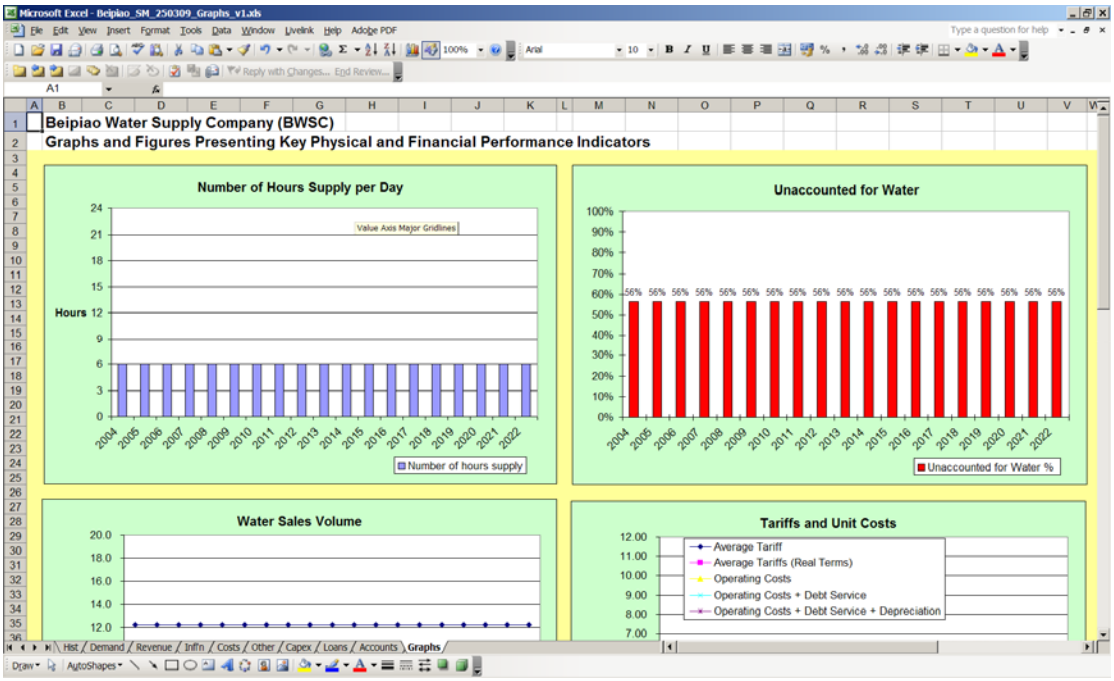
# China – UK, WRDMAP
# Integrated Water Resources Management Document Series

## Manual 5.7: The Development and Use of a Model for Financial Analysis of a Small to Medium Size Water Supply Company in China

**May 2010**

5. Economic Tools



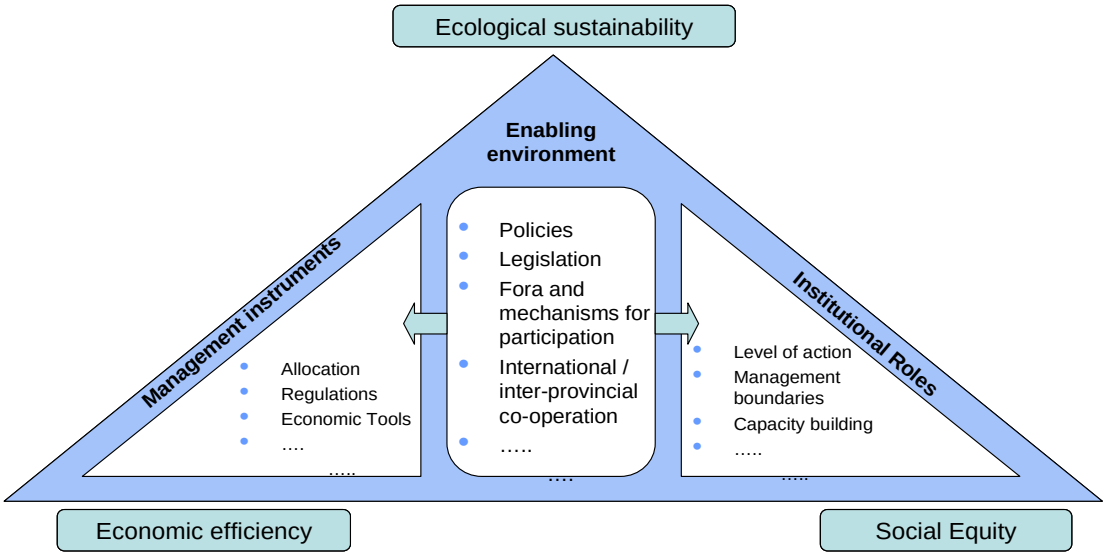

中国水利 CHINA WATER

DFID Department For International Development

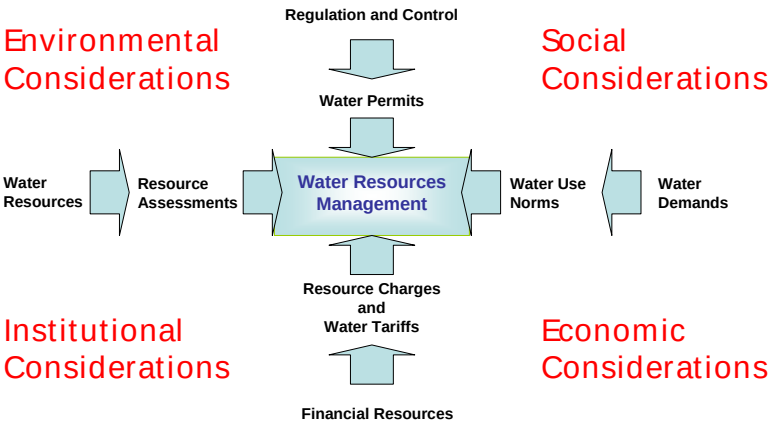
Mott MacDonald

# Integrated Water Resources Management (IWRM)

*(Basics after Global Water Partnership)*




**Driving Elements of Integrated Water Resources Management**




*(Second figure after WRDMAP)*

**Summary:** This Manual provides detailed guidance on financial management "best practice". It acts as a reference for creating necessary financial modelling worksheets in both Chinese and English, primarily using Excel. Here, the model is based on the Beipiao WSC in Liaoning Province, as part of the WRDMAP project.

Water Supply Companies (WSCs) should implement financial management in line with best practice to ensure that senior managers are provided with accurate and timely financial management reports that allow them to assess the financial performance of the WSC on a regular basis.

This document is supporting material for WSC financial modelling. There is also a WRDMAP Financial Model Excel Workbook to accompany this Manual. See References at the end of this booklet for more information.

The document has the following sections:

- Introduction
- Use of model worksheets
- Summary and suggested approach to financial analysis and modelling

This document is one of a series covering topics on sustainable water resources planning, allocation and management. Details are given in the bibliography.

The Ministry of Water Resources have supported the Water Resources Demand Management Assistance Project (WRDMAP) to develop this series to support WRD/WAB at provincial, municipal and county levels in their efforts to achieve sustainable water use.

# 1 Introduction

An Excel based financial model has been developed that can be viewed in either English or Chinese and ideally requires four years of historical data, upon which the future projections are based. The model has been designed to analyse Water Supply and Wastewater Company (WSC) operations and is intended to be part of the suite of tools used by WSC management to assist with planning (during the business planning cycle), monitoring and control of their business operations. In particular the model has been designed to assist in understanding future tariff implications as a result of planning decisions e.g. related to capital developments, changes in working practice or institutional restructuring.

The analysis provides a 15 year projection (2008 – 2022) of the WSC operation. The model should be completely updated each year, as part of the business planning cycle, to produce an updated so-called "base case" scenario. Optioneering (decision making process) and sensitivity analysis can then be undertaken to understand the implications of different approaches and priorities as they relate to the results derived from the base case analysis.

There are two key areas that company management must address before the analysis can be undertaken. Firstly they must decide what the WSC objectives should realistically be. This will include physical objectives such as levels of service, reduction in unaccounted for water and number of new water or wastewater connections, as well as financial objectives such as cost recovery levels and debt service. Secondly they should decide on the key assumptions to be included in the

analysis. This will include assumptions regarding the WSC's capital development programme, financing plan, sales (e.g. based on water supply and wastewater flows), operating costs, inflation and exchange rates. These aspects of the WSC should normally be addressed as part of the business planning process in any case.

If the customers of the WSC are unable or unwilling to pay the tariffs necessary to meet the company objectives the future commercial sustainability of the company will be in jeopardy. Without a reasonably assured revenue stream the company may not be able to: service its debts; maintain its assets properly; improve its service provision via further capital development; and may not even be able to pay its workforce.

Using data collected on domestic customer incomes and industrial customer output as well as water use patterns and an analysis of the affordability of WSC objectives from a customer point of view should therefore be part of the business planning process. Where appropriate, recommendations should be made as how to ensure that low-income families are able to receive an adequate level of service to meet their needs without incurring an unduly onerous financial burden to receive that level of service. The outcome of this analysis should be taken into consideration when undertaking the financial analysis to generate tariff requirements and in developing tariff policy.

Finally, during the design of the tariff system and the review of modelling results, due consideration needs to be given to 'willingness to pay' survey results and 'ability to pay' assessments. See Advisory Note 5.5 'Willingness to Pay Surveys (Urban Water Supply)'.

# 2 Use of Model Worksheets

The model is divided into 12 interlinked worksheets within a workbook, as outlined below (actual worksheet names are given in brackets):

1. Language Switch (Language Switch)
2. Set Up Data and Historic Accounting Information (Hist)
3. Demand, Production and Sales (Demand)
4. Revenue (Revenue)
5. Inflation (Infl'n)
6. Operating, Maintenance, and Non-operating Costs (Costs)
7. Other Assumptions (Other)
8. Capital Expenditure (Capex)
9. Borrowing (Loans)
10. Forecasted Accounts (Accounts)
11. Graphs (Graphs (En))
12. Graphs (Graphs (Cn))

Where appropriate data entry cells have a shaded rather than white background for ease of identification. It is recommended that a "pristine" original version of the model is saved as a back-up should, for any reason, the working version of the model become corrupted (e.g. due to introduction of a circular formula or breaking of links between cell formulae in different worksheets) during use.

Each worksheet in the model is set up to print on A3 paper and in landscape.

Before entering data into the model, use the language switch to operate in your language of choice. Always begin entering data in the Set Up Data and Historic Accounting Information (Hist) worksheet and work your way sequentially through the data entry areas of the other worksheets, up to and including the Loans (Loans) worksheet. There are no data entry areas in the Accounts worksheet or in the Graphs worksheets. These are output worksheets only.

You will need to use various internal (within the WSC) and external (outside the WSC) sources of information. These could include:

Table 1 Internal sources of data

| Data Type | Date Source | Data Entry Sheet(s) | Data Categories and Use |
|---|---|---|---|
| Financial | Finance or Accounting Department<br>Billing and Collection Department | Hist, Revenue and Other | Historical accounts, sales (physical and financial), tariffs and other charges, loans, grants and subsidies, receivables inventories, prior period adjustments and non-cash expenses. Service population, people per connection, and taxes. Tariffs. Unaccounted for water. |
| Operational | Operations Department | Hist and Costs | Production, operating costs, efficiencies (e.g. leakage rates). |
| Engineering | Technical Department | Hist, Demand | Production capacity, network capacity and extent. |
| Human resources | Human Resource Department | Hist, Costs | Staffing numbers (salaried and on wages) and costs |
| Planning | Planning Department | Demand, Revenue, Costs, Capex and Loans | Projected tariffs, production, capital programme (physical and financial), operating costs, staff numbers and financing. |

Table 2: External sources of data

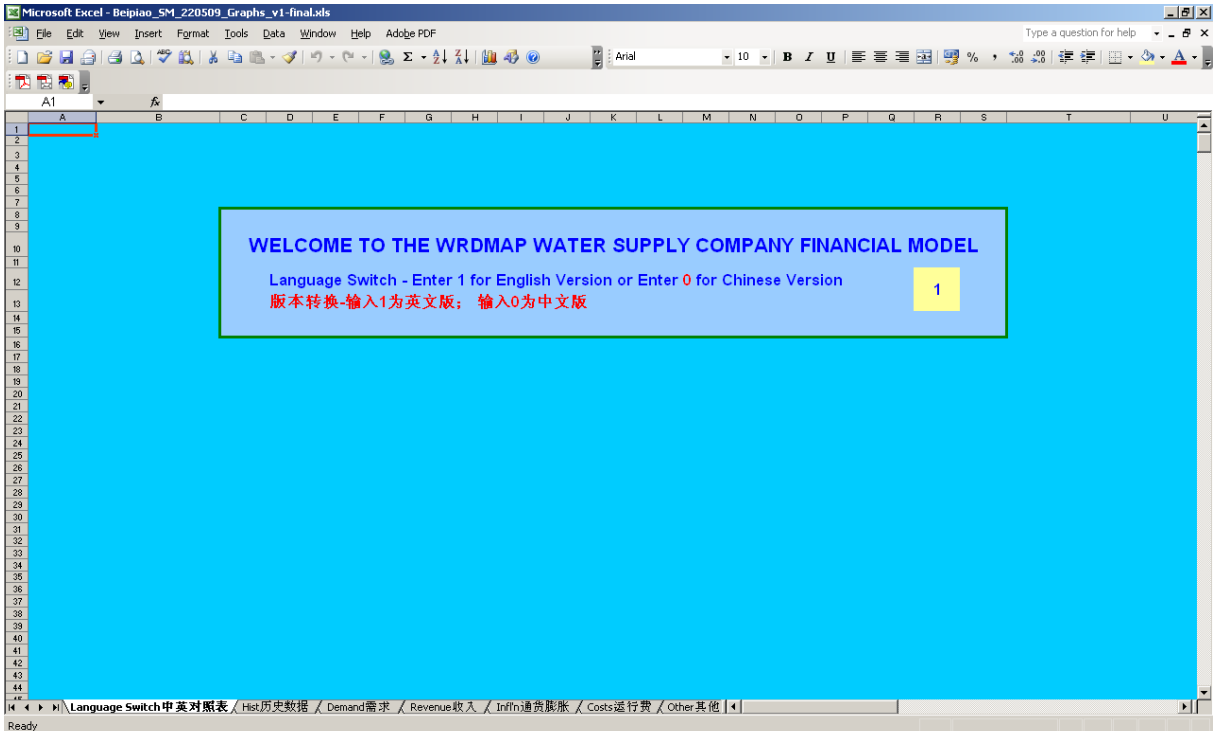
| Data Type | Date Source | Data Entry Sheet(s) | Data Categories and Use |
|---|---|---|---|
| Macro economic, population and population growth | National, Regional and City Statistical Year Books<br>National, Regional and City Statistics Office | Hist<br>Infl'n | Inflation figures (consumer prices and construction prices), household incomes, primary, secondary and tertiary GDP. |

A detailed checklist of data requirements is presented in Appendix A. This checklist covers the following data categories:

- Production and sales
- Customer base and charges
- Metering
- Distribution network
- Capital expenditure
- Investment finance
- Operating expenditures

## 2.1 Language Switch

Figure 1 Language Switch




This worksheet enables you to decide which language (Chinese or English) you would like to operate the model in. (See Figure 1.) When you first open the model press function key F5. When prompted to provide a reference, key in LS and then press the Enter key. You will be directed to the Language Switch in the Language Switch worksheet. Key in 0 for Chinese or 1 for English and then press the Enter Key. The model will now be ready for operation in your language of choice. You can switch between languages at any time using this procedure.

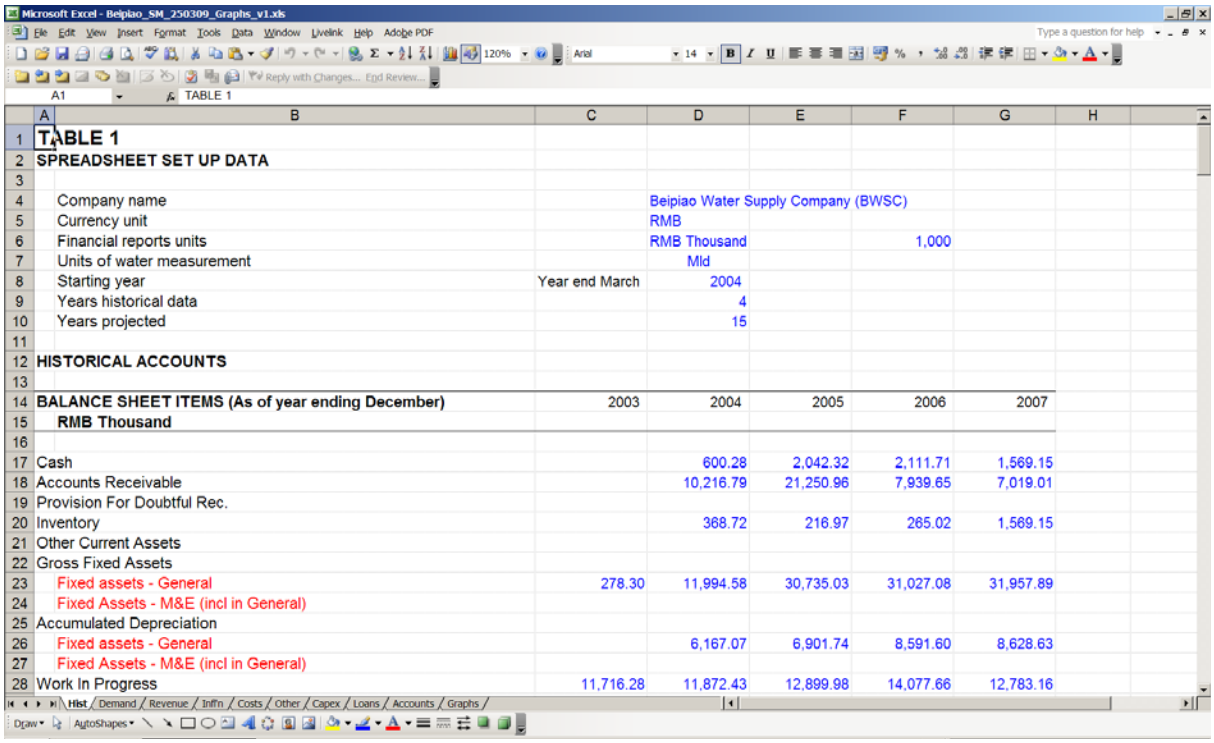
## 2.2 Set Up Data and Historic Accounting Information (Hist)

This worksheet is used to set up basic information, including: WSC name, currency, financial reporting units (thousand RMB), units of water measurement (Mld) and starting year for projections. Historic (actual) balance sheet, profit and loss, sales

revenue, production, staff, population served, inflation and capital expenditure data should be entered on an annual basis for the previous four years of WSC operation (Figure 2). Accounting information should preferably be obtained from the audited accounts of the WSC.

A data entry check schedule is also included in this sheet (not shown) to ensure the historic accounting data has been entered correctly. The results of the calculations in this schedule should always be equal to zero if data has been entered correctly. Any other result indicates the user should check data entry, e.g. make sure balance sheet entries are correct so that the balance sheets balance.

Figure 2 Set Up Data and Historic Accounting Information (Hist)



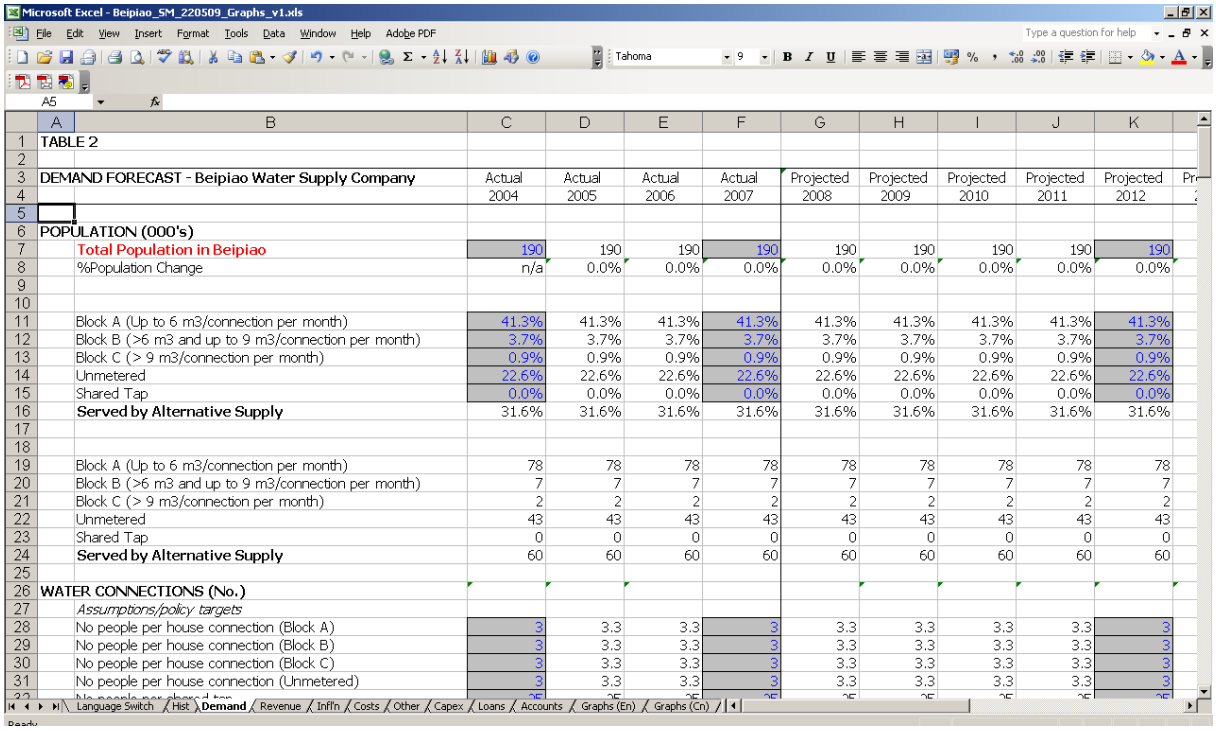
| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 1 | | | | | | | |
| 2 | SPREADSHEET SET UP DATA | | | | | | | |
| 3 | | | | | | | | |
| 4 | | Company name | | Beipiao Water Supply Company (BWSC) | | | | |
| 5 | | Currency unit | | RMB | | | | |
| 6 | | Financial reports units | | RMB Thousand | | 1,000 | | |
| 7 | | Units of water measurement | | Mld | | | | |
| 8 | | Starting year | Year end March | 2004 | | | | |
| 9 | | Years historical data | | 4 | | | | |
| 10 | | Years projected | | 15 | | | | |
| 11 | | | | | | | | |
| 12 | HISTORICAL ACCOUNTS | | | | | | | |
| 13 | | | | | | | | |
| 14 | BALANCE SHEET ITEMS (As of year ending December) | | 2003 | 2004 | 2005 | 2006 | 2007 | |
| 15 | | RMB Thousand | | | | | | |
| 16 | | | | | | | | |
| 17 | Cash | | | 600.28 | 2,042.32 | 2,111.71 | 1,569.15 | |
| 18 | Accounts Receivable | | | 10,216.79 | 21,250.96 | 7,939.65 | 7,019.01 | |
| 19 | Provision For Doubtful Rec. | | | | | | | |
| 20 | Inventory | | | 368.72 | 216.97 | 265.02 | 1,569.15 | |
| 21 | Other Current Assets | | | | | | | |
| 22 | Gross Fixed Assets | | | | | | | |
| 23 | | Fixed assets - General | 278.30 | 11,994.58 | 30,735.03 | 31,027.08 | 31,957.89 | |
| 24 | | Fixed Assets - M&E (incl in General) | | | | | | |
| 25 | Accumulated Depreciation | | | | | | | |
| 26 | | Fixed assets - General | | 6,167.07 | 6,901.74 | 8,591.60 | 8,628.63 | |
| 27 | | Fixed Assets - M&E (incl in General) | | | | | | |
| 28 | Work In Progress | | 11,716.28 | 11,872.43 | 12,899.98 | 14,077.66 | 12,783.16 | |

## 2.3 Demand, Production and Sales Forecast (Demand)

Basic parameters are input for every 5 years to develop a forecast of demand (Figure 3). This is then compared with production capacity and losses to develop a sales forecast. The basic assumptions will be tuned to current year conditions using the best available information. Likewise, policy decisions with respect to future conditions should be made as a basis for the projection.

It is important that various key departments in the WSC agree with these assumptions and projections.

Figure 3 Demand Forecast: Population and Connections (Demand)



Microsoft Excel - Beipiao_SM_220509_Graphs_v1.xls

| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 2 | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | DEMAND FORECAST - Beipiao Water Supply Company | | Actual | Actual | Actual | Actual | Projected | Projected | Projected | Projected | Projected |
| 4 | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| 5 | | | | | | | | | | | |
| 6 | POPULATION (000's) | | | | | | | | | | |
| 7 | | Total Population in Beipiao | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 | 190 |
| 8 | | %Population Change | n/a | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | Block A (Up to 6 m3/connection per month) | 41.3% | 41.3% | 41.3% | 41.3% | 41.3% | 41.3% | 41.3% | 41.3% | 41.3% |
| 12 | | Block B (>6 m3 and up to 9 m3/connection per month) | 3.7% | 3.7% | 3.7% | 3.7% | 3.7% | 3.7% | 3.7% | 3.7% | 3.7% |
| 13 | | Block C (> 9 m3/connection per month) | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% |
| 14 | | Unmetered | 22.6% | 22.6% | 22.6% | 22.6% | 22.6% | 22.6% | 22.6% | 22.6% | 22.6% |
| 15 | | Shared Tap | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 16 | | **Served by Alternative Supply** | 31.6% | 31.6% | 31.6% | 31.6% | 31.6% | 31.6% | 31.6% | 31.6% | 31.6% |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | Block A (Up to 6 m3/connection per month) | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 78 | 78 |
| 20 | | Block B (>6 m3 and up to 9 m3/connection per month) | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 21 | | Block C (> 9 m3/connection per month) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 22 | | Unmetered | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| 23 | | Shared Tap | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | | **Served by Alternative Supply** | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 25 | | | | | | | | | | | |
| 26 | WATER CONNECTIONS (No.) | | | | | | | | | | |
| 27 | | *Assumptions/policy targets* | | | | | | | | | |
| 28 | | No people per house connection (Block A) | 3 | 3.3 | 3.3 | 3 | 3.3 | 3.3 | 3.3 | 3.3 | 3 |
| 29 | | No people per house connection (Block B) | 3 | 3.3 | 3.3 | 3 | 3.3 | 3.3 | 3.3 | 3.3 | 3 |
| 30 | | No people per house connection (Block C) | 3 | 3.3 | 3.3 | 3 | 3.3 | 3.3 | 3.3 | 3.3 | 3 |
| 31 | | No people per house connection (Unmetered) | 3 | 3.3 | 3.3 | 3 | 3.3 | 3.3 | 3.3 | 3.3 | 3 |

Language Switch | Hist | Demand | Revenue | Inflfn | Costs | Other | Capex | Loans | Accounts | Graphs (En) | Graphs (Cn)

## *Demand*

The Demand Forecast is generated from population forecasts, targets for average numbers of people per connection type (which drives the number of connections), water demands for different categories of consumers, and the impacts of price increases on demand (derived from the tariffs set in the Revenue Forecast) through user-defined price elasticity values. Income elasticity values that reflect the growth in unit demand in response to anticipated rising living standards are also included. Unit demand is specified for five broad domestic customer groups as follows:

- Block A (Up to 6 $m^3$/connection per month)
- Block B (>6 $m^3$ and up to 9 $m^3$/connection per month)
- Block C (> 9 $m^3$/connection per month)
- Unmetered
- Shared taps – This category may only be applicable in less developed, less urbanised areas of a particular service area.

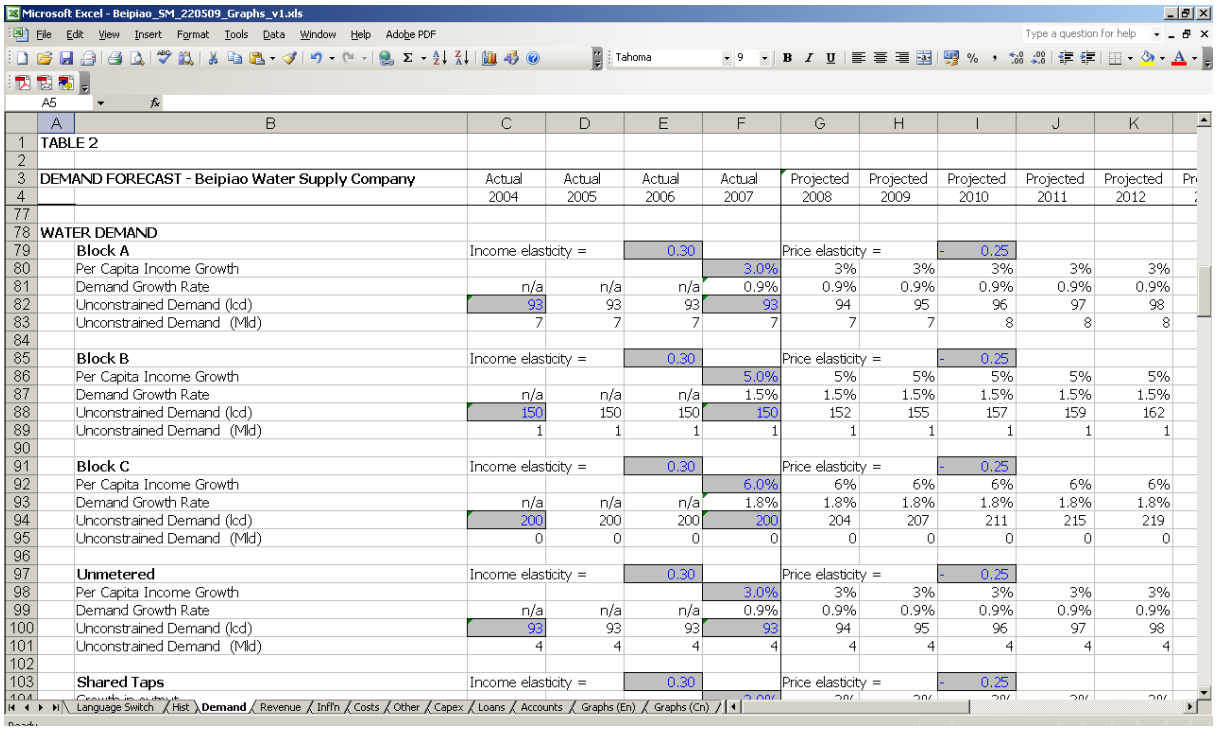
(See Figure 4 for an example.)

If using a flat rate tariff simply leave Block B and C data entry areas blank. Otherwise enter data by block and specify block usage parameters. Currently these are set at up to 6 $m^3$/connection/month for Block A, >6 $m^3$ and up to 9 $m^3$/connection per month for Block B and > 9 $m^3$/connection per month for Block C. These parameters can be changed to suit local policy.

Domestic unit demand increases in response to per capita income growth and income elasticity. For example, if income growth is 2% per annum and income elasticity is 0.5, then water demands would be expected to

increase at 1% per annum, if there are no price changes. Increases in price would be expected to curb the uptake of water. For example, if the price increases by 20% and the price elasticity is –0.5, then there would be a 10% reduction in demand. For the non-domestic sector, output growth is used in place of per capita income growth and this is factored against anticipated increases in the efficiency of water use to give a change in demand.

Figure 4 Demand Forecast: Water demand (Demand)



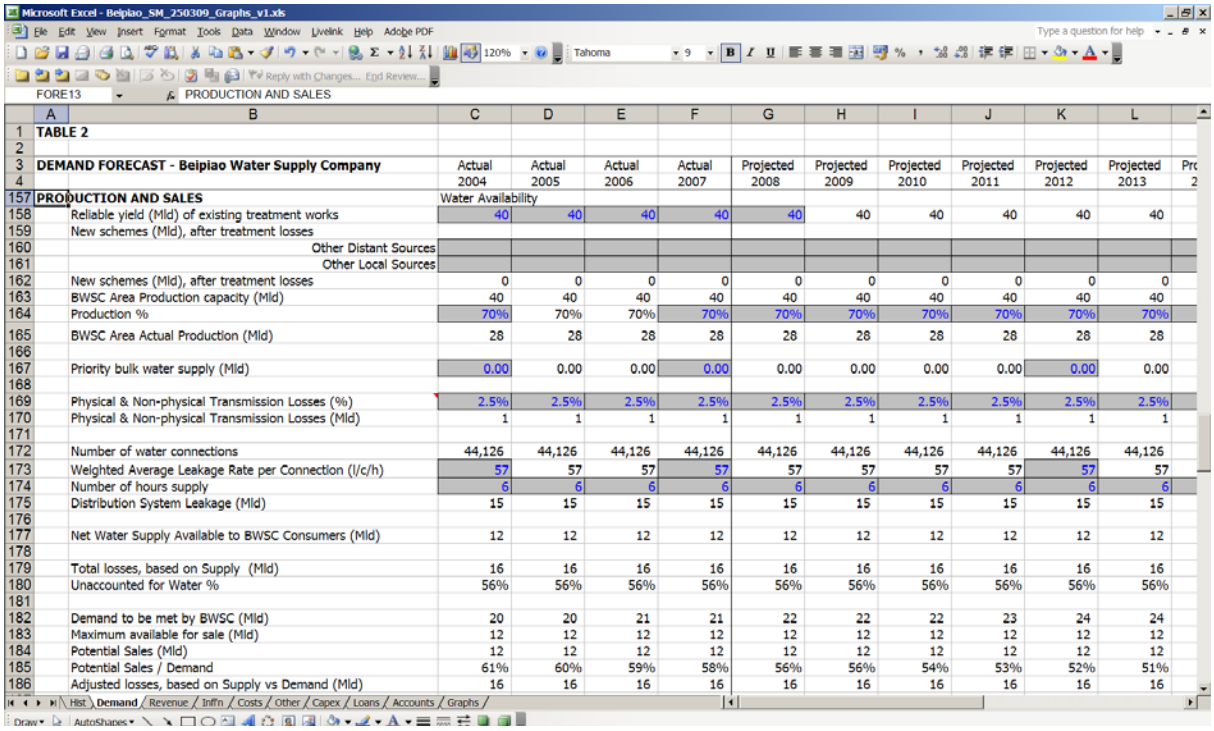
| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 2 | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | DEMAND FORECAST - Beipiao Water Supply Company | | Actual | Actual | Actual | Actual | Projected | Projected | Projected | Projected | Projected |
| 4 | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| 77 | | | | | | | | | | | |
| 78 | WATER DEMAND | | | | | | | | | | |
| 79 | | Block A | Income elasticity = | | 0.30 | | Price elasticity = | | - 0.25 | | |
| 80 | | Per Capita Income Growth | | | | 3.0% | 3% | 3% | 3% | 3% | 3% |
| 81 | | Demand Growth Rate | n/a | n/a | n/a | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% |
| 82 | | Unconstrained Demand (lcd) | 93 | 93 | 93 | 93 | 94 | 95 | 96 | 97 | 98 |
| 83 | | Unconstrained Demand (Mld) | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 |
| 84 | | | | | | | | | | | |
| 85 | | Block B | Income elasticity = | | 0.30 | | Price elasticity = | | - 0.25 | | |
| 86 | | Per Capita Income Growth | | | | 5.0% | 5% | 5% | 5% | 5% | 5% |
| 87 | | Demand Growth Rate | n/a | n/a | n/a | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% |
| 88 | | Unconstrained Demand (lcd) | 150 | 150 | 150 | 150 | 152 | 155 | 157 | 159 | 162 |
| 89 | | Unconstrained Demand (Mld) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 | | | | | | | | | | | |
| 91 | | Block C | Income elasticity = | | 0.30 | | Price elasticity = | | - 0.25 | | |
| 92 | | Per Capita Income Growth | | | | 6.0% | 6% | 6% | 6% | 6% | 6% |
| 93 | | Demand Growth Rate | n/a | n/a | n/a | 1.8% | 1.8% | 1.8% | 1.8% | 1.8% | 1.8% |
| 94 | | Unconstrained Demand (lcd) | 200 | 200 | 200 | 200 | 204 | 207 | 211 | 215 | 219 |
| 95 | | Unconstrained Demand (Mld) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 96 | | | | | | | | | | | |
| 97 | | Unmetered | Income elasticity = | | 0.30 | | Price elasticity = | | - 0.25 | | |
| 98 | | Per Capita Income Growth | | | | 3.0% | 3% | 3% | 3% | 3% | 3% |
| 99 | | Demand Growth Rate | n/a | n/a | n/a | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% | 0.9% |
| 100 | | Unconstrained Demand (lcd) | 93 | 93 | 93 | 93 | 94 | 95 | 96 | 97 | 98 |
| 101 | | Unconstrained Demand (Mld) | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 102 | | | | | | | | | | | |
| 103 | | Shared Taps | Income elasticity = | | 0.30 | | Price elasticity = | | - 0.25 | | |

### *Production and net supply*

The production and supply forecast for the WSC is based on the reliable yield of existing sources (after treatment losses) plus contributions from new sources. (See Figure 5.) Transmission losses are indicated as a % for both existing and new systems.

Distribution losses are calculated from the number of connections, a user specified rate of leakage per connection per hour (L/C/H), and a user specified number of hours supply per day. The impact of any leakage control initiatives should be reflected in a reduction of leakage from current levels, in-line with WSC strategy and the capital development programme proposed. Transmission losses and distribution system leakage are added to give unaccounted for water. Conversely any increase in hours of supply or system pressure without additional measures to control leakage will result in increased leakage. This should also be reflected in the model.

Figure 5 Demand Forecast: Production and sales (Demand)



Microsoft Excel - Beipiao_SM_250309_Graphs_v1.xls

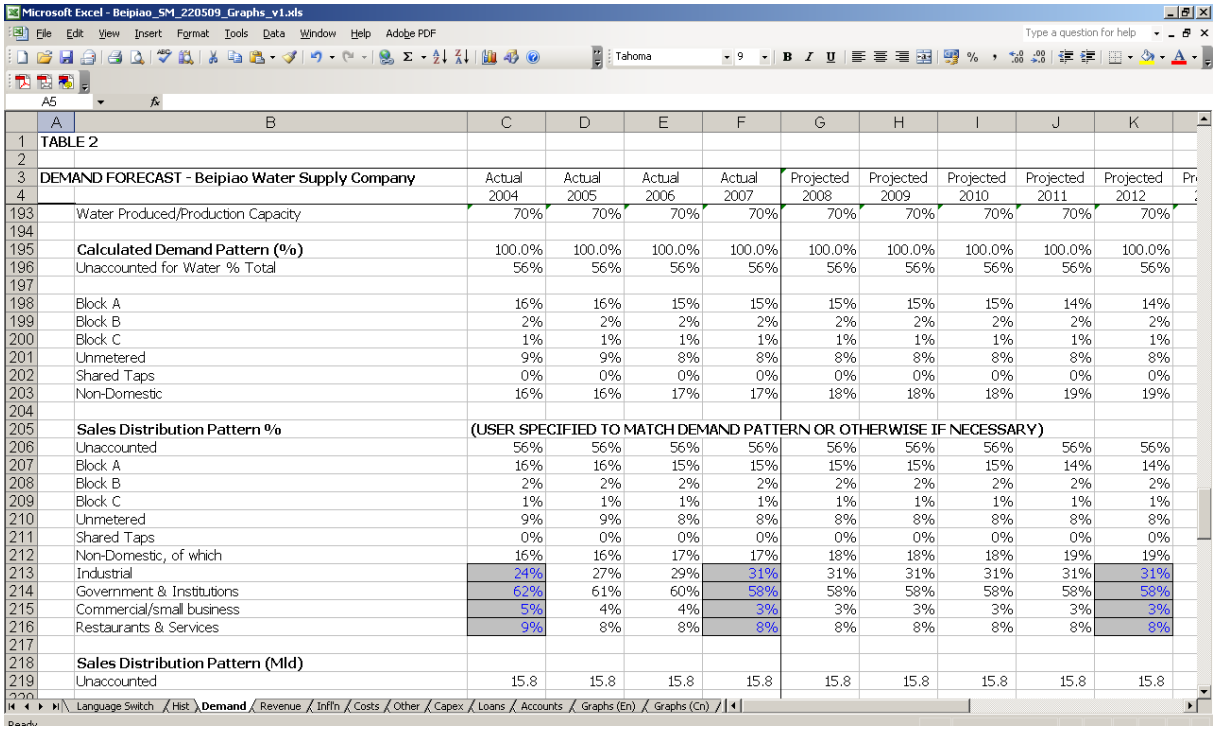
| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 2 | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | DEMAND FORECAST - Beipiao Water Supply Company | | Actual 2004 | Actual 2005 | Actual 2006 | Actual 2007 | Projected 2008 | Projected 2009 | Projected 2010 | Projected 2011 | Projected 2012 | Projected 2013 |
| 4 | | | | | | | | | | | | |
| 157 | PRODUCTION AND SALES | | Water Availability | | | | | | | | | |
| 158 | | Reliable yield (Mld) of existing treatment works | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 159 | | New schemes (Mld), after treatment losses | | | | | | | | | | |
| 160 | | Other Distant Sources | | | | | | | | | | |
| 161 | | Other Local Sources | | | | | | | | | | |
| 162 | | New schemes (Mld), after treatment losses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 163 | | BWSC Area Production capacity (Mld) | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 164 | | Production % | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% |
| 165 | | BWSC Area Actual Production (Mld) | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| 166 | | | | | | | | | | | | |
| 167 | | Priority bulk water supply (Mld) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 168 | | | | | | | | | | | | |
| 169 | | Physical & Non-physical Transmission Losses (%) | 2.5% | 2.5% | 2.5% | 2.5% | 2.5% | 2.5% | 2.5% | 2.5% | 2.5% | 2.5% |
| 170 | | Physical & Non-physical Transmission Losses (Mld) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 171 | | | | | | | | | | | | |
| 172 | | Number of water connections | 44,126 | 44,126 | 44,126 | 44,126 | 44,126 | 44,126 | 44,126 | 44,126 | 44,126 | 44,126 |
| 173 | | Weighted Average Leakage Rate per Connection (l/c/h) | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 174 | | Number of hours supply | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 175 | | Distribution System Leakage (Mld) | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| 176 | | | | | | | | | | | | |
| 177 | | Net Water Supply Available to BWSC Consumers (Mld) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 178 | | | | | | | | | | | | |
| 179 | | Total losses, based on Supply (Mld) | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| 180 | | Unaccounted for Water % | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% |
| 181 | | | | | | | | | | | | |
| 182 | | Demand to be met by BWSC (Mld) | 20 | 20 | 21 | 21 | 22 | 22 | 22 | 23 | 24 | 24 |
| 183 | | Maximum available for sale (Mld) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 184 | | Potential Sales (Mld) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 185 | | Potential Sales / Demand | 61% | 60% | 59% | 58% | 56% | 56% | 54% | 53% | 52% | 51% |
| 186 | | Adjusted losses, based on Supply vs Demand (Mld) | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |

Hist / Demand / Revenue / Infln / Costs / Other / Capex / Loans / Accounts / Graphs /

The net supply of water is calculated from the production capacity less unaccounted for water. This is then compared to the forecast demand. Water sales are taken as the lesser of the demand or the net supply. The allocation of sales between consumer categories is specified according to customer/user. The demand forecast distribution pattern is shown in the spreadsheet as a guide, giving water supply broken down by customer group.

Sales allocations are input every 5 years, with in-between years interpolated as a means of reducing user input requirements. Where there is a major discontinuity in a year (e.g. introduction of major new asset, it may be necessary to overwrite the interpolation formula and impose a different sales pattern to eliminate discontinuities (Figure 6).

Figure 6 Demand Forecast: patterns (Demand)



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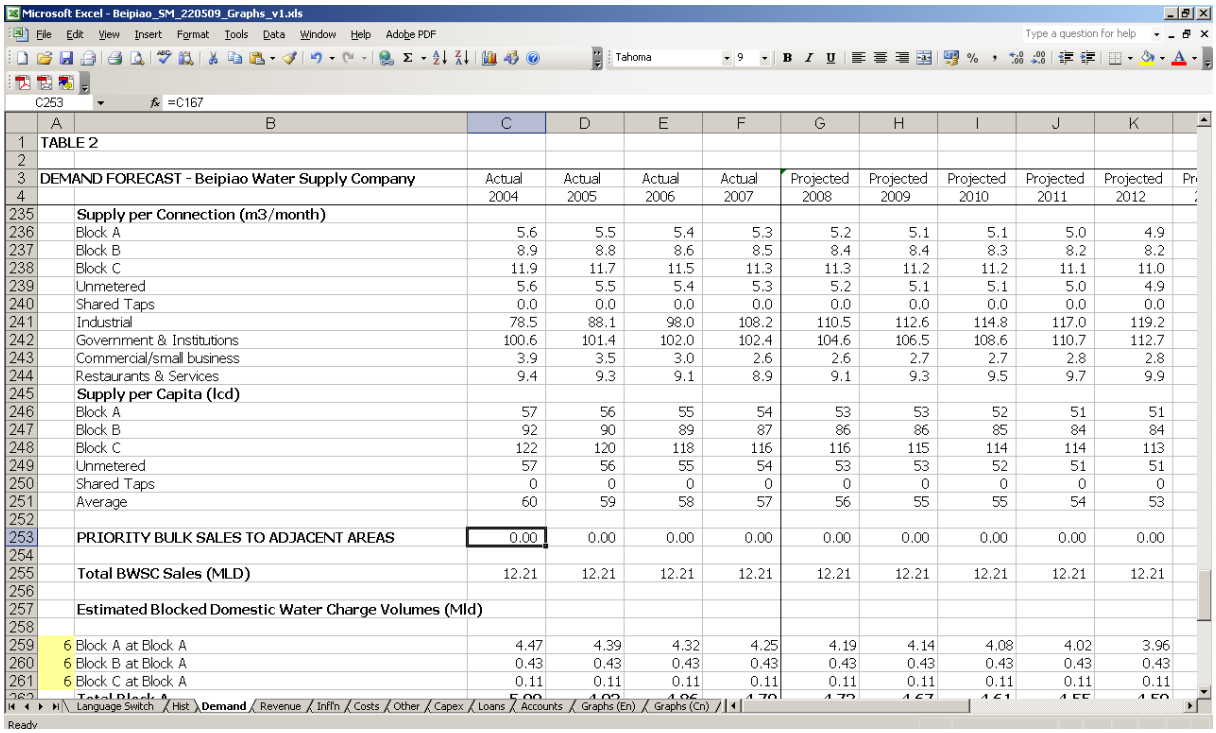
| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | TABLE 2 | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | DEMAND FORECAST - Beipiao Water Supply Company | Actual | Actual | Actual | Actual | Projected | Projected | Projected | Projected | Projected |
| 4 | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| 193 | | Water Produced/Production Capacity | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% | 70% |
| 194 | | | | | | | | | | | |
| 195 | | **Calculated Demand Pattern (%)** | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 196 | | Unaccounted for Water % Total | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% |
| 197 | | | | | | | | | | | |
| 198 | | Block A | 16% | 16% | 15% | 15% | 15% | 15% | 15% | 14% | 14% |
| 199 | | Block B | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% |
| 200 | | Block C | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% |
| 201 | | Unmetered | 9% | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 202 | | Shared Taps | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 203 | | Non-Domestic | 16% | 16% | 17% | 17% | 18% | 18% | 18% | 19% | 19% |
| 204 | | | | | | | | | | | |
| 205 | | **Sales Distribution Pattern %** | (USER SPECIFIED TO MATCH DEMAND PATTERN OR OTHERWISE IF NECESSARY) | | | | | | | | |
| 206 | | Unaccounted | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% | 56% |
| 207 | | Block A | 16% | 16% | 15% | 15% | 15% | 15% | 15% | 14% | 14% |
| 208 | | Block B | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 2% |
| 209 | | Block C | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% |
| 210 | | Unmetered | 9% | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 211 | | Shared Taps | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| 212 | | Non-Domestic, of which | 16% | 16% | 17% | 17% | 18% | 18% | 18% | 19% | 19% |
| 213 | | Industrial | 24% | 27% | 29% | 31% | 31% | 31% | 31% | 31% | 31% |
| 214 | | Government & Institutions | 62% | 61% | 60% | 58% | 58% | 58% | 58% | 58% | 58% |
| 215 | | Commercial/small business | 5% | 4% | 4% | 3% | 3% | 3% | 3% | 3% | 3% |
| 216 | | Restaurants & Services | 9% | 8% | 8% | 8% | 8% | 8% | 8% | 8% | 8% |
| 217 | | | | | | | | | | | |
| 218 | | **Sales Distribution Pattern (Mld)** | | | | | | | | | |
| 219 | | Unaccounted | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 |

Finally, water supply per connection, per capita daily supply and domestic water charge volumes are also calculated in this sheet (Figure 7). These are all very useful outputs, not least because they enable the model user to determine if the demand forecast is providing reasonable, realistic results.

Figure 7 Demand Forecast: other outputs (Demand)



Microsoft Excel - Beipiao_SM_220509_Graphs_v1.xls

| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | TABLE 2 | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | DEMAND FORECAST - Beipiao Water Supply Company | Actual | Actual | Actual | Actual | Projected | Projected | Projected | Projected | Projected |
| 4 | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| 235 | | **Supply per Connection (m3/month)** | | | | | | | | | |
| 236 | | Block A | 5.6 | 5.5 | 5.4 | 5.3 | 5.2 | 5.1 | 5.1 | 5.0 | 4.9 |
| 237 | | Block B | 8.9 | 8.8 | 8.6 | 8.5 | 8.4 | 8.4 | 8.3 | 8.2 | 8.2 |
| 238 | | Block C | 11.9 | 11.7 | 11.5 | 11.3 | 11.3 | 11.2 | 11.2 | 11.1 | 11.0 |
| 239 | | Unmetered | 5.6 | 5.5 | 5.4 | 5.3 | 5.2 | 5.1 | 5.1 | 5.0 | 4.9 |
| 240 | | Shared Taps | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 241 | | Industrial | 78.5 | 88.1 | 98.0 | 108.2 | 110.5 | 112.6 | 114.8 | 117.0 | 119.2 |
| 242 | | Government & Institutions | 100.6 | 101.4 | 102.0 | 102.4 | 104.6 | 106.5 | 108.6 | 110.7 | 112.7 |
| 243 | | Commercial/small business | 3.9 | 3.5 | 3.0 | 2.6 | 2.6 | 2.7 | 2.7 | 2.8 | 2.8 |
| 244 | | Restaurants & Services | 9.4 | 9.3 | 9.1 | 8.9 | 9.1 | 9.3 | 9.5 | 9.7 | 9.9 |
| 245 | | **Supply per Capita (lcd)** | | | | | | | | | |
| 246 | | Block A | 57 | 56 | 55 | 54 | 53 | 53 | 52 | 51 | 51 |
| 247 | | Block B | 92 | 90 | 89 | 87 | 86 | 86 | 85 | 84 | 84 |
| 248 | | Block C | 122 | 120 | 118 | 116 | 116 | 115 | 114 | 114 | 113 |
| 249 | | Unmetered | 57 | 56 | 55 | 54 | 53 | 53 | 52 | 51 | 51 |
| 250 | | Shared Taps | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251 | | Average | 60 | 59 | 58 | 57 | 56 | 55 | 55 | 54 | 53 |
| 252 | | | | | | | | | | | |
| 253 | | PRIORITY BULK SALES TO ADJACENT AREAS | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 254 | | | | | | | | | | | |
| 255 | | **Total BWSC Sales (MLD)** | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 |
| 256 | | | | | | | | | | | |
| 257 | | **Estimated Blocked Domestic Water Charge Volumes (Mld)** | | | | | | | | | |
| 258 | | | | | | | | | | | |
| 259 | 6 | Block A at Block A | 4.47 | 4.39 | 4.32 | 4.25 | 4.19 | 4.14 | 4.08 | 4.02 | 3.96 |
| 260 | 6 | Block B at Block A | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 | 0.43 |
| 261 | 6 | Block C at Block A | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |

### *Approach to undertaking demand forecasts*

#### (i) Introduction

A realistic demand forecast is a fundamental component of the annual business planning cycle in any water utility (water supply company - WSC). In the past, most utilities would plan on continuing growth in the demand for water and the corresponding volume of wastewater generated. The emphasis now ought to be more orientated towards conservation of water resources and ensuring that people can and do pay for the full cost of water and wastewater services. This requires a new and more sophisticated approach to demand forecasting.

#### (ii) Components of water demand

Modern demand forecasting always assesses the different components of demand individually. The main components of demand for water from the distribution system are:

- Household demand: This is the demand from the population for their domestic use within the home. It is often referred to as 'domestic demand'. It is often the largest component and the starting point for all demand forecasts. It should include both hot (where a central system is in place e.g. district heating) and cold water.
- Industrial demand: This is the demand for industrial firms. It includes all water taken from the public supply system for use on industrial premises. It includes water used for industrial processes, cooling, cleaning and for domestic use by staff for toilet flushing, hand washing etc.
- Commercial demand: This is water used for domestic purposes on the premises of commercial companies, shops, hotels, restaurants, etc. It may be included with industrial demand or, sometimes, with institutional demand.
- Institutional demand: This is water used for staff's domestic purposes on the premises of government offices, schools, hospitals, etc.
- Unaccounted for water (UFW): This is water that is delivered into the distribution system but is not recorded as consumption by paying customers. It comprises:
    - Legitimate use for activities such as fire fighting, flushing mains, cleaning roads, municipal garden watering, etc.
    - Illegal consumption by consumers with unregistered connections
    - Administrative losses due to failure of the utility to bill all customers and the under-reading of consumer meters
    - Physical leakage of water from the distribution system.

In calculating the requirement for raw water from the source, losses in the treatment works and the raw water conveyance system must be added to the treated water demand.

#### (iii) Estimating water demand

*Household demand*

Household demand covers all water consumed in the home for drinking, cooking, personal washing and bathing, laundry, house cleaning, toilet flushing, garden watering, car washing

and other cleaning outside the house but within the owner's property. It should include both hot and cold water. It is defined as the number of people served multiplied by a per capita demand figure. Where metering is not in place, per capita demands can be significantly higher than in a metered supply situation. Metering of consumers and full cost recovery tariffs will reduce demand (in a situation where 24 hours supply is available) because people have an incentive to avoid wasteful use. Demand forecasts should reflect current trends and the impact of increased metering of consumers and future tariff increases.

In general, demand in Western Europe is around 150 litres per capita per day (lpcd), and appears to be stabilising around this figure. In some countries where there has been pressure to conserve water, demand is now below this figure. Furthermore any successful application for International Funding Agency financial support for water system development must be founded on the commitment to implement policies that will result in the provision of a 24 hour water supply service where tariffs are set to manage demand.

*Industrial, commercial and institutional demand*

These demands are likely to be based on consumption as recorded at present. They may be considered as a single component, non-household demand, or sub-divided if current billings data allows such sub-division. They will generally be expected to follow trends in household demand when forecasting future demands. There may be special factors to be considered, e.g. major new industries may need to be considered individually, or the closure of old industries may result in a significant reduction in demand. The development of water re-use practices and other 'internal' water saving initiatives should be reflected in the demand forecast.

*Unaccounted for water (UFW)*

UFW may be considered as the difference between the volume of water delivered into the distribution system and the total quantity of measured water consumption by the utility's customers. If there are non-metered customers, the volume of water consumed by these must be assessed and included in the total consumption.

*Legitimate unmetered use*

This should be small, no more than 1% to 2% of consumption. It is usually included as a percentage of consumption or included in a general allowance for UFW.

*Illegal consumption*

The nature of illegal consumption means that it is unknown. However, utilities will probably know whether it is a serious problem. The aim should be to register all connections, ensure that they are made to an appropriate standard, upgrade them as necessary, recover as much of the past unpaid fees as possible and ensure all future consumption is measured and charged for. It will not normally be included in the demand as a separate item, but may be incorporated in the overall volume of UFW, or may be regarded as a loss of revenue.

*Administrative losses*

If demand is estimated from present billed consumption, it will be important to consider the additional consumption, which is not included in the billings

system. If demand is estimated from an assessment of actual per capita water use, administrative losses may be considered as a loss of revenue rather than a component of demand.

*Leakage*

This is usually the main component of UFW. It may be very large, over 50% of water distributed in some towns in China. In any demand forecast, the aim will be to reduce leakage to an economic level. Defining the economic level of leakage is difficult as it depends on a complex set of costs and benefits, which are not easy to define. If substantial new investments are required in source works and treatment facilities, an intensive programme of leakage control involving regular soundings, the establishment of leakage control zones and monitoring of night flows may be appropriate. This will have a substantial cost, but should reduce leakage to 15% of production or less.

Whatever policy is chosen, it is important that leakage targets in the demand forecast are reflected in an appropriate level of investment in the financial section of the business plan.

**(iv) Total water requirements**

The total treated water requirements will be the sum of the components described in the previous section (Components of Water Demand). The requirement for raw water will include the losses in the treatment works, which may be typically 5% of output, but will depend on the source, treatment processes and whether wash-water recovery is included or not.

**(v) Demand management**

It is now widely accepted that water utilities should attempt to influence demand in order to conserve water resources, protect the environment and help to ensure water and wastewater services are affordable to the public. The achievement of this reduction in demand (in a situation of 24 hour supply) will require the utility to take certain actions, some of which will be essential to implement investment plans. Utilities should adopt the following policies aimed at reduction in demand:

- Customers should be metered: Ideally meters should be installed for each customer, but this is difficult in practice for the majority of consumers who live in apartments. For apartments, utilities should at least meter the supply to each staircase.
- Tariffs should be raised: Increases in tariffs will be necessary to implement new capital programmes and it is possible that in future charges for water and wastewater services will be a significant part of regular household expenditure.
- Customer relations: Information campaigns explaining to customers the importance of conservation of water, how they can minimise their bills and simple actions to reduce wastage of water can all have an effect if combined with metering and tariff increases. Water utilities may consider providing a reliable plumbing service to replace tap washers and leaking valves within properties.
- Leakage reduction: Water utilities should also reduce demand by reducing leakage from their own networks. This is important not only because of the resulting economies in the utilities' costs, but also because it improves the

customer's perception of the utility as an efficient organisation.

### (vi) Estimating of wastewater volumes

Wastewater volumes will be based on the water demand forecast, a knowledge of any wastewater flows generated by industries or other establishments with private water supplies, infiltration to sewers and storm water flows in combined foul sewage and rainwater systems.

### (vii) Dry weather flows

The dry weather flow comprises the wastewater discharged to sewers by households, institutions, commercial premises and industry, plus the infiltration to the sewer from groundwater.

Wastewater from household, commercial and institutional premises may be taken as 80% to 90% of the water supply.

For industrial consumers, it is necessary to consider how much wastewater may be generated by industries having their own water supply, and how much industrial wastewater is treated and discharged to the environment by the industry itself. Industries must pre-treat industrial waste that does not comply with the standards for discharge to sewers, and some may prefer to fully treat all their own waste. Infiltration may only be estimated from measurements of flows. It may be significant in low-lying areas with high groundwater tables.

### (viii) Stormwater flows

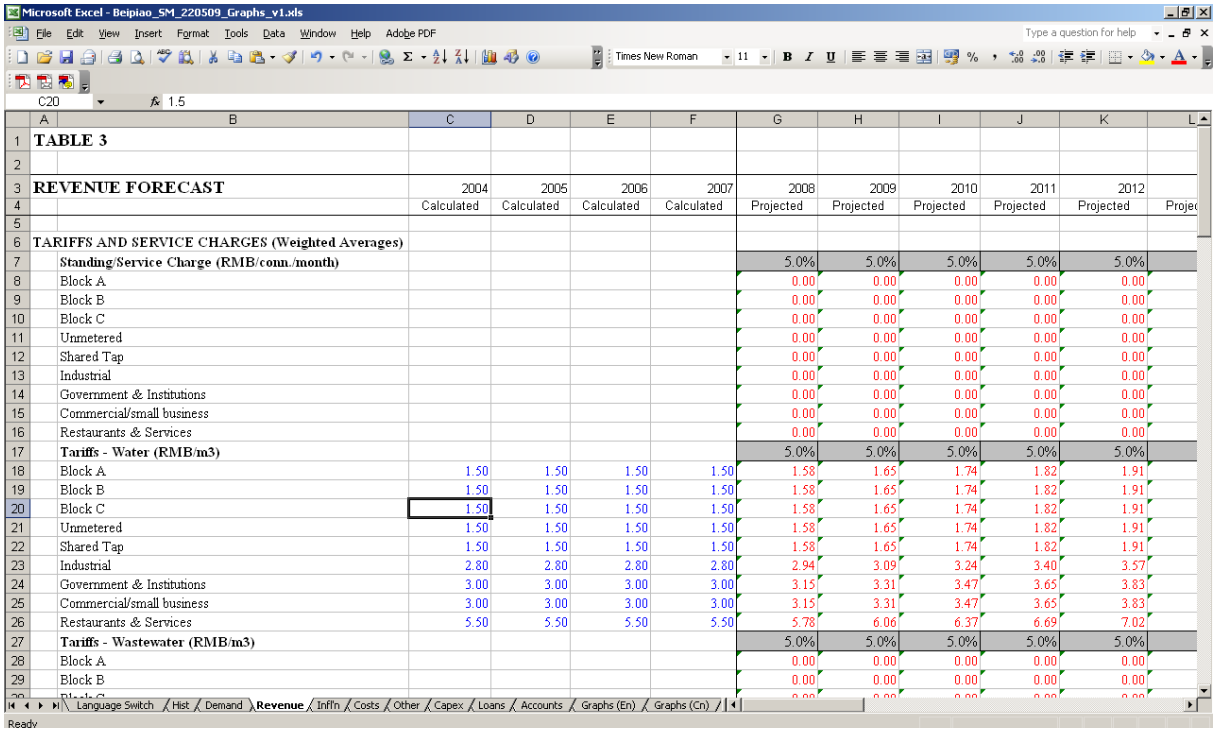
If the sewerage network is a combined system, i.e. one that takes both wastewaters from households and other premises and natural run-off due to rainfall, there will be a large increase in the flow to the wastewater treatment plant during storms. It is not economic to design for all the flow to be treated during periods of heavy rainfall.

## 2.4 Revenue Forecast (Revenue)

This schedule is used to calculate revenue potential from demand and production/sales forecasts (Figure 8). The main input parameters are:

- Service charges in RMB per connection per year for the different customer groups
- Block A: Domestic customer water tariffs in RMB/$m^3$
- Block B: Domestic customer water tariffs in RMB/$m^3$
- Block C: Domestic customer water tariffs in RMB/$m^3$
- Shared taps water tariffs in RMB/$m^3$
- Unmetered domestic customer water tariffs in RMB/$m^3$
- Industrial water tariffs in RMB/$m^3$
- Government & Institutions water tariffs in RMB/$m^3$
- Commercial/small business water tariffs in RMB/$m^3$
- Restaurants & Services water tariffs in RMB/$m^3$
- Sewage tariff in RMB/$m^3$ (where appropriate)

Figure 8 Revenue Forecast (Revenue)



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| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | TABLE 3 | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | REVENUE FORECAST | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| 4 | | | Calculated | Calculated | Calculated | Calculated | Projected | Projected | Projected | Projected | Projected |
| 5 | | | | | | | | | | | |
| 6 | | TARIFFS AND SERVICE CHARGES (Weighted Averages) | | | | | | | | | |
| 7 | | Standing/Service Charge (RMB/conn./month) | | | | | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 8 | | Block A | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9 | | Block B | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10 | | Block C | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11 | | Unmetered | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12 | | Shared Tap | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 13 | | Industrial | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 14 | | Government & Institutions | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15 | | Commercial/small business | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 16 | | Restaurants & Services | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 17 | | Tariffs - Water (RMB/m3) | | | | | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 18 | | Block A | 1.50 | 1.50 | 1.50 | 1.50 | 1.58 | 1.65 | 1.74 | 1.82 | 1.91 |
| 19 | | Block B | 1.50 | 1.50 | 1.50 | 1.50 | 1.58 | 1.65 | 1.74 | 1.82 | 1.91 |
| 20 | | Block C | 1.50 | 1.50 | 1.50 | 1.50 | 1.58 | 1.65 | 1.74 | 1.82 | 1.91 |
| 21 | | Unmetered | 1.50 | 1.50 | 1.50 | 1.50 | 1.58 | 1.65 | 1.74 | 1.82 | 1.91 |
| 22 | | Shared Tap | 1.50 | 1.50 | 1.50 | 1.50 | 1.58 | 1.65 | 1.74 | 1.82 | 1.91 |
| 23 | | Industrial | 2.80 | 2.80 | 2.80 | 2.80 | 2.94 | 3.09 | 3.24 | 3.40 | 3.57 |
| 24 | | Government & Institutions | 3.00 | 3.00 | 3.00 | 3.00 | 3.15 | 3.31 | 3.47 | 3.65 | 3.83 |
| 25 | | Commercial/small business | 3.00 | 3.00 | 3.00 | 3.00 | 3.15 | 3.31 | 3.47 | 3.65 | 3.83 |
| 26 | | Restaurants & Services | 5.50 | 5.50 | 5.50 | 5.50 | 5.78 | 6.06 | 6.37 | 6.69 | 7.02 |
| 27 | | Tariffs - Wastewater (RMB/m3) | | | | | 5.0% | 5.0% | 5.0% | 5.0% | 5.0% |
| 28 | | Block A | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 29 | | Block B | | | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Customer categories, tariff structure and tariff levels should be taken from the WSC billing and collection database. Tariff increases should be included in the analysis as required to achieve cost recovery and to meet debt service requirements associated with existing loans and any future loans related to future capital programmes.

The relationship between weighted average tariffs for different consumer categories is set for the current year,

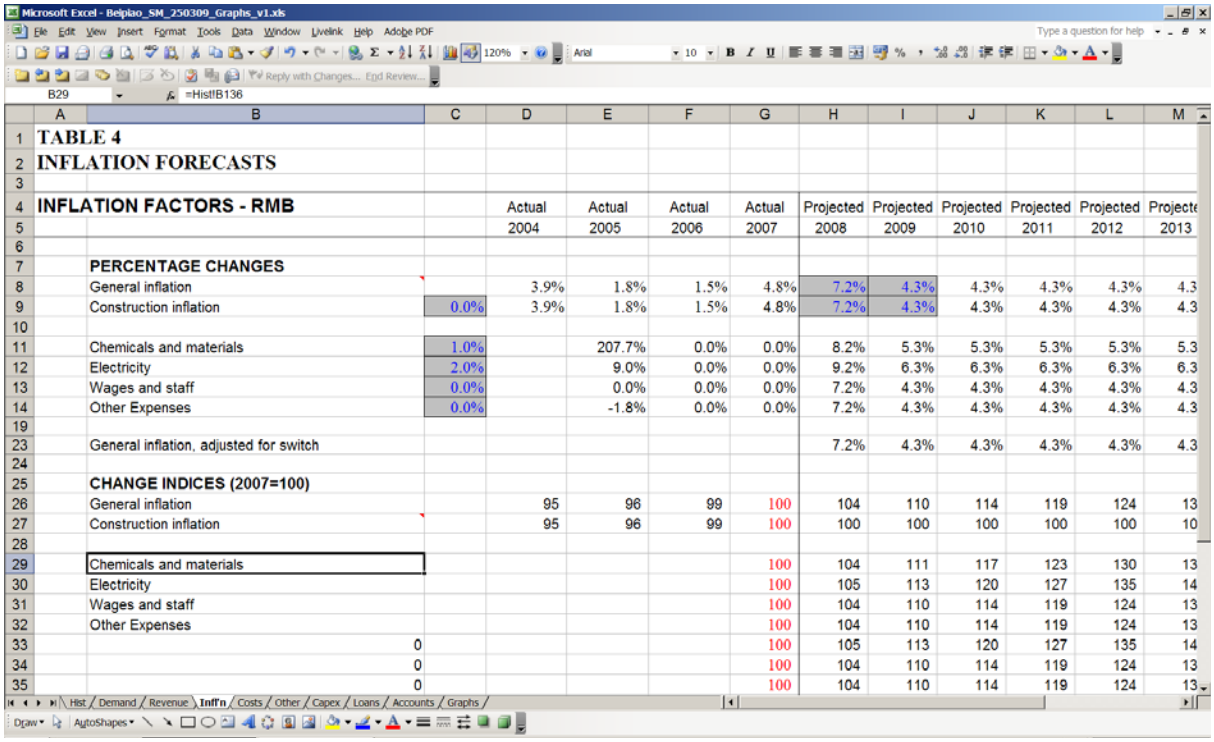
with the opportunity to revise this structure as required. Also included is a table where any other income (including equity injections) can be specified. At present this includes government grants and subsidies, interest on investments and other income.

The bottom part of the sheet allows the setting of debtor days and loss on receivables, both of which affect the level of debtors and hence cash flow. User entries for current values, targets for improvement, and rates of improvement are provided. Accounts receivable (excluding provision for doubtful receivables) can be adjusted to increase or decrease (preferably) during the period of the projection by a user specified number of days per annum. Losses on receivables can also be specified by the user as a percentage of receivables.

## 2.5 Inflation Forecast (Infl'n)

This schedule is used to set inflation forecast parameters for various cost centres (Figure 9). Actual historic inflation can be sourced from statistical year books. Projected general inflation and construction inflation should be sourced from a reliable source such as the IMF data sheet projection for China. Inflation for the major operating cost categories can be set at the general level of inflation or adjusted up or down as appropriate.

Figure 9 Inflation Forecast (Inflation)



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| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 4 | | | | | | | | | | | | |
| 2 | INFLATION FORECASTS | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | INFLATION FACTORS - RMB | | | Actual | Actual | Actual | Actual | Projected | Projected | Projected | Projected | Projected | Projecte |
| 5 | | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| 6 | | | | | | | | | | | | | |
| 7 | | PERCENTAGE CHANGES | | | | | | | | | | | |
| 8 | | General inflation | | 3.9% | 1.8% | 1.5% | 4.8% | 7.2% | 4.3% | 4.3% | 4.3% | 4.3% | 4.3 |
| 9 | | Construction inflation | 0.0% | 3.9% | 1.8% | 1.5% | 4.8% | 7.2% | 4.3% | 4.3% | 4.3% | 4.3% | 4.3 |
| 10 | | | | | | | | | | | | | |
| 11 | | Chemicals and materials | 1.0% | | 207.7% | 0.0% | 0.0% | 8.2% | 5.3% | 5.3% | 5.3% | 5.3% | 5.3 |
| 12 | | Electricity | 2.0% | | 9.0% | 0.0% | 0.0% | 9.2% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3 |
| 13 | | Wages and staff | 0.0% | | 0.0% | 0.0% | 0.0% | 7.2% | 4.3% | 4.3% | 4.3% | 4.3% | 4.3 |
| 14 | | Other Expenses | 0.0% | | -1.8% | 0.0% | 0.0% | 7.2% | 4.3% | 4.3% | 4.3% | 4.3% | 4.3 |
| 19 | | | | | | | | | | | | | |
| 23 | | General inflation, adjusted for switch | | | | | | 7.2% | 4.3% | 4.3% | 4.3% | 4.3% | 4.3 |
| 24 | | | | | | | | | | | | | |
| 25 | | CHANGE INDICES (2007=100) | | | | | | | | | | | |
| 26 | | General inflation | | 95 | 96 | 99 | 100 | 104 | 110 | 114 | 119 | 124 | 13 |
| 27 | | Construction inflation | | 95 | 96 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 10 |
| 28 | | | | | | | | | | | | | |
| 29 | | Chemicals and materials | | | | | 100 | 104 | 111 | 117 | 123 | 130 | 13 |
| 30 | | Electricity | | | | | 100 | 105 | 113 | 120 | 127 | 135 | 14 |
| 31 | | Wages and staff | | | | | 100 | 104 | 110 | 114 | 119 | 124 | 13 |
| 32 | | Other Expenses | | | | | 100 | 104 | 110 | 114 | 119 | 124 | 13 |
| 33 | 0 | | | | | | 100 | 105 | 113 | 120 | 127 | 135 | 14 |
| 34 | 0 | | | | | | 100 | 104 | 110 | 114 | 119 | 124 | 13 |
| 35 | 0 | | | | | | 100 | 104 | 110 | 114 | 119 | 124 | 13 |

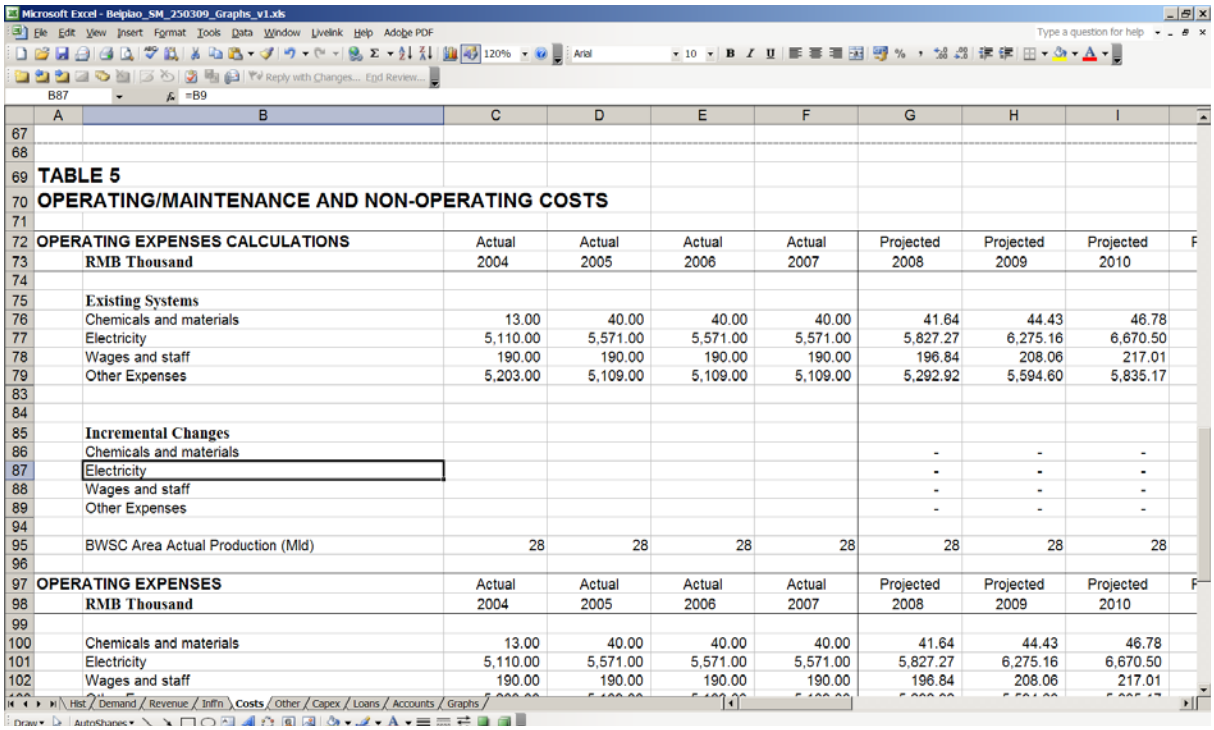
Hist / Demand / Revenue / Infl'n / Costs / Other / Capex / Loans / Accounts / Graphs /

## 2.6 Operating, Maintenance and Non-operating Costs (Costs)

The split between costs associated with water and those associated with wastewater (if appropriate) will be based on the figures provided by the WSC. Projected operating costs are based on a cost per $m^3$ of water produced or wastewater collected (if appropriate), derived from WSC's Income and Expenditure statements calculated for the WSC operation. In this way they are related to the anticipated flow of water and wastewater in the system. A similar approach has been adopted for estimated incremental changes in cost due to the commissioning of new assets. (See Figure 10.)

It is necessary to undertake the detailed calculations for incremental operating costs associated with such things as changes in practice, service area, decommissioning of existing assets and commissioning of new assets outside the model. These incremental changes can then be entered into the Costs schedule which then combines them with the operating costs associated with the existing assets to provide an overall operating cost structure and amount for the WSC.

Figure 10 Operating, Maintenance and Non-operating Costs (Costs)



Microsoft Excel - Belpiao_SM_250309_Graphs_v1.xls

B87 =B9

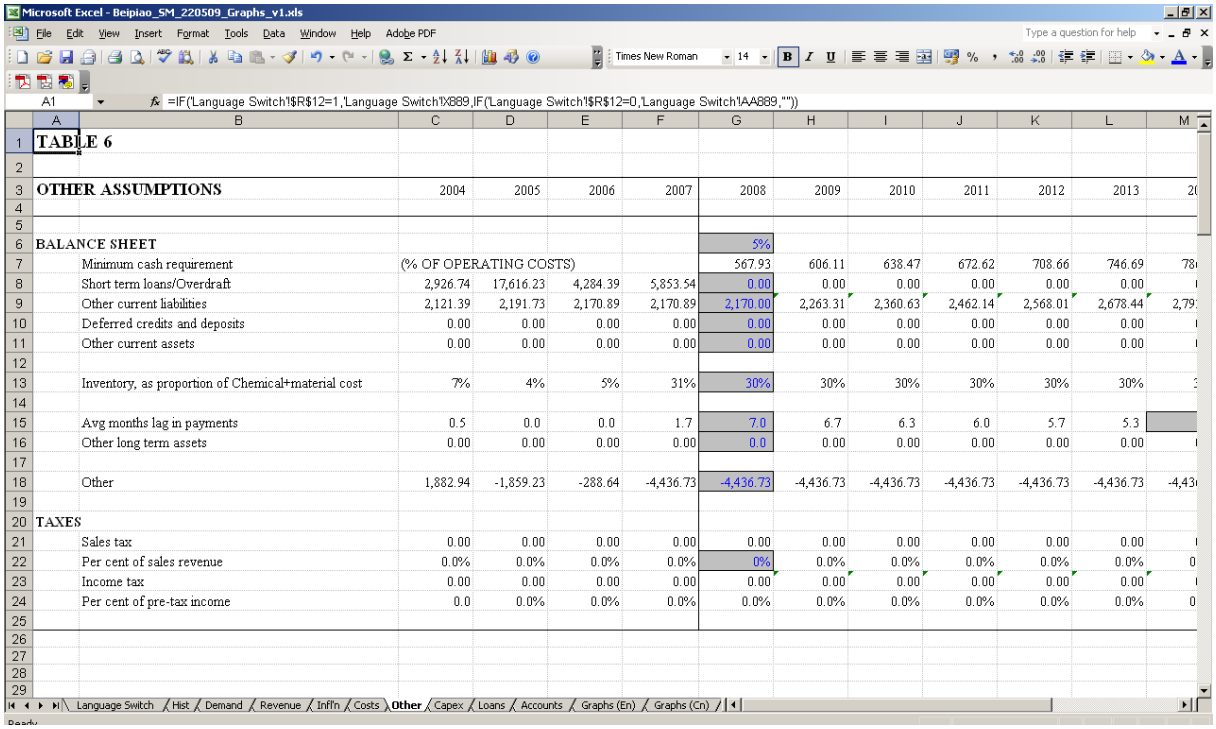
| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 67 | | | | | | | | | |
| 68 | | | | | | | | | |
| 69 | | **TABLE 5** | | | | | | | |
| 70 | | **OPERATING/MAINTENANCE AND NON-OPERATING COSTS** | | | | | | | |
| 71 | | | | | | | | | |
| 72 | | **OPERATING EXPENSES CALCULATIONS** | Actual | Actual | Actual | Actual | Projected | Projected | Projected |
| 73 | | **RMB Thousand** | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| 74 | | | | | | | | | |
| 75 | | **Existing Systems** | | | | | | | |
| 76 | | Chemicals and materials | 13.00 | 40.00 | 40.00 | 40.00 | 41.64 | 44.43 | 46.78 |
| 77 | | Electricity | 5,110.00 | 5,571.00 | 5,571.00 | 5,571.00 | 5,827.27 | 6,275.16 | 6,670.50 |
| 78 | | Wages and staff | 190.00 | 190.00 | 190.00 | 190.00 | 196.84 | 208.06 | 217.01 |
| 79 | | Other Expenses | 5,203.00 | 5,109.00 | 5,109.00 | 5,109.00 | 5,292.92 | 5,594.60 | 5,835.17 |
| 83 | | | | | | | | | |
| 84 | | | | | | | | | |
| 85 | | **Incremental Changes** | | | | | | | |
| 86 | | Chemicals and materials | | | | | - | - | - |
| 87 | | Electricity | | | | | - | - | - |
| 88 | | Wages and staff | | | | | - | - | - |
| 89 | | Other Expenses | | | | | - | - | - |
| 94 | | | | | | | | | |
| 95 | | BWSC Area Actual Production (Mld) | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| 96 | | | | | | | | | |
| 97 | | **OPERATING EXPENSES** | Actual | Actual | Actual | Actual | Projected | Projected | Projected |
| 98 | | **RMB Thousand** | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| 99 | | | | | | | | | |
| 100 | | Chemicals and materials | 13.00 | 40.00 | 40.00 | 40.00 | 41.64 | 44.43 | 46.78 |
| 101 | | Electricity | 5,110.00 | 5,571.00 | 5,571.00 | 5,571.00 | 5,827.27 | 6,275.16 | 6,670.50 |
| 102 | | Wages and staff | 190.00 | 190.00 | 190.00 | 190.00 | 196.84 | 208.06 | 217.01 |

Hist / Demand / Revenue / Inf/n / Costs / Other / Capex / Loans / Accounts / Graphs /

## 2.7 Other Assumptions (Other)

This schedule enables the user to enter any additional balance sheet assumptions as a basis for the projections e.g. level of current liabilities, taxes, etc. can be set here. A minimum cash requirement can also be included. Other current assets and other current liabilities assumptions for the projections can be entered. The average months lag in payments to suppliers can also be entered. (See Figure 11.)

Figure 11 Other Assumptions (Other)

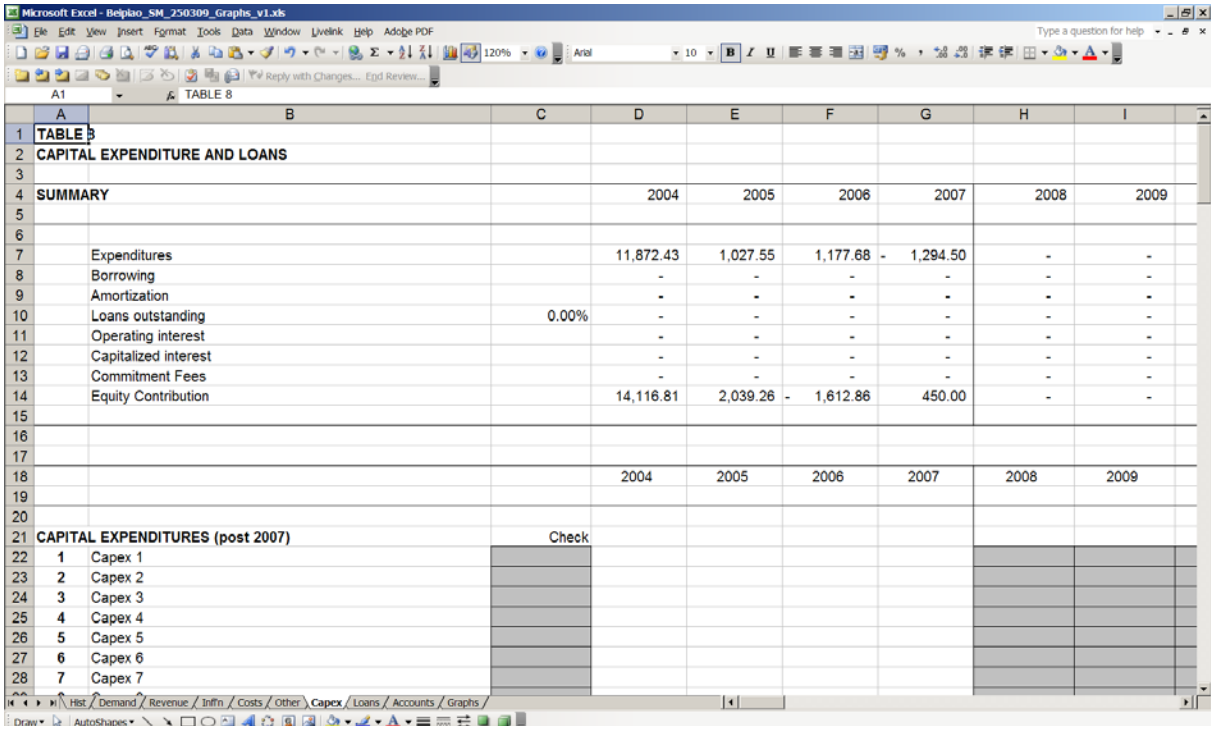



| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 6 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | OTHER ASSUMPTIONS | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 20 |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | BALANCE SHEET | | | | | | 5% | | | | | | |
| 7 | | Minimum cash requirement | (% OF OPERATING COSTS) | | | | 567.93 | 606.11 | 638.47 | 672.62 | 708.66 | 746.69 | 78 |
| 8 | | Short term loans/Overdraft | 2,926.74 | 17,616.23 | 4,284.39 | 5,853.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 9 | | Other current liabilities | 2,121.39 | 2,191.73 | 2,170.89 | 2,170.89 | 2,170.00 | 2,263.31 | 2,360.63 | 2,462.14 | 2,568.01 | 2,678.44 | 2,79 |
| 10 | | Deferred credits and deposits | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 11 | | Other current assets | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | | | | | | | | | | | | | |
| 13 | | Inventory, as proportion of Chemical+material cost | 7% | 4% | 5% | 31% | 30% | 30% | 30% | 30% | 30% | 30% | |
| 14 | | | | | | | | | | | | | |
| 15 | | Avg months lag in payments | 0.5 | 0.0 | 0.0 | 1.7 | 7.0 | 6.7 | 6.3 | 6.0 | 5.7 | 5.3 | |
| 16 | | Other long term assets | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 17 | | | | | | | | | | | | | |
| 18 | | Other | 1,882.94 | -1,859.23 | -288.64 | -4,436.73 | -4,436.73 | -4,436.73 | -4,436.73 | -4,436.73 | -4,436.73 | -4,436.73 | -4,43 |
| 19 | | | | | | | | | | | | | |
| 20 | TAXES | | | | | | | | | | | | |
| 21 | | Sales tax | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 22 | | Per cent of sales revenue | 0.0% | 0.0% | 0.0% | 0.0% | 0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0 |
| 23 | | Income tax | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | | Per cent of pre-tax income | 0.0 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0 |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |

## 2.8 Capital Expenditure (Capex)

This schedule is used to calculate capital expenditures year by year from user entered expenditure profiles, and adds an inflation element (Figure 12). Detailed capital expenditure costs and scheduling should be calculated outside the model. The total costs for each element of the capital development programme should then be entered into the model along with a percentage completion figure for each year of construction. The schedule goes on to calculate loan draw-downs, interest payments, capitalised interest and amortisation. There is also an area for entry of any grant funding that has or is likely to be received to assist with capital development programmes.

Figure 12 Capital Expenditure (Capex)



Microsoft Excel - Belplao_SM_250309_Graphs_v1.xls

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 8 | | | | | | | | |
| 2 | CAPITAL EXPENDITURE AND LOANS | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | SUMMARY | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | Expenditures | | 11,872.43 | 1,027.55 | 1,177.68 | - 1,294.50 | - | - |
| 8 | | Borrowing | | - | - | - | - | - | - |
| 9 | | Amortization | | - | - | - | - | - | - |
| 10 | | Loans outstanding | 0.00% | - | - | - | - | - | - |
| 11 | | Operating interest | | - | - | - | - | - | - |
| 12 | | Capitalized interest | | - | - | - | - | - | - |
| 13 | | Commitment Fees | | - | - | - | - | - | - |
| 14 | | Equity Contribution | | 14,116.81 | 2,039.26 | - 1,612.86 | 450.00 | - | - |
| 15 | | | | | | | | | |
| 16 | | | | | | | | | |
| 17 | | | | | | | | | |
| 18 | | | | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| 19 | | | | | | | | | |
| 20 | | | | | | | | | |
| 21 | CAPITAL EXPENDITURES (post 2007) | | Check | | | | | | |
| 22 | 1 | Capex 1 | | | | | | | |
| 23 | 2 | Capex 2 | | | | | | | |
| 24 | 3 | Capex 3 | | | | | | | |
| 25 | 4 | Capex 4 | | | | | | | |
| 26 | 5 | Capex 5 | | | | | | | |
| 27 | 6 | Capex 6 | | | | | | | |
| 28 | 7 | Capex 7 | | | | | | | |

At the bottom of the Capital Expenditure Sheet, calculations for work in progress are included and expenditure is added to assets on a year to year basis. The sheet includes existing assets, as well as future assets. Capital costs of future expenditure programmes in current prices are included and a rough division of associated assets by category is also included. There is also a facility to include an annual programme of works (e.g. leakage control). Average depreciation has been assumed at 3.3% per annum, in-line with current WSC practice.

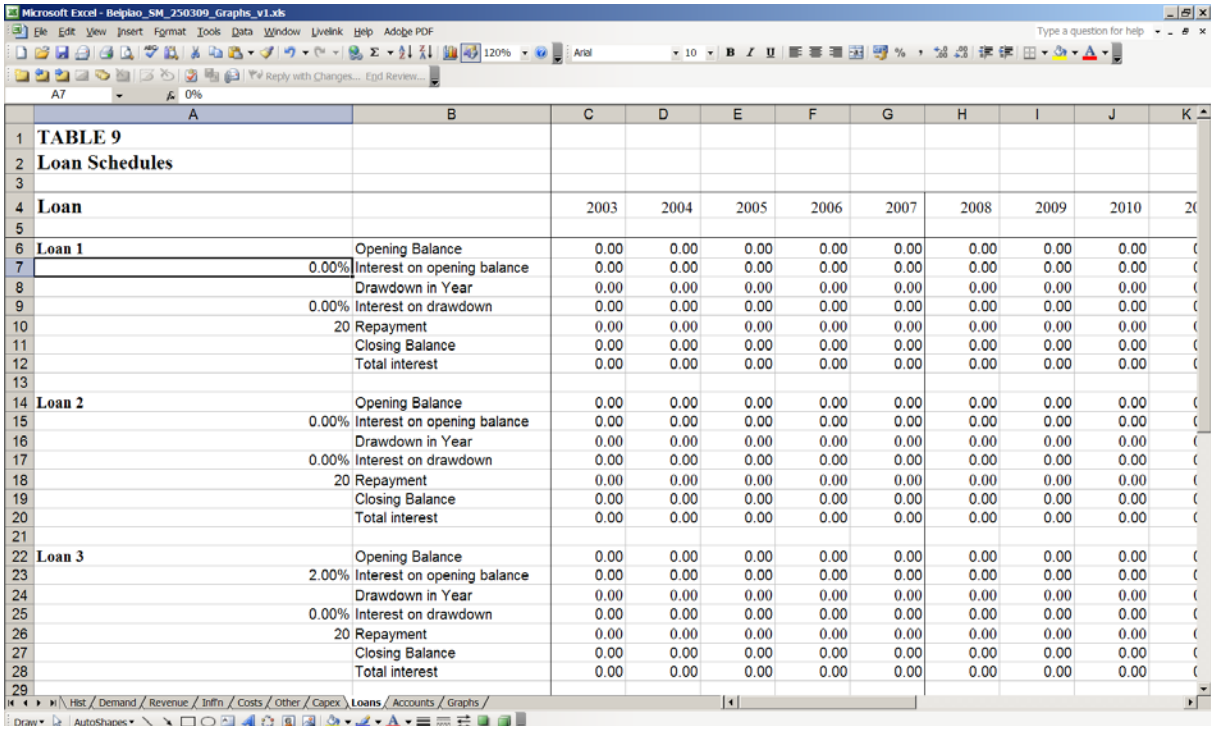
## 2.9 Borrowing (Loans)

This schedule is used to enter details of all existing, ongoing and future long term loans as part of the WSC's current and anticipated financing plans. It is possible to include the following details:

- Opening balance
- Interest on opening balance
- Drawdown in year
- Interest on drawdown (%)
- Repayment period in years and annual amount in RMB
- Closing balance
- Total interest
- Commitment fee (%)

The schedule is set up so that a total of 5 loans can be ongoing at any one time (see Figure 13). It is however possible to include additional further loans should this prove necessary.

Figure 13 Borrowing (Loans)



Microsoft Excel - Belpiao_SM_250309_Graphs_v1.xls

| | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **TABLE 9** | | | | | | | | | | |
| 2 | **Loan Schedules** | | | | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | **Loan** | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 20 |
| 5 | | | | | | | | | | | |
| 6 | **Loan 1** | Opening Balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 7 | 0.00% | Interest on opening balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 8 | | Drawdown in Year | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 9 | 0.00% | Interest on drawdown | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 10 | 20 | Repayment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 11 | | Closing Balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | | Total interest | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 13 | | | | | | | | | | | |
| 14 | **Loan 2** | Opening Balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 15 | 0.00% | Interest on opening balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 16 | | Drawdown in Year | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 17 | 0.00% | Interest on drawdown | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 18 | 20 | Repayment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 19 | | Closing Balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 20 | | Total interest | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 21 | | | | | | | | | | | |
| 22 | **Loan 3** | Opening Balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 23 | 2.00% | Interest on opening balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | | Drawdown in Year | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 25 | 0.00% | Interest on drawdown | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 26 | 20 | Repayment | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 27 | | Closing Balance | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 28 | | Total interest | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 29 | | | | | | | | | | | |

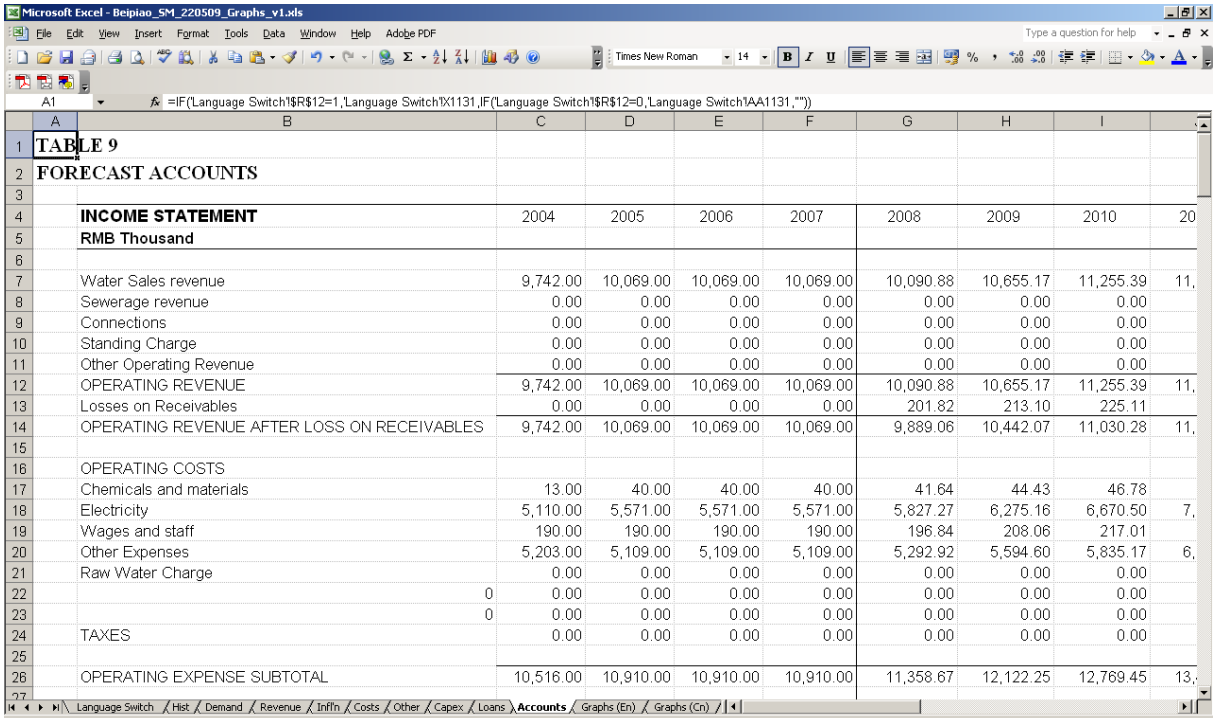
## 2.10 Forecast Accounts (Accts)

The Forecast Accounts Sheet includes the Forecast income statement, Source and application of funds statement and Balance sheet (see Figure 14). Always check to make sure the balance sheet balances before using the financial model for business planning purposes e.g. calculating required tariffs.

The Forecast Accounts Sheet also includes a schedule of Performance indicators (see Figure 15), covering debt service coverage, internal cash contribution to investments and average tariffs. It is suggested that the key drivers behind setting the tariff in each year of the projection should be:

- Tariffs should always be set to maintain a positive cumulative cash position, i.e. unrestricted or cumulative cash should always remain above zero.
- Where loans have been taken out to assist with implementing capital expenditure programmes, the "three year rolling average debt service coverage ratio" should not fall below 1.0.

Figure 14 Accounts: Forecast income statement (Accts)



Microsoft Excel - Beipiao_SM_220509_Graphs_v1.xls

=IF('Language Switch'!$R$12=1,'Language Switch'!X1131,IF('Language Switch'!$R$12=0,'Language Switch'!AA1131,""))

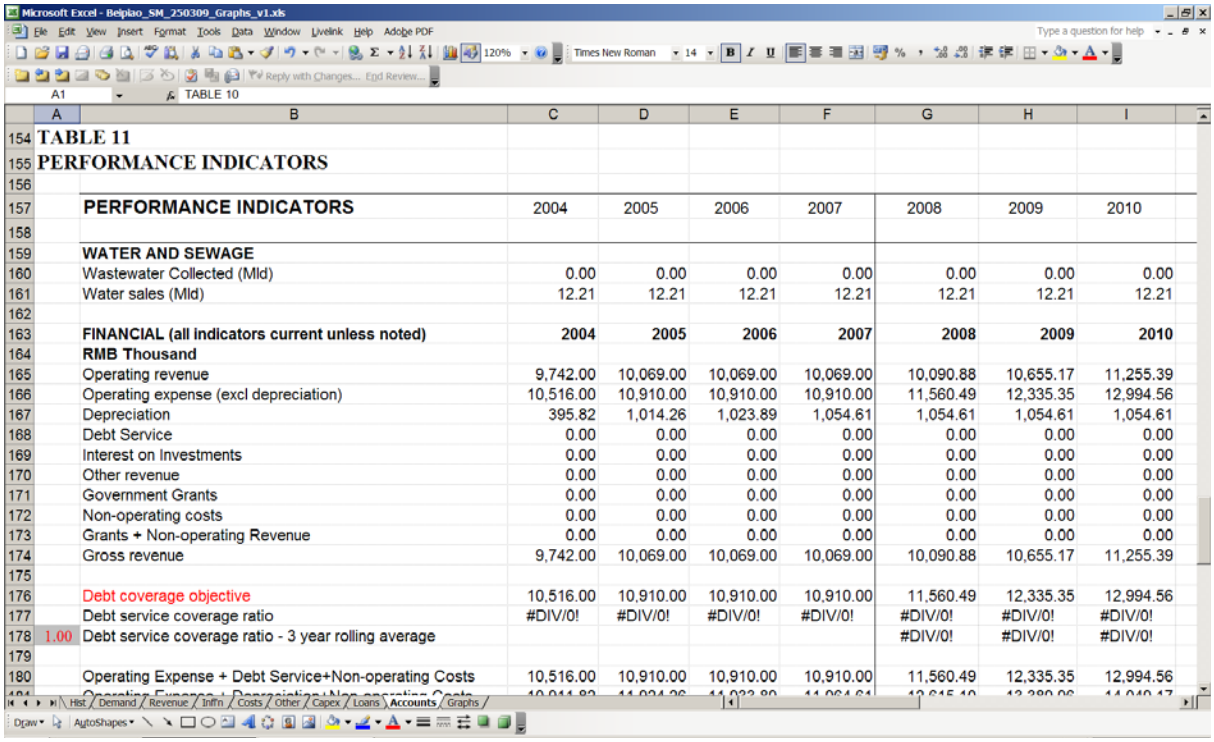
| | A | B | C | D | E | F | G | H | I | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TABLE 9 | | | | | | | | | |
| 2 | FORECAST ACCOUNTS | | | | | | | | | |
| 3 | | | | | | | | | | |
| 4 | | **INCOME STATEMENT** | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 20 |
| 5 | | **RMB Thousand** | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | Water Sales revenue | 9,742.00 | 10,069.00 | 10,069.00 | 10,069.00 | 10,090.88 | 10,655.17 | 11,255.39 | 11, |
| 8 | | Sewerage revenue | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 9 | | Connections | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 10 | | Standing Charge | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 11 | | Other Operating Revenue | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 12 | | OPERATING REVENUE | 9,742.00 | 10,069.00 | 10,069.00 | 10,069.00 | 10,090.88 | 10,655.17 | 11,255.39 | 11, |
| 13 | | Losses on Receivables | 0.00 | 0.00 | 0.00 | 0.00 | 201.82 | 213.10 | 225.11 | |
| 14 | | OPERATING REVENUE AFTER LOSS ON RECEIVABLES | 9,742.00 | 10,069.00 | 10,069.00 | 10,069.00 | 9,889.06 | 10,442.07 | 11,030.28 | 11, |
| 15 | | | | | | | | | | |
| 16 | | OPERATING COSTS | | | | | | | | |
| 17 | | Chemicals and materials | 13.00 | 40.00 | 40.00 | 40.00 | 41.64 | 44.43 | 46.78 | |
| 18 | | Electricity | 5,110.00 | 5,571.00 | 5,571.00 | 5,571.00 | 5,827.27 | 6,275.16 | 6,670.50 | 7, |
| 19 | | Wages and staff | 190.00 | 190.00 | 190.00 | 190.00 | 196.84 | 208.06 | 217.01 | |
| 20 | | Other Expenses | 5,203.00 | 5,109.00 | 5,109.00 | 5,109.00 | 5,292.92 | 5,594.60 | 5,835.17 | 6, |
| 21 | | Raw Water Charge | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 22 | 0 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 23 | 0 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 24 | | TAXES | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 25 | | | | | | | | | | |
| 26 | | OPERATING EXPENSE SUBTOTAL | 10,516.00 | 10,910.00 | 10,910.00 | 10,910.00 | 11,358.67 | 12,122.25 | 12,769.45 | 13, |

Language Switch | Hist | Demand | Revenue | Inflfn | Costs | Other | Capex | Loans | Accounts | Graphs (En) | Graphs (Cn)

At the bottom of the Performance indicators schedule, a number of key efficiency, leverage and liquidity indicators or ratios are presented. These include:

- Working ratio. This is the ratio of operating costs (excluding depreciation and interest payments, but no debt service) to operating revenues. Good financial management will always ensure the working ratio is well below 1.0.
- Operating ratio: This is the ratio of operating costs to operating revenues, including depreciation and interest payments, but excluding debt service. This ratio should also always be kept below 1.0.
- Current ratio: This is the ratio of current assets to current liabilities. Ideally this ratio should be greater than 1.0, which would usually indicate short-term liquidity is not a problem for the WSC.
- Debtor days: This is calculated by dividing accounts receivable by operating revenues and multiplying the result by 365 to give the number of days taken to receive payment from customers. This should obviously be as low as possible, however realistically, somewhere between 30 – 60 days should be achievable.

Figure 15 Accounts: Performance indicators (Accts)



Microsoft Excel - Belplao_SM_250309_Graphs_v1.xls

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| 154 | TABLE 11 | | | | | | | | |
| 155 | PERFORMANCE INDICATORS | | | | | | | | |
| 156 | | | | | | | | | |
| 157 | | PERFORMANCE INDICATORS | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| 158 | | | | | | | | | |
| 159 | | WATER AND SEWAGE | | | | | | | |
| 160 | | Wastewater Collected (Mld) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 161 | | Water sales (Mld) | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 | 12.21 |
| 162 | | | | | | | | | |
| 163 | | FINANCIAL (all indicators current unless noted) | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| 164 | | RMB Thousand | | | | | | | |
| 165 | | Operating revenue | 9,742.00 | 10,069.00 | 10,069.00 | 10,069.00 | 10,090.88 | 10,655.17 | 11,255.39 |
| 166 | | Operating expense (excl depreciation) | 10,516.00 | 10,910.00 | 10,910.00 | 10,910.00 | 11,560.49 | 12,335.35 | 12,994.56 |
| 167 | | Depreciation | 395.82 | 1,014.26 | 1,023.89 | 1,054.61 | 1,054.61 | 1,054.61 | 1,054.61 |
| 168 | | Debt Service | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 169 | | Interest on Investments | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 170 | | Other revenue | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 171 | | Government Grants | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 172 | | Non-operating costs | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 173 | | Grants + Non-operating Revenue | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 174 | | Gross revenue | 9,742.00 | 10,069.00 | 10,069.00 | 10,069.00 | 10,090.88 | 10,655.17 | 11,255.39 |
| 175 | | | | | | | | | |
| 176 | | Debt coverage objective | 10,516.00 | 10,910.00 | 10,910.00 | 10,910.00 | 11,560.49 | 12,335.35 | 12,994.56 |
| 177 | | Debt service coverage ratio | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! |
| 178 | 1.00 | Debt service coverage ratio - 3 year rolling average | | | | | #DIV/0! | #DIV/0! | #DIV/0! |
| 179 | | | | | | | | | |
| 180 | | Operating Expense + Debt Service+Non-operating Costs | 10,516.00 | 10,910.00 | 10,910.00 | 10,910.00 | 11,560.49 | 12,335.35 | 12,994.56 |

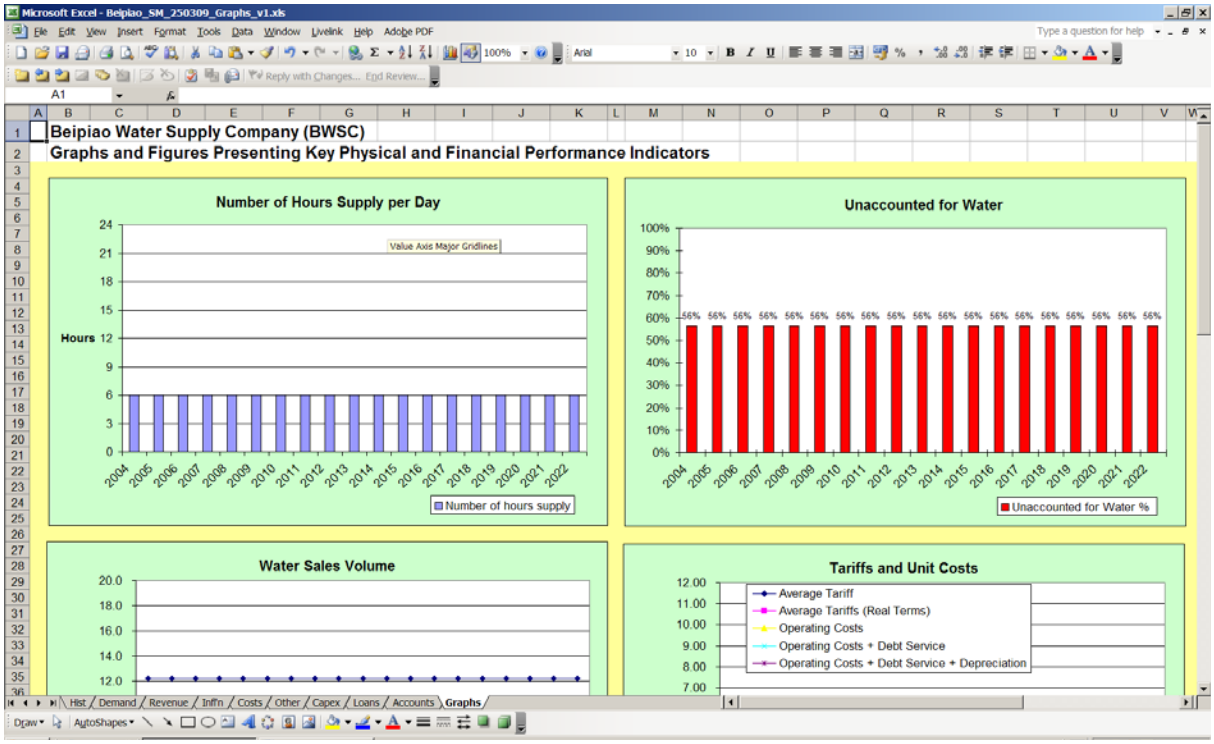
## 2.11 Graphs (Graphs)

A number of graphs are produced for key output and performance indicators to provide a visual presentation of the key WSC performance parameters. These include:

- Number of Hours Supply per Day.
- Unaccounted for Water.
- Water Sales Volume.
- Tariffs and Unit Costs.
- Demand, Production and Supply Forecast.
- Water Sales Revenue.
- Financial Objectives.
- Capital Expenditure and Borrowing.
- Indicators or Ratios.
- Income.

The user can customise this schedule by including an additional 2 graphs for other parameters if it is felt this would be useful.

Figure 16 Graphs (Graphs)




# 3 Summary and Suggested Approach to Financial Analysis and Modelling of the WSC

The financial model developed is intended to be part of the suite of tools used by WSC management during the annual business planning process. The model should be comprehensively revised once a year during the business planning period to produce a base case analysis. Optioneering and sensitivity analysis can then be undertaken at any time during the rest of the financial year to understand the implications of different approaches, potential capital developments and priorities as they relate to the results derived from the base case analysis. The key output from the model is the average tariff required to meet company objectives.

Each year, before undertaking the base case analysis it is important for the WSC management to decide company objectives for the business planning period (short term – 1 year, medium term – 5 year and long term – 15 year). The WSC objectives should further be divided into physical and financial categories.

Once the company objectives have been finalised the key assumptions to be used in the financial analysis should be determined. These include:

- Capital development programme
- Loan funding
- Water sales
- Operating costs
- Inflation and exchange rates
- Revenue and tariffs.

In terms of approach, to obtain the most use from the model and the analysis undertaken, it is suggested the following philosophy be adopted:

- Be honest with yourselves (don't be over optimistic or pessimistic in the assumptions used).
- Be pragmatic (take a practical, realistic approach).
- Experiment (determine the effect of changes to objectives and assumptions).
- Make the model work for you (it is only a tool, you will only benefit if it is used properly just like any other tool).
- Take account of externalities but don't let them compromise what you know to be right for the WSC and its customers.

During preparation of the so-called "Base Case Projection", using the assumptions agreed with WSC management, it is important to keep the management team informed of model progress and outputs. Management input during this process is very important to ensure the model reflects WSC objectives within the realities of the financial and operating situation the WSC currently finds itself.

There are a number of important questions that those developing the "Base Case Projection" should keep in mind, including:

- Does the balance sheet balance? Incorrect data entry when transferring information from the historical company accounts is the most likely cause of any problems with the balance sheet.
- Is a positive company cash balance maintained throughout the period of the projection? If not, alternative decisions should be made about tariffs, loan financing, capital developments (investments) and operations. Similarly if the company cash balance is too high, the same factors can be adjusted to produce a more realistic scenario.
- If the WSC has secured loan funding e.g. for capital developments, there will usually be covenants associated with the loan(s). Are these covenants being met? If not, assumptions regarding revenues, operating costs and size of capital programme (and associated financing package) should be adjusted accordingly.
- Does the projected combination of external financing and internal cash generation fully support the costs associated with planned capital developments? If not, adjustments to the magnitude or timing of capital developments should be made, possibly along with changes to assumptions on revenue generation and or loan funding.
- Are the assumed sources of funding reasonably assured? If not, a less ambitious capital programme should perhaps be adopted, either by re-scheduling or scaling down.
- What do the resulting physical and financial performance indicators tell us about the WSC? The resulting indicators or ratios should generally be within acceptable limits and if this is not the case indicate potential problems with the WSC operation.

Having completed and agreed the base case with WSC management the

model can now be used for sensitivity analysis and optioneering. A series of 'What ifs' should be agreed with WSC management and the model used to determine their impact on WSC performance. These could include:

- What if revenue collection rates are 25% lower than expected or 30 days longer than expected to collect?
- What if certain operating costs rise by 10% or 20% more than anticipated, e.g. electricity for pumping operations?
- What if the planned capital programme costs 20% more than anticipated or takes a year longer than anticipated to complete?
- What if the required amount of loan funding is not secured?

The results from these scenarios can be used by management to determine the factors which, should they change, will have the greatest impact on the WSC, i.e. the WSC operation is most sensitive to. This enables management to think about how they should react if such an eventuality occurs or indeed how to manage the WSC currently to reduce the likelihood of such an eventuality occurring.

Once the use of such a tool is embedded in company culture and becomes an integral part of the business planning, monitoring and control process, managers will be better placed to make sound decisions based on scenario analysis. By regularly revisiting and updating the model, both the impact of recent WSC results, e.g. first quarter revenue collection, against projections at the beginning of the year and necessary changes to assumptions due to external factors such as economic slow down can be better understood. Use of the model therefore has the potential to empower managers to run a more efficient, effective WSC providing a better, more cost effective service to all consumers of water in the WSC service area.

The following Appendix A provides a detailed checklist of data requirements for all necessary aspects of the WSC financial model.

# Appendix A: Detailed Checklist of Data Requirements

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Water Resources Demand Management Assistance Project** | | | | | | | |
| **Water Supply Data (Historic)** | | | | | | | |
| **Water Supply Company (WSC):** | | | | | | | |
| | | | | | | | |
| | | | Year | | | | |
| | **Item** | **Units** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Production and sales** | | | | | | |
| 1 | Actual water production | Mm3/a | | | | | |
| | Capacity of treatment plants | 000 m3/d | | | | | |
| | Names and sizes of treatment plants | | | | | | |
| | Name: | 000 m3/d | | | | | |
| | Name: | 000 m3/d | | | | | |
| | Name: | 000 m3/d | | | | | |
| 2 | Weekly Peak Supply | 000 m3/d | | | | | |
| | Daily Peak Supply | 000 m3/d | | | | | |
| 3 | Total Water Sales | Mm3/a | | | | | |
| | Domestic Sales | Mm3/a | | | | | |
| | Industrial Sales | Mm3/a | | | | | |
| | Commercial Sales | Mm3/a | | | | | |
| | Government/Public Buildings | Mm3/a | | | | | |
| | Public standpipes | Mm3/a | | | | | |
| | Other | Mm3/a | | | | | |
| | **Customer base and charges** | | | | | | |
| 4 | Domestic population served | No | | | | | |
| | Households served | No | | | | | |
| | Households with own connection | No | | | | | |
| | Households served by standpipes | No | | | | | |
| | Industrial customers | No | | | | | |
| | Commercial customers | No | | | | | |
| | Government/Public Buildings | No | | | | | |
| | Other | No | | | | | |
| 5 | Service area and standards | km2 | | | | | |
| | Number of supply districts and areas | No | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
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| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | District Name: | km2 | | | | | |
| | Target Pressures | Mpa | | | | | |
| | % area achieving target pressures | % | | | | | |
| | % achieving water quality targets | % | | | | | |
| | Average number of hours supply per da | Hours/day | | | | | |
| | Complaints received per year | No | | | | | |
| | Supply interruptions | No | | | | | |
| | Water taste/smells | No | | | | | |
| | Inadequate pressure | No | | | | | |
| | Other | No | | | | | |
| 6 | Tariffs | km2 | | | | | |
| | Domestic | RMB/m3 | | | | | |
| | Industrial | RMB/m3 | | | | | |
| | Commercial | RMB/m3 | | | | | |
| | Government/Public Buildings | RMB/m3 | | | | | |
| | Other | RMB/m3 | | | | | |
| 6a | Connections charges | | | | | | |
| | Domestic | RMB | | | | | |
| | Industrial (by size of meter ?) | RMB | | | | | |
| | Commercial | RMB | | | | | |
| | Government/Public Buildings | RMB | | | | | |
| | Other | RMB | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Water Resources Demand Management Assistance Project** | | | | | | | |
| **Water Supply Data (Historic)** | | | | | | | |
| **Water Supply Company (WSC):** | | | | | | | |
| | | | | | | | |
| | | | **Year** | | | | |
| | **Item** | **Units** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Metering** | | | | | | |
| 7 | Water meters read by WSC | No | | | | | |
| | Domestic | No | | | | | |
| | Industrial | No | | | | | |
| | Commercial | No | | | | | |
| | Government/Public Buildings | No | | | | | |
| | Other | No | | | | | |
| | Water meters not working | No | | | | | |
| | Premises served without meters | No | | | | | |
| | Standpipes | No | | | | | |
| 8 | Meter sizes | | | | | | |
| | > 100mm | No | | | | | |
| | 50 to 100mm | No | | | | | |
| | 15 to 50mm | No | | | | | |
| | < 15mm | No | | | | | |
| 9 | Meters replaced each year | No | | | | | |
| 10 | Meters repaired each year | No | | | | | |
| 11 | Ages of meters | | | | | | |
| | > 10 years | No | | | | | |
| | 5 to 10 years | No | | | | | |
| | 3 to 5 years | No | | | | | |
| | < 3 years | No | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Water Resources Demand Management Assistance Project** | | | | | | | |
| **Water Supply Data (Historic)** | | | | | | | |
| **Water Supply Company (WSC):** | | | | | | | |
| | | | | | | | |
| | | | Year | | | | |
| | **Item** | **Units** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Distribution Network (repeat for each material - cast iron, reinforced concrete, etc for items 12 to 17)** | | | | | | |
| | **Material - ??** | | | | | | |
| 12 | Pipelines | km | | | | | |
| | > 1000 mm | km | | | | | |
| | 600 to 1000mm | km | | | | | |
| | 300 to 600mm | km | | | | | |
| | 75 to 300 mm | km | | | | | |
| | < 75 mm | km | | | | | |
| 13 | New pipelines added to system | km | | | | | |
| | > 1000 mm | km | | | | | |
| | 600 to 1000mm | km | | | | | |
| | 300 to 600mm | km | | | | | |
| | 75 to 300 mm | km | | | | | |
| | < 75 mm | km | | | | | |
| 14 | Old pipelines replaced | km | | | | | |
| | > 1000 mm | km | | | | | |
| | 600 to 1000mm | km | | | | | |
| | 300 to 600mm | km | | | | | |
| | 75 to 300 mm | km | | | | | |
| | < 75 mm | km | | | | | |
| 15 | Age of pipelines | | | | | | |
| | >1000mm, > 50 years | km | | | | | |
| | >1000mm, 30 to 50 years | km | | | | | |
| | >1000mm, 10 to 30 years | km | | | | | |
| | >1000mm, <10 years | km | | | | | |
| | 600 to 1000mm, > 50 years | km | | | | | |
| | 600 to 1000mm, 30 to 50 years | km | | | | | |
| | 600 to 1000mm, 10 to 30 years | km | | | | | |
| | 600 to 1000mm, <10 years | km | | | | | |
| | 300 to 600mm, > 50 years | km | | | | | |
| | 300 to 600mm, 30 to 50 years | km | | | | | |
| | 300 to 600mm, 10 to 30 years | km | | | | | |
| | 300 to 600mm, <10 years | km | | | | | |
| | 75 to 300mm, > 50 years | km | | | | | |
| | 75 to 300mm, 30 to 50 years | km | | | | | |
| | 75 to 300mm, 10 to 30 years | km | | | | | |
| | 75 to 300mm, <10 years | km | | | | | |
| | <75mm, > 50 years | km | | | | | |
| | <75mm, 30 to 50 years | km | | | | | |
| | <75mm, 10 to 30 years | km | | | | | |
| | <75mm, <10 years | km | | | | | |
| 16 | Pipe Bursts/Breaks | No | | | | | |
| | > 1000 mm | No | | | | | |
| | 600 to 1000mm | No | | | | | |
| | 300 to 600mm | No | | | | | |
| | 75 to 300 mm | No | | | | | |
| | < 75 mm | No | | | | | |
| 17 | Leakage from system | % | | | | | |
| | Leakage from system | m3/day/km | | | | | |
| 18 | Service reservoirs | No | | | | | |
| | Service reservoirs capacity | 000 m3 | | | | | |
| 19 | Booster Stations | No | | | | | |
| | Booster Stations capacity | 000 m3/d | | | | | |
| | Name: | 000 m3/d | | | | | |
| | Name: | 000 m3/d | | | | | |
| | Name: | 000 m3/d | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Water Resources Demand Management Assistance Project** | | | | | | | |
| **Water Supply Data (Historic)** | | | | | | | |
| **Water Supply Company (WSC):** | | | | | | | |
| | | | | | | | |
| | | | Year | | | | |
| | **Item** | **Units** | **2004** | **2005** | **2006** | **2007** | **2008** |
| | **Capital Expenditures** | | | | | | |
| 20 | New assets commissioned | RMB Mn | | | | | |
| | Source development | RMB Mn | | | | | |
| | Trunk mains | RMB Mn | | | | | |
| | Treatment works | RMB Mn | | | | | |
| | Pump stations | RMB Mn | | | | | |
| | Service reservoirs | RMB Mn | | | | | |
| | Distribution pipes | RMB Mn | | | | | |
| | Connections | RMB Mn | | | | | |
| | New meters | RMB Mn | | | | | |
| | Depots/Workshops | RMB Mn | | | | | |
| | Other (specify) | RMB Mn | | | | | |
| 21 | Replacements | RMB Mn | | | | | |
| | Expenditure on structures | RMB Mn | | | | | |
| | Expenditure on mech/elect works | RMB Mn | | | | | |
| | Expenditure on replacement meters | RMB Mn | | | | | |
| | Expenditure on pipe replacement | RMB Mn | | | | | |
| | Expenditure on leakage control | RMB Mn | | | | | |
| | Other | RMB Mn | | | | | |
| | **Investment Finance** | | | | | | |
| | Source: | RMB Mn | | | | | |
| | Source: | RMB Mn | | | | | |
| | Source: | RMB Mn | | | | | |
| | Source: | RMB Mn | | | | | |
| | **Operating Expenditures** | | | | | | |
| 22 | Number of staff | No | | | | | |
| | Personnel costs (excl retired staff) | RMB Mn | | | | | |
| | Personnel costs (retired staff) | RMB Mn | | | | | |
| | Administration costs | RMB Mn | | | | | |
| 23 | Power price | RMB/kWh | | | | | |
| | Power costs | RMB Mn | | | | | |
| | Flocculant price | RMB/t | | | | | |
| | Flocculant costs | RMB Mn | | | | | |
| | Chlorine price | RMB/t | | | | | |
| | Chlorine costs | RMB Mn | | | | | |
| | Raw water price | RMB/t | | | | | |
| | Raw water cost | RMB Mn | | | | | |
| 24 | Materials | RMB Mn | | | | | |
| 25 | Repairs | RMB Mn | | | | | |
| | Civil | RMB Mn | | | | | |
| | Mechanical/Electrical | RMB Mn | | | | | |
| | Other | RMB Mn | | | | | |
| 26 | Maintenance | RMB Mn | | | | | |
| | Civil | RMB Mn | | | | | |
| | Mechanical/Electrical | RMB Mn | | | | | |
| | Other | RMB Mn | | | | | |
| 27 | Sales costs | RMB Mn | | | | | |
| 28 | Other (specify) | RMB Mn | | | | | |
| | | | | | | | |
| | | | | | | | |

# Document Reference Sheet

## Glossary:

| | |
|---|---|
| Optioneering | Decision making process comparing options |
| Price elasticity | Responsiveness of the demand for water to the increase or decrease in its price. Normally, sales increase with a drop in prices and decrease with a rise in prices. As water tariffs rise demand for water (except for that portion used for basic needs such as drinking and cooking) would fall if incomes do not rise also |
| Income elasticity | Proportionate change in the demand for water in response to a change in income. It is reflected in how people change their consumption habits with changes in their income levels. As incomes rise in China, per capita demand for water rises accordingly |

## Bibliography:

WRDMAP and Beipiao Water Supply Company

## Related materials from the MWR IWRM Document Series:

The WRDMAP Financial Model Excel Workbook to accompany this Manual

| | |
|---|---|
| Advisory Note 5.4 | Tariff Setting for Small to Medium Size Water Supply Company |
| Example 5.4 | Tariff Setting for Beipiao Water Supply Company |
| Advisory Note 5.5 | Willingness to Pay Surveys (Urban Water Supply) |
| Example 5.5 | Willingness to Pay Survey for Beipiao Water Supply Company |
| Thematic Paper 5.7 | Financial Management and Modelling in Small and Medium Water Supply Companies |

## Where to find more information on IWRM – recommended websites:

Ministry of Water Resources: www.mwr.gov.cn

Global Water Partnership: www.gwpforum.org

WRDMAP Project Website: www.wrdmap.com

# China – UK, WRDMAP

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