of such policies include electricity price subsidies for wastewater treatment plants and free allocation of the right to use the land for wastewater treatment purposes.

3. Circular: Strengthening municipal water supply and saving, and water pollution control and treatment (2000)

In 2000, the State Council issued a circular “Strengthening municipal water supply and efficiency, and water pollution control and treatment” (State Council (2000) 36). The main rationale of this circular was to address the problem of scarcity of water resources in China, especially in cities. Its aim was to rationalize water supply tariffs, and to increase enforcement of water saving measures and of abatement of water pollution. There are two main provisions that explicitly address urban wastewater treatment.

The first provision sets the quantitative targets for all cities in China to build centralized wastewater treatment facilities. It states that all cities should build wastewater treatment facilities during the 10th five year plan period(2000-2005). By the year 2005, at least 60 per cent of generated wastewater should be treated in cities with 500 000 inhabitants and by 2010 in all other cities in China, except where the even more ambitious target of 70 per cent of the wastewater treatment rate has been established. This goal has been set for the largest cities, for particular cities such as those that are under direct supervision of the State Council, for provincial capital cities, cities listed separately in the national plans, and for the cities which are key tourist attractions.

The second wastewater related provision calls the Chinese cities to levy a wastewater treatment charge in order to reduce urban wastewater pollution. The circular stipulates that all cities in China should adopt a wastewater treatment charge in accordance with the relevant regulations and increase the rate to the level that recovers the cost of operation and maintenance as well as a reasonable profit. The enterprises operating water supply and wastewater treatment facilities should be continuously reformed in order to enhance management performance and to reduce cost.

4. Circular: Further promote the reform of pricing for municipal water supply (SDPC [2002] 515)

This circular was issued jointly by the State Development and Planning Commission, the Ministry of Finance, the Ministry of Construction, the Ministry of Water Resources and the State Environmental Protection Administration. The stated aim of the circular was to ensure the implementation of the circular of the State Council (2000\36) and to clarify issues related the protection and utilization of water resources and the control of water pollution. This circular addressed two main issues related to urban centralized wastewater management: Improving collection, and increasing the rate of wastewater treatment charges.

The fourth article in the circular, entitled “Strengthen the collection of wastewater treatment charge and progressively increase water resource fee”, calls for the enhancement of the collection of the wastewater treatment charge. By the end of 2003, all cities should have started to collect a wastewater treatment charge. Wastewater treatment plants with an appropriate capacity should be built and put into operation by 2006 in accordance with the relevant requirements contained in the river basin or regional water pollution control plans¹⁴, and urban master plans of cities. Those cities that have already enforced the collection of a wastewater treatment fee should increase the rates enough to recover costs with a marginal profit.

In reality only a few cities had introduced a wastewater treatment charge before 1999. Those that had done so had established them at very low levels that did not cover operation and maintenance costs. Charge arrears and evasion were very common.

¹⁴ These plans are prepared by upper level environmental protection agencies (EPBs) in cooperation with lower level governments and their EPBs according to the Water pollution prevention and control Law. Normally local EPBs are responsible for the implementation of river basin/regional water pollution control plans.

The sixth article in the circular, entitled “Reform the management system for the entities engaging urban water supply and wastewater treatment and introduce market mechanism into water supply and wastewater treatment”, calls for the reform of the management system of municipal enterprises in order to increase the efficiency of water supply and wastewater treatment. The article states that the key to enterprise reform is to introduce market competition. Those wastewater treatment plants that have adopted enterprise management should further improve their management systems. Those wastewater treatment plants that are still treated as public institutions should be converted into enterprises. Before such a conversion is accomplished, enabling conditions should be created and a two-tier management of expenditure and revenue adopted. Principally, the conversion of wastewater treatment plants in large and medium-sized cities into enterprises should be accomplished during the 10th five year plan period (until 2005). By that time government functions should be separated from enterprise functions. The roles and responsibilities of the government and enterprises should be clearly defined so as to make the water supply and wastewater treatment utilities independent operationally and responsible for their losses and profits. Cities can carry out the pilot corporate reforms of water supply and wastewater treatment according to the stipulations of Company Law and their own characteristics. If conditions allow, cities may separate plants from the network and announce bidding for connection of plants to the network.

The circular is not explicit about issues such as what responsibilities government will retain and how the division of responsibilities should be established. It also stops short of specifying who will be the owner of physical assets and who will be the owner of enterprises.

5. Circular: Decision on promoting industrialization of urban wastewater treatment and solid waste treatment (2002) (SDPC[2002]1591)

This circular was issued jointly by the State Development Planning Commission, the Ministry of Construction, and the SPEA in 2002. In the circular, the model of concession is introduced to promote private involvement in wastewater treatment and solid waste management. It is envisaged that through concession, additional financing for capital investments in the construction and operation of wastewater treatment plants and solid waste management facilities can be provided.

In order to attract private investment in wastewater treatment, local government or its entrusted agency can decide what rate of return on private investments could be deemed reasonable by referring to the lending rates of commercial banks on loans with the same maturities. They also decide what would be the rational prices for wastewater treatment according to the operation cost based on local conditions. On this basis, local government or its entrusted agency determines tender specifications for investors in, and operators of, wastewater treatment facilities. Tender should be used to select the best management option and the best bidder. Government or its entrusted agency must transfer the revenue from the wastewater treatment charge to the enterprise selected through bidding, according to the contract. Mutual benefit and risk sharing should be embodied in the agreement between government or its entrusted agent and the investor. The government or its entrusted agency should not provide any insurance or guarantee of return on investment if the private investor bears no risk.

A private company can be involved in the construction of wastewater treatment plants provided that the private investor has cash in its account to cover at least 20 per cent of the total capital expenditures needed to implement the wastewater treatment project. The concession period should be less than 30 years. If a corporate entity wants to get concession for operating wastewater treatment plants, its registered capital should be no less than 50 per cent of the total operation and maintenance of the plant. The duration of the operating concession should be not more than eight years. After the concession contract expires, the bids need to be repeated to allow new operators to enter the market.

The circular suggests that in order to attract private investment, the wastewater charges should be high enough to cover operation and maintenance and a reasonable return on capital investment. The rates should be raised progressively to such a level. There is, however, no particular schedule for achieving the cost recovery target.

This circular was the first official document to establish the basis for concessions in wastewater treatment and solid waste management infrastructure. It remained the only regulation on concessions for water and wastewater treatment plants until early 2004 when the “Concession regulation for urban infrastructure” was promulgated. However this latter act was not available for detailed analysis within the scope of this project.

The 2002 circular encourages local governments to raise additional investment funds by using the revenue from the wastewater treatment charge as collateral on loans taken for the construction and renovation of the sewage network. In addition the Central Government encourages municipalities to actively use all other quasi taxes and fees under their jurisdiction to raise funds for wastewater treatment and for solid waste treatment. A certain proportion of the revenue from urban construction and maintenance tax, supplementary funds for urban infrastructure development, and the fees for the lease of the state-owned land should be used to co-finance construction of the sewage collection system or to compensate for the deficit in the operation cost where the wastewater treatment charges are not high enough.

National Government can support operators of urban wastewater treatment projects in applying for foreign investment funds including foreign public loans and can provide appropriate subsidies to the industrial development of wastewater treatment.