

State of Palestine

Palestinian Water Authority



دولة فلسطين

سلطة المياه الفلسطينية

Planning For Water And Sanitation

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Abbreviations

AFD	Agence Française de Développement (French Development Agency)
EC	European Commission
EQA	Environmental Quality Authority
GOI	Government of Israel
ICA	Israeli Civil Administration
IWRM	Integrated Water Resources Management
JSC	Joint Service Council
JWC	Joint Water Committee
JWU	Jerusalem Water Undertaking
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOH	Ministry of Health
MOJ	Ministry of Justice
MOLG	Ministry of Local Government
MOPAD	Ministry of Planning and Development
MOPH	Ministry of Public Works and Housing
NGO	Non-governmental Organization
NWC	National Water Council
ORGUT	Consortium led by ORGUT Consulting AB, also including Finnish Consulting Group Ltd. and Palestinian Wastewater Engineering Group
PIU	Project Implementation Unit
PMU	Project Management Unit
PNA	Palestinian National Authority
PSC	Project Steering Committee
PWA	Palestinian Water Authority
PWEG	Palestinian Wastewater Engineers Group
RCU	Reform Committee Unit
RSC	Reform Steering Committee
SIDA	Swedish International Development Cooperation Agency
TOR	Terms of Reference
TPAT	Technical, Planning and Advisory Services
WB	World Bank
WBWD	West Bank Water Department
WRM	Water Resources Management
WSSA	Water Supply and Sewerage Authority

Executive Summary

Introduction

Since the establishment of the PWA there have been many different plans produced by many different authors. The quality of many of these plans is high however the methodology, approach and process used to produce these vary considerably and makes it very difficult to compare and collate the recommendations of these plans at a national level.

The document promotes, defines and explains a standardised format, approach, methodology and analysis of plans which are designed to; Split the planning function, and presentation of those plans by 3 defined levels; Master (20 years), Investment (5years) and Implementation (3years) planning for long term, medium term and short term planning, presenting each defined level as a single volume in a clear simple format. The document proposes the presentation of all the background information, methodology, development and justification of each plan as a separate volume. The document further promotes that each level of planning is sub-divided by separate disciplines, Water Resources & Transmission, Water Supply Distribution and Sanitation.

This methodology allows the information from plans by different authors, for different areas of the Palestinian Territory to be extracted, collated and compared and assembled at a national level so that they can more easily be used as a decision making tool and further allows those organisations responsible for implementation to assess their short, medium and long term technical and financial responsibilities and liabilities.

Planning Overview

It is the objective of the PWA to ensure that the preparation of all plans related to water supply and sanitation adhere to the Policy and have objective of fulfilling the requirements of the Strategy.

This is achieved by separating planning into three distinct and separate levels of master, investment and implementation.

Tier 1 – Master Planning: To achieve the key national policy of ensuring equal levels of access to services within each region & separate regions of the Palestinian Territory, the occupied Palestinian Territory (oPT) has been divided into 6 distinct regions: North, Northwest, Jordan Valley, Central, Southern and the Gaza Strip so the development of Regional Master Plans will ensure that they are inclusive for all communities and, in addition, the regional approach allows for any intraregional schemes to be included in the plan. The main objective of the master plan is to present a plan which represents the best solution to meeting the overall infrastructure and capacity requirements for the project area in sufficient detail for all its implications to be understood and then be used to develop a detailed investment plan to meet the requirements of the 1st five years of the plan.

Tier 2 – Investment Planning: The objective of this plan is to present a five year plan, of feasible projects from the phased implementation of the master plan, in sufficient detail to demonstrate distinct projects and understand all the implications of those projects to allow three year implementation plans and detailed designs to be developed from these without further feasibility studies being required.

Tier 3 – Implementation Planning: The objective of this plan is to have a prioritized list of projects, based upon the five year investment plan, which meet the criteria according to need, cost and

benefit and can be presented to the MOPAD. In addition they include a short design brief which can easily be developed into a detailed design.

Plan format and layout

The format and layout of the plan allows those responsible for planning to go straight to the plan and extract and collate details regarding certain subjects. The Regional Plan is divided into 4 volumes, each with defined sections and input.

- Volume 1 - Tier 1 - Water and Sanitation Master Plan
- Volume 2 - Tier 2 - Water and Sanitation 5 year Investment Plan
- Volume 3 - Tier 3 - Water and Sanitation 3 year Implementation Plan
- Volume 4 - Detailed Methodology and Background Information

Volumes 1-2 only include the agreed master and investment plans for water resources & transmission, water supply distribution and sanitation and include only pertinent information which describes the plan including a short written description with maps, schematic and tables for further details. It should be noted that capacity building projects, in addition to infrastructure projects are included. The findings of the economic & financial analysis and programme are presented here.

Volume 3 includes a list of prioritised projects identified by a unique project number, project title, type of project and costs. It includes details of programme costs and funding requirements. A separate section includes a design brief for each project.

Volume 4 includes background information, methodology and demonstrates the development of the plans from assessment of future demand for services through to plan criteria, gap analysis through to defined plans which fill the gap.

1 Introduction & Objective

Since the establishment of the PWA there have been many different plans produced by many different authors. The quality of many of these plans is high however the methodology, approach and process used to produce these vary considerably and makes it very difficult to compare and collate the recommendations of these plans at a national level.

The objective of this document is to promote, define and explain a standardised format, approach, methodology and analysis of plans. The standard formats and methodology are designed to:

- Split the planning function, and presentation of those plans by 3 defined levels; Master, Investment and Implementation Planning for long term, medium term and short term planning
- Present the final agreed plan for each defined level as a single volume in a clear simple format
- Present the background information, methodology, development and justification of each plan as a separate volume
- Sub-divide each level of planning by separate disciplines, Water Resources & Transmission, Water Supply Distribution and Sanitation so that the organisations responsible for implementation can assess their short, medium and long term technical and financial responsibilities and liabilities
- Allow the information from plans by different authors, for different areas of the Palestinian Territory to be extracted, collated and compared and assembled at a national level so that they can more easily be used as a decision making tool.

2 Planning Overview

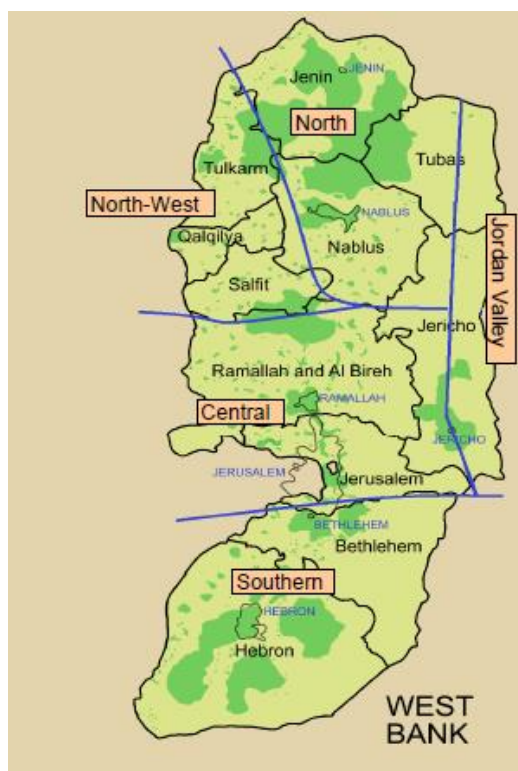
Further to the completion of national Water Sector Policy and Water Sector Strategy (2012-32) for the West Bank and Gaza, from herein referred to the “Policy” and “Strategy”, it is the objective of the PWA to ensure that the preparation of all plans related to water supply and sanitation adhere to the Policy and have objective of fulfilling the requirements of the Strategy.

The planning process has been divided into three distinct levels and these should at all times be kept separate so that they can be easily extracted and collated for different purposes in the national and local planning process. The three levels of planning, below the strategy include:

- Tier 1 - Long Term - Master Plans – 20 year horizon
- Tier 2 - Medium Term - Investment Plans – 5 year horizon
- Tier 3 - Short Term - Implementation Plans – 3 year horizon.

Plans at each level shall include and clearly delineate between one or more of the following services, water resource & transmission, water supply & distribution, sewerage, wastewater treatment and disposal and wastewater re-use, depending on the requirements of the project terms of reference.

2.1 Tier 1 – Master Planning – 20 years



A key national policy is to ensure where possible equal levels of access to services within separate regions of the Palestinian Territory and also within each region so that marginalized areas and smaller rural communities away from the main population centers within each Governorate are not neglected within the planning process. To enable this process to take place the occupied Palestinian Territory (oPT) has been divided into 6 distinct regions: North, Northwest, Jordan Valley, Central, Southern and the Gaza Strip in that the development of Regional Master Plans will ensure that they are inclusive for all communities within that area. In addition, the regional approach ensures that any intraregional schemes will be included in the plan.

The main objective of the master plan is to present a long term plan which represents the best solution to meeting the overall infrastructure, capacity requirements for the project area in sufficient detail that the overall physical, financial and economic implications can be understood and to allow a detailed investment plan to be developed to meet the requirements of the 1st five years of the plan.

2.2 Tier 2 – Investment Planning – 5 years

The main objective of this is to present a five year plan of feasible projects which represent the first five years of the phased implementation of the master plan, in sufficient detail to demonstrate distinct projects and allow three year implementation plans and detailed designs to be developed from these without further feasibility studies being required. The investment plans must include sufficient detail regarding overall costs associated with the implementation and operation of facilities so that the medium term financial and economic implications of the plan can be understood and addressed including tariff requirements.

2.3 Tier 3 – Implementation Planning – 3 years

The objective of the implementation plans is to have a prioritized list of projects, based upon the five year investment plan, which meet the criteria according to need, cost and benefit and can be presented to the MOPAD. They should include a short design brief which can easily be developed into a detailed design. Sufficient detail should be included which represents the overall costs associated with the procurement and implementation of the plan and which represent the individual costs of each project.

3 Plan Format and Layout

Ideally plans will be prepared for each of the regions of the occupied Palestinian Territory from Tier 1 to Tier 3 so that the next level of planning can be developed from the level immediately above, and should investment plans and implementation plans be developed for sub-regions within one of the 6 regions these will be collated into the larger regional plan which will include all levels of planning information so that it is in one place. The format and layout of the plan allows those responsible for planning to go straight to the plan and extract and collate details regarding certain subjects.

The Regional Plan shall be divided into 4 volumes as shown below and should include all sections included below even if it is just a reference to say that this work has not been carried out.

- Volume 1 - Tier 1 - Water and Sanitation Master Plan
- Volume 2 - Tier 2 - Water and Sanitation 5 year Investment Plan
- Volume 3 - Tier 3 - Water and Sanitation 3 year Implementation Plan
- Volume 4 - Detailed Methodology and Background Information.

3.1 Volume 1 - Tier 1 - Water and Sanitation Master Plan

Volume 1 shall be divided into the following Sections:

- Executive Summary
- Document Map of the Plan
- Section 1 Introduction and Objectives
- Section 2 Water Resource and Transmission Master Plan
- Section 3 Water Supply Distribution Master Plan
- Section 4 Sanitation Master Plan
- Section 5 Programme Costs and Financing.

3.2 Volume 2 - Tier 2 - Water & Sanitation 5 year Investment Plans

Volume 2 shall be divided into the following Sections:

- Summary
- Document Map of the Plan
- Section 1 Introduction and Objectives
- Section 2 Water Resource and Transmission Investment Plan
- Section 3 Water Supply Distribution Investment Plan
- Section 4 Sanitation Investment Plan
- Section 5 Programme Costs and Financing.

3.3 Volume 3 - Tier 3 - Water & Sanitation 3 year Implementation Plan

Volume 3 shall be divided into the following Sections:

- Summary
- Document Map of the Plan
- Section 1 Introduction and Background
- Section 2 Water & Sanitation Prioritised Projects List
- Section 3 Programme, Costs and Funding
- Section 4 Project Design Briefs.

3.4 Volume 4 - Detailed Methodology & Background Information

Volume 4 shall include the background information and methodology and demonstrate the development of the master, investment and implementation plans and shall include the following sections:

- Section 1 Population Data & Projections
- Section 2 Existing Water & Planned Future Water Resources
- Section 3 Existing & Projected Water Use Analysis & Projections
- Section 4 Existing & Projected Wastewater Production
- Section 5 Demand of Wastewater for Re-Use
- Section 6 Existing & Projected Surface Water Quantities and Potential Re-use
- Section 7 Existing Water Resource and Transmission Infrastructure
- Section 8 Existing Water Supply Infrastructure
- Section 9 Existing Wastewater Collection & Treatment Infrastructure
- Section 10 Infrastructure Design Criteria & Assumptions
- Section 11 Water Resource & Transmission Infrastructure Gap Analysis
- Section 12 Water Supply Infrastructure Gap Analysis
- Section 13 Wastewater Collection & Treatment Infrastructure Gap Analysis
- Section 14 Economic & Financial Criteria
- Section 15 Alternative Outline Plans & Justification of Proposed Solutions
- Section 16 Methodology & Development of Final Master Plan
- Section 17 Methodology & Development Economic Analysis of Final Master Plan
- Section 18 Methodology & Development of 5 year Investment Plans
- Section 19 Methodology & Development of Cost Analysis of Investment Plans
- Section 20 Methodology & Development of 3 year Implementation Plans
- Section 21 Methodology & Cost Development - 3 year Implementation Plans.

4 Volume 1 – Master Plan

Volume 1 should only include the agreed master plans for water resources & transmission, water supply distribution and sanitation. Only pertinent information which describes the plan should be presented. Discussion, methodology and justification should be presented in Volume 4.

4.1 Executive Summary

The executive summary should include the following:

- Details of who carried out the study, who funded it and why
- Objective of the study
- Details of the existing project area
- Brief description of the plan
- Tabulated summary of the plan including costs, phasing and financing requirements.

4.2 Document Map of the Plan

One page flow diagram to guide the reader through the methodology and formulation of the plan.

4.3 Section 1 - Introduction and Objectives

One page including project background, objective of the plan and scope of works.

4.4 Section 2 – Water Resources and Transmission Master Plan

Section 2.1 – Plan Description - Include a brief written description of the water resource & transmission master plan.

Section 2.2 – Maps and Schematics - Include maps and schematics identifying the fixed infrastructure requirements of the whole plan and five year phased implementation plans for the design horizon. Clearly identify existing fixed assets which will remain unchanged and existing infrastructure which will be rehabilitated under the plan. Schematics must demonstrate the overall method of operation of the transmission system. Maps and schematics should include sufficient topographical information to understand system operation.

Section 2.3 – Infrastructure Requirements – Include tabulated details of the fixed and non-fixed infrastructure requirements of the plan including infrastructure for capacity building and should include capital costs. Examples are shown in the tables in Appendix A of this document.

Section 2.4 – Institutional Capacity Building Requirements – Include broad details of increased (or decreased) staffing requirements and institutional capacity building and public awareness requirements for all those tasks required of a bulk water service provider, i.e. not just the direct operation & maintenance of the assets. Include this as a capital cost.

4.5 Section 3 – Water Supply Distribution Master Plan

Section 3.1 – Plan Description - Include a brief written description of the water supply distribution master plan.

Section 3.2 – Maps and Schematics - Include maps and schematics identifying the fixed infrastructure requirements of the whole plan and five year phased implementation plans for the design horizon. Clearly identify existing fixed assets which will remain unchanged and existing infrastructure which will be rehabilitated under the plan. Maps should include sufficient topographical information to understand system operation.

Section 3.3 – Infrastructure Requirements – Include tabulated details of the fixed and non-fixed infrastructure requirements of the plan including infrastructure for capacity building requirements and should include capital costs. Examples are shown in the tables in Appendix A.

Section 3.4 – Institutional Capacity Building Requirements – Include broad details of increased (or decreased) staffing requirements and institutional capacity building and public awareness requirements for all those tasks required of a water supply distribution service provider, i.e. not just the direct operation & maintenance of the assets. Include this as a capital cost.

4.6 Section 4 – Sanitation Master Plan

This section is where only the agreed sanitation master plan and pertinent information to the plan should be presented. Discussion, methodology and justification are presented elsewhere in the document. Sub-sections include:

Section 4.1 – Plan Description - Include a brief written description of the sanitation master plan.

Section 4.2 – Maps and Schematics - Include maps and schematics identifying the fixed infrastructure requirements of the whole plan and five year phased implementation plans for the design horizon. Clearly identify existing fixed assets which will remain unchanged and existing infrastructure which will be rehabilitated under the plan. Maps should include sufficient topographical information to understand system operation.

Section 4.3 – Infrastructure Requirements – Include tabulated details of the fixed and non-fixed infrastructure requirements of the plan including infrastructure required for capacity building requirements and should include capital costs. Examples are shown in Appendix A.

Section 4.4 – Institutional Capacity Building Requirements – Include broad details of increased (or decreased) staffing requirements and institutional capacity building and public awareness requirements for all those tasks required of a water supply distribution service provider, i.e. not just the direct operation & maintenance of the assets. Include this as a capital cost.

4.7 Section 5 - Programme Costs and Financing

Section 5.1 – Programme - Insert a programme showing the implementation programme of works required to complete the water and sanitation master plans showing the interdependency of separate projects, or project types and the critical path.

Section 5.2 – Costs & Expenditure – Insert, in tabular format and graphically, details of all capital and all operational costs and expenditure profiles for water and sanitation master plans.

Section 5.3 – Financing versus Cost Recovery – Insert, in tabular format and graphically, details of financing requirements versus anticipated cost recovery for water and sanitation master plans.

5 Volume 2 - Investment Plan

Volume 2 should only include the agreed master plans for water resources & transmission, water supply distribution and sanitation. Only pertinent information which describes the plan should be presented. Discussion, methodology and justification should be presented in Volume 4.

5.1 Summary

The summary should include the following:

- Details of who carried out the study, who funded it and why
- Objective of the investment plan
- Details of the existing project area
- Brief description of the plan
- Tabulated summary of the plan including costs, phasing and financing requirements.

5.2 Document Map of the Plan

One page flow diagram to guide the reader through the methodology and formulation of the plan.

5.3 Section 1 - Introduction and Objectives

One page including project background, objective of the plan and scope of works.

5.4 Section 2 – Water Resources and Transmission Investment Plan

This section is where only the agreed water resources and transmission investment plan and pertinent information to the plan should be presented. Discussion, methodology and justification are presented elsewhere in the document. Sub-sections include:

Section 2.1 – Plan Description - Include a brief written description of the water resource & transmission investment plan.

Section 2.2 – Maps and Schematics - Include maps and schematics identifying the fixed infrastructure requirements (including rehabilitation of existing infrastructure) of the five year investment plans for the design horizon. Include sufficient topographical information.

Section 2.3 – Infrastructure Requirements – Include tabulated details of the fixed and non-fixed infrastructure requirements of the plan including infrastructure required for capacity building requirements and should include capital costs. Ideally a master plan is completed prior to an investment plan and the proposed infrastructure requirements would represent that infrastructure proposed in the 1st five years of the phased implementation of the master plan. The format of these tables is shown in Appendix A.

Section 2.4 – Institutional Capacity Building Requirements – Include broad details of proposed projects required for institutional capacity building and public awareness requirements for all those tasks required of a service provider. Include this as a capital cost.

5.5 Sections 3 – Water Supply Distribution Investment Plan

This section is where only the agreed water supply distribution investment plan and pertinent information to the plan should be presented. Discussion, methodology and justification are presented elsewhere in the document. Sub-sections include:

Section 3.1 – Plan Description - Include a brief written description of the water supply distribution investment plan.

Section 3.2 – Maps and Schematics - Include maps and schematics identifying the fixed infrastructure requirements (including rehabilitation of existing infrastructure) of the five year investment plans for the design horizon. Include sufficient topographical information.

Section 3.3 – Infrastructure Requirements – Include tabulated details of the fixed and non-fixed infrastructure requirements of the investment plan including capacity building requirements and capital costs. The format of the tables shown in Appendix A should be used as a summary sheet in the main body of the report, with a further detailed table with name of each community placed as an annex to Volume 1.

Section 3.4 – Institutional Capacity Building Requirements – Include broad details of proposed projects required for institutional capacity building and public awareness requirements for all those tasks required of a service provider. Include this as a capital cost.

5.6 Section 4 – Sanitation Investment Plan

This section is where only the agreed sanitation investment plan and pertinent information to the plan should be presented. Discussion, methodology and justification are presented elsewhere in the document. Sub-sections include:

Section 4.1 – Plan Description - Include a brief written description of the sanitation investment plan.

Section 4.2 – Maps and Schematics - Include maps and schematics identifying the fixed infrastructure requirements (including rehabilitation of existing infrastructure) of the five year investment plans for the design horizon.

Section 4.3 – Infrastructure Requirements – Include tabulated details of the fixed and non-fixed infrastructure requirements of the plan including capacity building requirements including capital costs. The format of these tables shown in Appendix A should be used as a summary sheet in the main body of the report, with a further detailed table with name of each community placed as an annex to Volume 1.

Section 4.4 – Institutional Capacity Building Requirements – Section 3.4 – Institutional Capacity Building Requirements – Include broad details of proposed projects required for institutional

capacity building and public awareness requirements for all those tasks required of a service provider. Include this as a capital cost.

5.7 Section 5 - Programme Costs and Financing

Section 5.1 – Programme - Insert a programme showing the implementation programme of works required to complete the water and sanitation investment plans showing the interdependency of separate projects and the critical path and including lead-in times for project design and procurement and construction.

Section 5.2 – Costs & Expenditure – Insert, in tabular format and graphically, details of capital costs and expenditure profiles for water and sanitation investment plans.

Section 5.3 – Financing Requirements – Insert, in tabular format and graphically, details of financing requirements for water and sanitation investment plans.

6 Volume 3 - Implementation Plan

This section includes distinct packages and projects which may include individual items of infrastructure described in the 5 year investment plan or a number of pieces of infrastructure collated to make a logical project. These projects are then prioritised on the basis of how they meet the requirements of the National Policy and Strategy.

6.1 Summary

The summary should include the following:

- Details of who carried out the study, who funded it and why
- Objective of the Implementation Plan
- Details of the existing project area
- Brief description of the plan
- Tabulated summary of the plan including costs, phasing and financing requirements.

6.2 Document Map of the Plan

One page flow diagram to guide the reader through the methodology and formulation of the plan.

6.3 Section 1 - Introduction and Background

One page including the background to the plan, objective of the plan and scope of works.

6.4 Section 2 – Water & Sanitation Implementation Prioritised Project List

Projects must be prioritised in accordance with the PWA Prioritisation Criteria. Include a brief written description of the water resource & transmission prioritised projects. Discussion, methodology and justification are presented elsewhere in the document. Present a table with project numbers, communities served, governorate where the project will be implemented, project type, project title, total estimated implementation cost and name of donor if available. Examples of the proposed project prioritisation methodology and table layout are included in the TPAT document "*Task 2.17 – Prioritisation of Short Term Water Supply Projects*". It is important to remember that some of these projects may be capacity building projects.

6.5 Section 3 – Programme Costs & Funding

Section 3.1 – Capital Costs - Include tabulated details of the fixed and non-fixed infrastructure requirements of the plan including capital cost estimates. Capital costs should reflect the estimated cost of each project and include a breakdown of the design, construction, supervision and administration costs.

Section 3.2 – Programme - Insert a programme showing the implementation programme of works required to complete the water and sanitation investment plans showing the interdependency of separate projects and the critical path and including lead-in times for project design and procurement and construction or implementation.

Section 3.3 – Costs & Expenditure – Insert, in tabular format and graphically, details of capital costs and expenditure profiles for water and sanitation investment plans.

Section 3.4 – Financing Requirements – Insert, in tabular format and graphically, details of financing requirements for water and sanitation investment plans.

6.6 Section 4 – Project Design Briefs

Include an outline design brief for each project including a cost estimate and breakdown of the cost estimate. Include sufficient detail so that an engineer could take the project to detailed design without further study.

7 Volume 4 – Detailed Methodology & Background Information

7.1 Section 1 Population Data & Projections

Include the agreed population data for the project area in this section. Include the source of the data for existing populations and agreed growth rates taking into account the demographic principles of the National Strategy and projections of the Ministry of Planning. Take notice of internal migration within the Territory and the projected number of returnees. Present the information as a summary table by project area, governorate and individual community.

7.2 Section 2 Existing Water & Planned Future Water Resources

Include hydro-geological details of existing and proposed water sources pertinent to the project area and their proposed time based allocation to the project area. This should include water resources for both municipal use and agricultural use. This information should be based on the National Strategy.

7.3 Section 3 Existing & Projected Water Use Analysis & Projections

Include an assessment of existing and time based projections of water use for the project area for both agricultural and municipal use. This information should be based on the National Strategy. The projections for municipal use should be broken down by category (domestic, commercial, public, light industrial and industrial) and the time based estimate for the design horizon of the plan by community. Both agricultural and municipal demands should be presented graphically at a large scale to give the reader an overview of the project area. Projected water use cannot be greater than the planned future water resources.

7.4 Section 4 Existing & Projected Wastewater Production

Include an assessment of existing and time based projections of wastewater production for the project area.

7.5 Section 5 Demand of Wastewater for Re-Use

Include an assessment of existing and time based projections of demand for wastewater for agricultural re-use for the project area, include seasonal variation for demand and present the information graphically versus wastewater production.

7.6 Section 6 Existing & Projected Surface Water Quantities and Potential Re-use

Include an assessment of existing and time based projections for the potential collection of surface water and its potential for agricultural re-use for the project area, include seasonal variations for production.

7.7 Section 7 Existing Water Resource and Transmission Infrastructure

Include a written description of the existing water resource and transmission infrastructure including wells, pumping stations and storage reservoirs. Present the information on maps and schematically to demonstrate the method of operation. Include tabulated details of location, size, performance, age and condition of the assets.

7.8 Section 8 Existing Water Supply Infrastructure

Include a written description giving an overview for the project area of the existing water supply distribution infrastructure based on extrapolation of the towns visited in the project area and existing information available for smaller towns. For larger towns this must include information gained on the ground. Present the information on maps and, where required, schematically to demonstrate the method of operation. Include tabulated details of location, size, performance, age and condition of the assets.

7.9 Section 9 Existing Wastewater Collection & Treatment Infrastructure

Include a written description of the existing wastewater collection & treatment infrastructure including household collection, sewerage systems and treatment plants. Include information regarding the method and location of disposal of treated and untreated wastewater. Present the information on maps and, where required, schematically to demonstrate the method of operation. Include tabulated details of location, size, performance, age and condition of the assets.

7.10 Section 10 Infrastructure Design Criteria & Assumptions

This section should include the plan design criteria and assumptions used to assess the infrastructure requirements costs for each section of the plan including, but not limited to, the following:

Water Resources & Transmission

Wells & Well Sites: Hydrological criteria and assumptions. Criteria for well & well pump design, well depth, pump setting, design pumping rate, hours per day pumped, seasonal variation and annual reliable yield. Criteria for well site equipment design, well site storage, standby power. Assumed treatment facilities at site. Filling points for tankers. Basis for assumed area of well site.

Bulk Water Transmission Mains: Design velocity and peak velocity. Pipe friction factors over the lifetime of the scheme. Friction factors of existing pipelines. Percentage of main constructed in or out of highway.

Bulk Water Storage Reservoirs: Balancing storage requirements for demand variation and pumped flow variations, emergency storage requirements, dead volume within reservoirs. Assumed area of reservoir site based on volume.

Bulk Water Transmission Pump Stations: Criteria for pump station design, assumed duty & standby arrangements, design pumping rate, hours/day. Criteria for ancillary site equipment design, site storage, standby power, filling points for tankers.

Water Supply Distribution Systems

Distribution Reservoirs: Balancing storage requirements, emergency storage requirements, fire fighting requirements including allowances for seasonal variations in demand.

Distribution Networks: Peak design flows based on diurnal and seasonal variations and fire fighting flows. Minimum system operating pressure at peak flow. Maximum operating pressure at static flow. Maximum variation in pressure with a system. Assumptions for zoning, bulk metering. Service pipes. Urban and Rural networks.

Water & Sanitation

Sewerage Systems: Criteria for applicability of waterborne municipal sewerage systems v's household. Assumptions for water use v's wastewater production. Peak flows v's system size/population. Design assumption separate or combined. Allowance for infiltration/exfiltration. Maximum and minimum design velocities. Criteria for manhole location. Assumptions for sewer depth. Assumptions for number of manholes.

Wastewater Pumping Stations: Assumptions for station design. Peak flows v's average flow. Wet well storage, pump configuration. Standby power requirements and other ancillary works at site. Assumed footprint size of pump station versus design flow.

Wastewater Treatment Plant (WWTP): Rationale and criteria for WWTP distribution. Criteria for location of WWTP. Rationale for treatment type for location and size of WWTP. Assumptions used for flows and loads forwarded for treatment. Assumptions for diurnal and seasonal flow variations. Final effluent standards, including those for discharge to water course and for re-use. Assumptions for footprint size of works versus treatment type and flows to be treated. Assumptions for standby power requirements and other ancillary site works.

Wastewater Re-use: Assumptions for volumes available for re-use on a daily basis and seasonal variations in availability versus demand. Economic and technical criteria for design storage volumes for wastewater for re-use. Assumptions and criteria for the design of re-use pumping stations and re-use wastewater pumping stations and distribution.

7.11 Section 11 Water Resource & Transmission Infrastructure Gap Analysis

Include a time based written assessment for the design horizon of the plan of the existing water resources and transmission infrastructure to be able to abstract and deliver the assessed water demands and provide the required emergency and balancing storage. The time based assessment should take allowance of the age and condition of existing assets and their assumed asset life, indicating when major refurbishment or asset replacement may be required.

7.12 Section 12 Water Supply Infrastructure Gap Analysis

Include a time based written assessment for the design horizon of the plan of the existing water supply distribution infrastructure to be able to efficiently deliver services with a service area and provide the required emergency & balancing storage. The time based assessment should take allowance of the age and condition of existing assets and their assumed asset life, indicating when major refurbishment or asset replacement may be required.

7.13 Section 13 Wastewater Collection & Treatment Infrastructure Gap Analysis

Include a time based written assessment for the design horizon of the plan of the wastewater collection and treatment infrastructure to be able to meet the demands of the project areas. The time based assessment should take allowance of the age and condition of existing assets and their assumed asset life, indicating when major refurbishment or asset replacement may be required. Include wastewater re-use assets.

7.14 Section 14 Economic & Financial Criteria

In terms of financial and economical analysis the emphasis will be on feasibility studies. All investments will align with PWA's strategies and the analysis process will cover master plans, investment plans, and implementation plans.

Plans

The main efforts around feasibility studies will be carried out at master plan level – subsequently there will only be a need for minor modifications at investment plan and implementation plan levels.

Master plans cover twenty-year periods – investments should be chosen within the context of a long-term perspective and maximise benefits for all. Investment plans cover five-year periods and will be prepared within each master plan – the objective is properly costed feasible investments ready for implementation. Implementation plans cover three-year periods and will be extracted from each investment plan – the objective is properly costed feasible investments ready for inclusion in the budget cycle of the Ministry of Finance.

On master plans, as indicated previously, a number of options will initially be identified for each master plan investment package with the costs being indicative rather than detailed and one specific option will be chosen for further investigation. Costs for each option chosen will then be subject to a detailed feasibility study including financial and economic analysis – only investments deemed feasible following a feasibility study should be included in approved master plans.

Master plans (and investment and implementation plans) should ensure that all relevant capital costs are taken into consideration including design, supervision, research, capacity building, institutional strengthening, community participation (stakeholders engagement, public consultation and information programmes) etc. It should be noted that the choice of technologies can make a big difference to costs as can operational flexibility, modes of construction, phasing of developments, implementation models, etc. It is also important to consider operation and maintenance costs (O&M), the full life cycle of assets, the costs of replacement after the design life expires etc.

Feasibility Studies

Master plans should only include investments that are realistic and viable. Feasibility studies should be carried out for the individual investments of the master plans. In order to identify the most appropriate interventions, a feasibility study should assess the technical, financial /economic, institutional /capacity building, social and environmental aspects of each investment as well as the timing (phases) of the investment, regulatory and legal issues, stakeholders perceptions etc.

Cost-benefit analysis should be carried out as part of a feasibility study. It is important that the life-time feasibility cycle is properly addressed and that like is compared with like. Finance-related matters to be covered in a feasibility study include:

- Capital costs (including contingencies, design /engineering, supervisory contracts etc.);
- Relevant replacement costs during the lifetime of the investment;
- O&M costs over the lifetime of the investment;
- Revenues over the lifetime of the investment;
- Costs for capacity building measures;
- Costs for institutional arrangements;
- Other relevant costs.

Sustainability, realism and affordability are crucial factors. O&M costs should be analysed and the level of cost recovery required to ensure sustainable operations should be clearly identified – O&M costs should be covered by tariffs i.e. over an investment's lifetime, costs should be minimised and revenues (tariffs) should be maximised. Related tariff issues should be addressed and a phased politically acceptable plan for introducing cost recovery tariffs should be agreed – most likely some form of cross-subsidised tariffs will need to be introduced; other factors include affordability and willingness-to-pay as well as poverty alleviation and benefits to the poor (particularly women and children). Realistically wastewater tariffs will not always be sufficient to cover the full O&M costs in the short-term and the need for subsidies should be addressed together with possible sources.

All assumptions underlying the feasibility study should be clearly described including the main inputs required to ensure success. Different scenarios may be appropriate and other matters to be specifically addressed include:

- Risks analysis; and
- Sensitivity analysis.

In addition it may be necessary to prepare an analysis of the existing financial position, assets and liabilities, commercial performance etc. of the municipality and/or service provider expected to be the beneficiary(ies) of the investment(s).

Investment Screening

To ensure sustainability each new investment should be screened before the final investment is authorized to ensure that the likely local resources are sufficient to fund continuing O&M costs i.e. tariffs for each investment should be sufficient to fund the continuing O&M costs of the relevant services. If there is an O&M financing gap a solution should be provided before the capital investment goes ahead (e.g. the choice of technology, service standards etc. should be revisited). It should be unacceptable for unfunded O&M commitments to exist in the pre-implementation planning phase of any investment.

Funding

Master plans should include, as far as is practical, detailed proposals for funding. In this respect, it is recommended that there are lists of prioritised investment projects with total and year-by-year funding requirements. In the present circumstances funds will most likely be provided mainly by donors and to a limited extent by the Government. In certain circumstances Government funds could also be used for subsidies. Due consideration should be given to connection fees and community contributions (cash and/or in-kind) as a source of funds.

Other

If possible consideration should be given to identifying projects, facilities and services which may be suitable for private sector participation.

At a minimum, each investment should reflect the following factors:

- designs should not be over-engineered and/or over-dimensioned;
- value for money;
- benefits of economies of scale, modular solutions, upgradable options etc.;
- sustainability of O&M and related tariff issues;
- practical logistical aspects; and
- the technology (or technologies) should be supported locally.

One cost-related suggestion (to safeguard that costs are reasonable) is that the cost of intervention per head of population could be determined for each investment package – a data base could be established to enable benchmarking to be carried out.

Economic and financial criteria are dealt with in more detail at **Appendix C** (Financial and Economic Analysis) which contains Appendix C1 (Plans and Costing) and Appendix C2 (Financing Water and Wastewater Investments).

7.15 Section 15 Alternative Outline Plans & Justification of Proposed Solutions

Include three separate outline plans for each of water resources & transmission, water supply distribution and sanitation which fulfil the requirements of the Strategy and meet the needs. These should be high level plans i.e. not too detailed to be included in the master plan. These should then be compared and the agreed solution should be justified and moved forward for development into a master plan.

7.16 Section 16 Methodology & Development of Final Master Plan

This section should include all details of the development of the master plan and the methodology and justification and discussion of those methods, including the proposed phased implementation of the plan. The information in this section will be more detailed and complex than that contained in Volume 1, however it should be presented clearly and logically so that the reader can easily understand the conclusions included in Volume 1.

7.17 Section 17 Methodology & Development Economic Analysis of Final Master Plan

This section should include an economic analysis of the master plan, separated by water resource & transmission, water supply distribution, wastewater collection and treatment and wastewater re-use and summarized for the whole plan. It should include an assessment of the capital and operational costs. Operational costs should include all the costs involved in providing the services included in the plan. It should further include the costs of the organisational capacity building required during the design horizon of the scheme. The analysis should assess the tariff requirements for the lifetime of the project for both full cost recovery and cost recovery based on meeting only operational costs. It

should include external/internal funding and financing requirements based upon the expenditure profile and the cost recovery gap based on the ability of customers to pay for those services.

The methodology used to assess the cost of the plan should use a simplified unit costs method which reflects the overall cost of the plan which can be easily manipulated when the plan is re-visited in five years. However the unit costs used to develop the simplified units costs must be realistic and justified, and the build-up should reflect the assumptions made in the plan design criteria. Particular attention should be made to the costs of developing access to sites and providing mains electricity supply.

7.18 Section 18 Methodology & Development of 5 year Investment Plans

This section should include all details of the development of the 5 year investment plans. It should be based upon the 1st five years of the requirements of the master plan. Where no plan exists it should include methodology and justification of the plan based on the National Policy and Strategy. It should include a more detailed evaluation of the schemes included in the master plan and include discussion of the proposed construction programme. The information in this section will be more detailed and complex than that contained in Volume 1, however it should be presented clearly and logically so that the reader can easily understand the conclusions included in Volume 1.

7.19 Section 19 Methodology & Development of Cost Analysis of Investment Plans

The section shall include a detailed breakdown of the capital costs and expenditure profiles for water and sanitation investment plans separated by water resource & transmission, water supply distribution, wastewater collection and treatment and wastewater re-use and summarized for the five year plan. It should further include the costs of the organisational capacity building required for the work to be implemented. It should include external/internal funding and financing requirements to implement the works.

The methodology used to assess the cost of the plan should not constitute a full engineering estimate but still must reflect the overall cost of the investment plan and pay particular attention to the cost of the larger schemes included in the plan. Particular attention should be made to the costs of developing access to sites and providing mains electricity supply.

7.20 Section 20 Methodology & Development of 3 year Implementation Plans

This section should include the methodology for the logical development of either individual items of infrastructure or collated items of infrastructure to be implemented as single projects from the 5 year investment plans. It should include the “score” sheets used to prioritize each project to justify their inclusion in the list and detail any further actions required before they can go to construction. The programme should make allowance for all the actions required from “approval of project” including the time taken to tender the design and supervision, design and tendering process, construction and handover.

7.21 Section 21 Methodology & Cost Development - 3 year Implementation Plans

A detailed cost estimate of the individual projects should be included in this section. The costs for individual projects in this section should be based on all the known information regarding the proposed project. Particular attention should be made to the costs of developing access to sites and providing mains electricity supply.

Appendices

Appendix A Example Tables

Appendix A1.1 Example Tables – Water Resource & Transmission Planning

Table 1 – Water Resource Assets – Example

Plan Year	Asset Type	Asset	Location	Northing	Easting	GI (masl)	SWL (masl)	DWL (masl)	Design Flow (m3/hr)	Design Yield (MCM/yr)	Cost \$
0-5	R	New Well & Well Site	Jenin	132045	191021	700	400	300	60	0.44	\$1,000,000
0-5	R	Well Refurbishment	Tulkarem	130021	190029	200	-100	-200	70	0.51	\$200,000
5-10	R	New Well Pump & Site Works	Salfit	127798	190029	150	-150	-250	90	0.66	\$500,000
5-10	R	New Well & Well Site	Nablus	124821	187211	400	100	0	25	0.18	\$1,000,000
10-15	R	New Well & Well Site	Tubas	123035	186021	200	-100	-200	85	0.62	\$1,000,000
10-15	R	New Well & Well Site	Qalqiliya	100069	176323	160	-140	-240	70	0.51	\$1,000,000
15-20	R	New Well & Well Site	Jenin	119786	183169	700	400	300	50	0.37	\$1,000,000
15-20	R	New Well & Well Site	Tulkarem	115592	177833	200	-100	-200	150	1.10	\$1,000,000

Table 2 – Transmission Mains – Example

Plan Year	Asset Type	Asset	From	To	Length (km)	Diameter (mm)	Design Flow (m3/hr)	Design Flow (MCM/yr)	Cost \$
0-5	TM	Transmission Main	Jenin	Tubas	16	300	382	2.79	\$4,800,000
0-5	TM	Transmission Main	Tulkarem	Salfit	20	400	679	4.95	\$8,000,000
5-10	TM	Transmission Main	Salfit	Tubas	23	200	170	1.24	\$4,600,000
5-10	TM	Transmission Main	Tubas	Nablus	46	300	382	2.79	\$13,800,000
10-15	TM	Transmission Main	Nablus	Tubas	17	400	679	4.95	\$6,800,000
10-15	TM	Transmission Main	Tubas	Qalqiliya	21	600	1,527	11.15	\$12,600,000
15-20	TM	Transmission Main	Qalqiliya	Jenin	42	300	382	2.79	\$12,600,000
15-20	TM	Transmission Main	Jenin	Tulkarem	36	250	265	1.94	\$9,000,000
15-20	TM	Transmission Main	Tulkarem	Jenin	13	250	265	1.94	\$3,250,000

Table 3 – Transmission Pump Stations – Example

Plan Year	Asset Type	Asset	From	To	Northing	Easting	PS GI (masl)	Destination GI (masl)	Design Flow (m³/hr)	Design Flow (MCM/yr)	Cost \$
0-5	TPS	Transmission Pump Stn.	Jenin	Tubas	132045	191021	200	400	60	0.44	\$600,000
5-10	TPS	Transmission Pump Stn.	Salfit	Tubas	127798	190029	100	150	90	0.66	\$900,000
10-15	TPS	Transmission Pump Stn.	Tubas	Qalqiliya	123035	186021	50	100	85	0.62	\$850,000
15-20	TPS	Transmission Pump Stn.	Tulkarem	Jenin	115592	177833	30	70	150	1.10	\$1,500,000

Table 4 – Transmission Storage – Example

Plan Year	Asset Type	Asset	Location	Northing	Easting	GI (masl) at Reservoir	Volume MI	Cost \$
0-5	TSR	Transmission Storage Reservoir	Jenin	132045	191021	200	1,200	\$600,000
5-10	TSR	Transmission Storage Reservoir	Salfit	127798	190029	100	1,800	\$900,000
10-15	TSR	Transmission Storage Reservoir	Tubas	123035	186021	50	1,700	\$850,000
15-20	TSR	Transmission Storage Reservoir	Tulkarem	115592	177833	30	3,000	\$1,500,000

Appendix A1.2 Example Tables – Water Supply Distribution Assets

Table 5 – Distribution Storage – Example

Plan Year	Asset Type	Asset	Location	Volume M³	No.	Cost \$
0-5	DSR	Distribution Storage Reservoirs	Project Wide	0-100	17	\$170,000
0-5	DSR	Distribution Storage Reservoirs	Project Wide	100-500	27	\$675,000
0-5	DSR	Distribution Storage Reservoirs	Project Wide	500-1,000	22	\$1,650,000
0-5	DSR	Distribution Storage Reservoirs	Project Wide	1,000-5,000	24	\$6,000,000
5-10	DSR	Distribution Storage Reservoirs	Project Wide	5,000-10,000	13	\$3,250,000
5-10	DSR	Distribution Storage Reservoirs	Jenin	10,000	1	\$500,000
5-10	DSR	Distribution Storage Reservoirs	Qalqiliya	12,000	2	\$600,000
10-15	DSR	Distribution Storage Reservoirs	Nablus	15,000	1	\$750,000
10-15	DSR	Distribution Storage Reservoirs	Tubas	20,000	1	\$1000,000
15-20	DSR	Distribution Storage Reservoirs	Tulkaren	15,000	1	\$750,000

Table 6 – Supply Distribution Network – Example

Plan Year	Asset Type	Asset	Location	No. of Communities	Population Served	Cost \$
0-5	RDN	New or Extended Rural Networks	Project Wide	14	36,000	\$4,000,000
0-5	UDN	New or Extended Urban Networks	Project Wide	7	11,000	\$1,100,000
0-5	RDN	Rehabilitate Rural Networks	Project Wide	14	60,000	\$4,500,000
0-5	UDN	Rehabilitate Urban Networks	Project Wide	23	30,000	\$1,800,000
0-5	RDN	Network Management & NRW Reduction Projects	Project Wide	11	20,000	\$400,000
5-10	DSR	New or Extended Rural Networks	Project Wide	9	10,000	\$500,000
5-10	DSR	New or Extended Urban Networks	Project Wide	6	12,000	\$600,000
10-15	DSR	Rehabilitate Rural Networks	Project Wide	4	15,000	\$750,000
10-15	DSR	Rehabilitate Urban Networks	Project Wide	11	20,000	\$1000,000
15-20	DSR	Network Management & NRW Reduction Projects	Project Wide	3	15,000	\$750,000

Table 7 – Supply Distribution Pump Stations – Example

Include tables for pump stations, distribution pipes etc.

Appendix A1.3 Example Tables – Sanitation Assets

Table 8 – Sewerage Network – Example

Plan Year	Asset Type	Asset	Location	No. of Communities	Population Served	Cost \$
0-5	RSN	New or Extended Rural Sewerage Networks	Project Wide	14	36,000	\$4,000,000
0-5	USN	New or Extended Urban Sewerage Networks	Project Wide	7	11,000	\$1,100,000
0-5	RDN	Rehabilitate Rural Sewerage Networks	Project Wide	14	60,000	\$4,500,000
0-5	UDN	Rehabilitate Urban Sewerage Networks	Project Wide	23	30,000	\$1,800,000
5-10	DSR	New or Extended Rural Sewerage Networks	Project Wide	9	10,000	\$500,000
5-10	DSR	New or Extended Urban Sewerage Networks	Project Wide	6	12,000	\$600,000
10-15	DSR	Rehabilitate Rural Sewerage Networks	Project Wide	4	15,000	\$750,000
15-20	DSR	Rehabilitate Urban Sewerage Networks	Project Wide	3	15,000	\$750,000

Table 9 – Wastewater Transmission Pump Stations – Example

Plan Year	Asset Type	Asset	From	To	Northing	Easting	PS GI (masl)	Destination GI (masl)	Design Flow (m³/hr)	Design Flow (MCM/yr)	Cost \$
0-5	WWTPS	WW Trans Pump Stn.	Jenin	Tubas	132045	191021	200	400	60	3,200	\$600,000
5-10	WWTPS	WW Trans Pump Stn.	Salfit	Tubas	127798	190029	100	150	90	2,700	\$900,000
10-15	WWTPS	WW Trans Pump Stn.	Tubas	Qalqiliya	123035	186021	50	100	85	1,700	\$850,000
15-20	WWTPS	WW Trans Pump Stn.	Tulkarem	Jenin	115592	177833	30	70	150	3,000	\$1,500,000

Table 10 – Wastewater Transmission Mains – Example

Plan Year	Asset Type	Asset	From	To	Length (km)	Diameter (mm)	Design Flow (m ³ /hr)	Design Flow (m ³ /day)	Cost \$
0-5	WWTM	WW Transmission Main	Jenin	Tubas	16	300	382	7,640	\$4,800,000
0-5	WWTM	WW Transmission Main	Tulkarem	Salfit	20	400	679	1,358	\$8,000,000
5-10	WWTM	WW Transmission Main	Salfit	Tubas	23	200	170	3,400	\$4,600,000
5-10	WWTM	WW Transmission Main	Tubas	Nablus	46	300	382	7,640	\$13,800,000
10-15	WWTM	WW Transmission Main	Nablus	Tubas	17	400	679	1,358	\$6,800,000
10-15	WWTM	WW Transmission Main	Tubas	Qalqiliya	21	600	1,527	3,054	\$12,600,000
15-20	WWTM	WW Transmission Main	Qalqiliya	Jenin	42	300	382	7,640	\$12,600,000
15-20	WWTM	WW Transmission Main	Jenin	Tulkarem	36	250	265	5,300	\$9,000,000
15-20	WWTM	WW Transmission Main	Tulkarem	Jenin	13	250	265	5,300	\$3,250,000

Table 11 – Wastewater Treatment Plants – Example

Plan Year	Asset Type	Asset	From	To	Northing	Easting	PS GI (masl)	Destination GI (masl)	Design Flow (m ³ /hr)	Design Flow (MCM/yr)	Cost \$
0-5	WWTP	WW Treatment Plant	Jenin	Tubas WWTP	132045	191021	200	400	60	3,200	\$600,000
5-10	WWTP	WW Treatment Plant	Salfit	Tubas WWTP	127798	190029	100	150	90	2,700	\$900,000
10-15	WWTP	WW Treatment Plant	Tubas	Qalqiliya WWPT	123035	186021	50	100	85	1,700	\$850,000
15-20	WWTP	WW Treatment Plant	Tulkarem	Jenin WWTP	115592	177833	30	70	150	3,000	\$1,500,000

Table 12 – Wastewater Re-use Assets – Example

Include tables for storage, pumping stations, filling points and distribution pipes

Appendix B - Planning Process Flows

Figure B1.1 – Master Planning

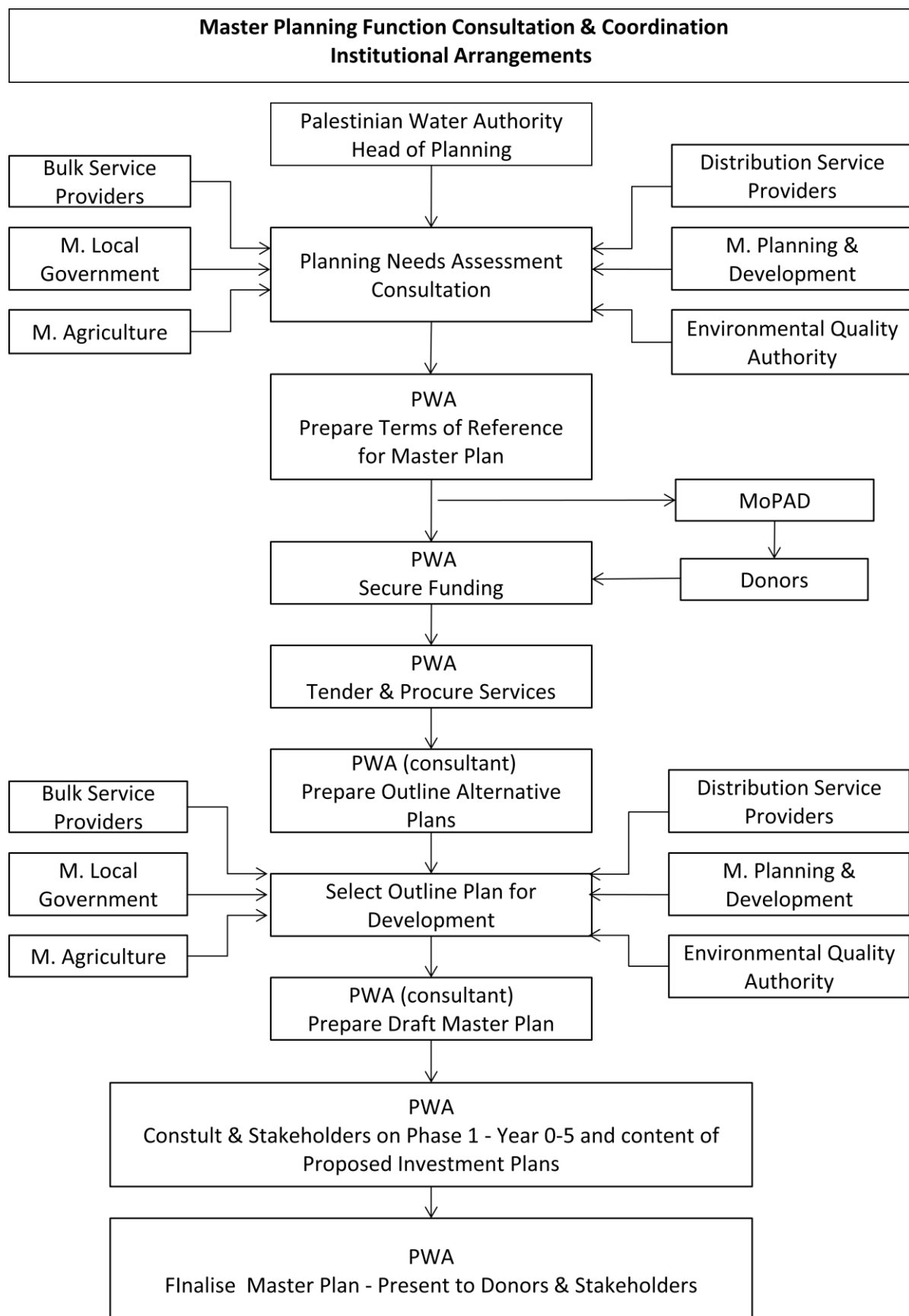


Figure B1.2 – Investment & Implementation Planning

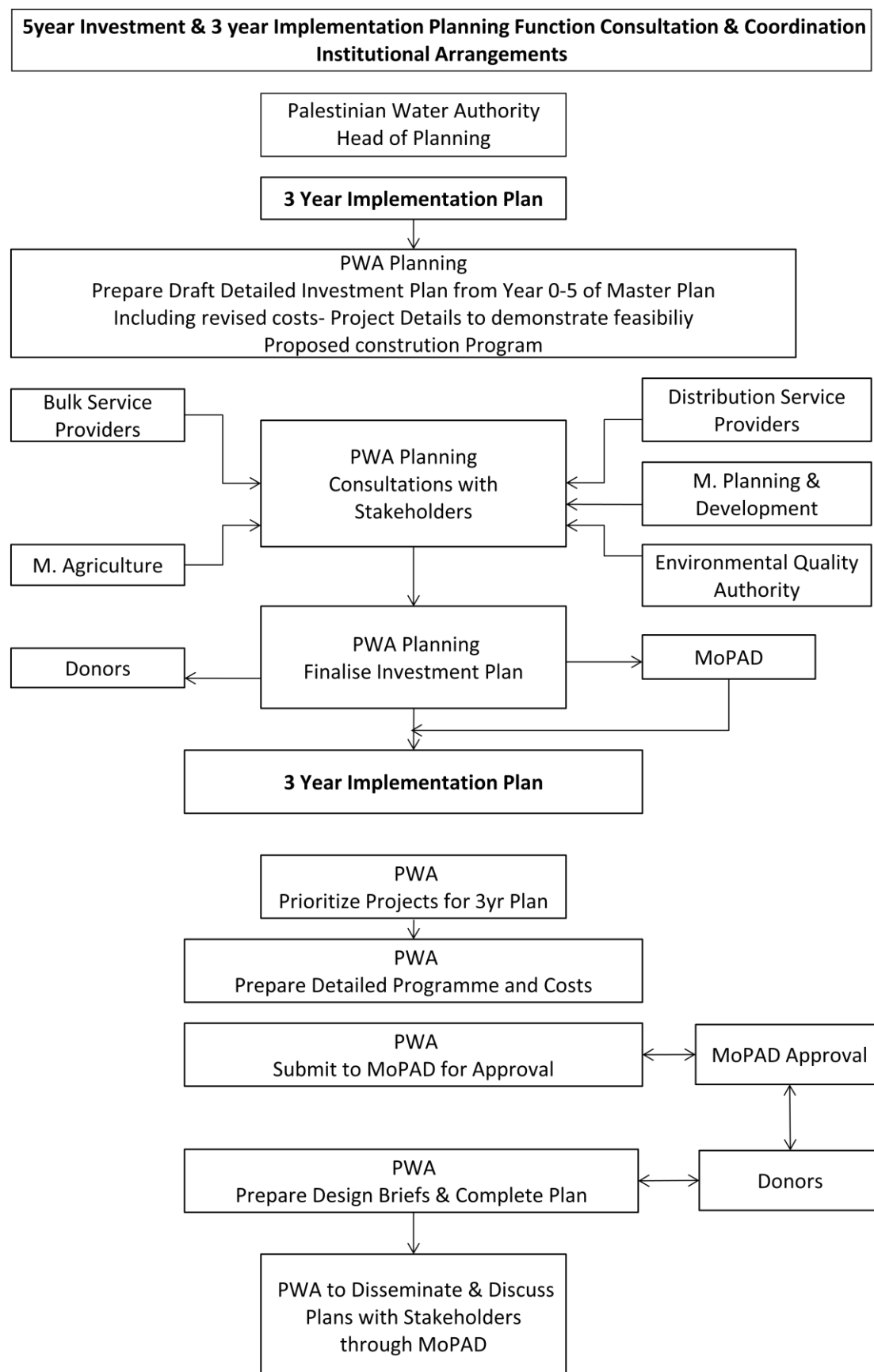


Figure B2.1 Master Planning

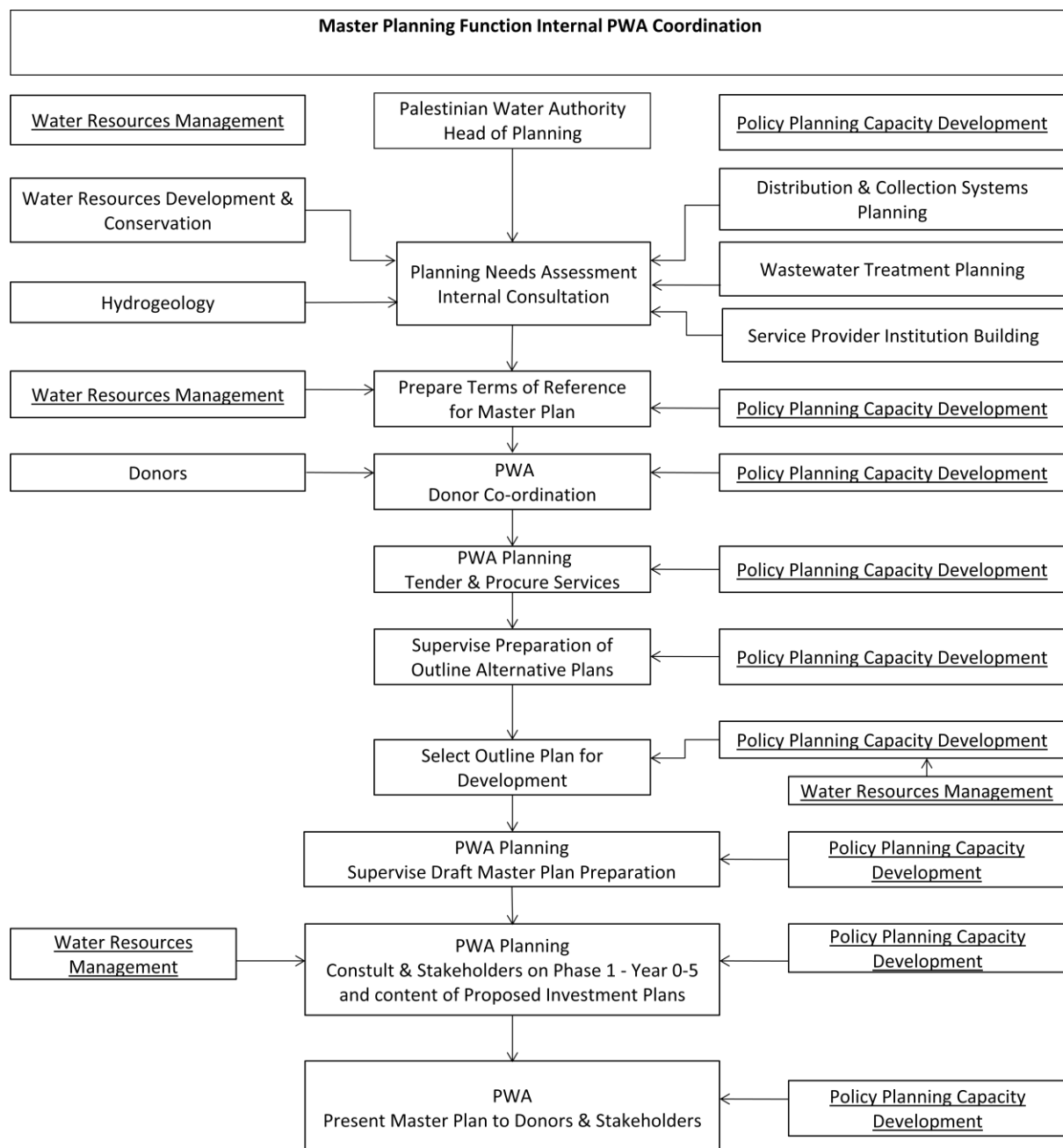
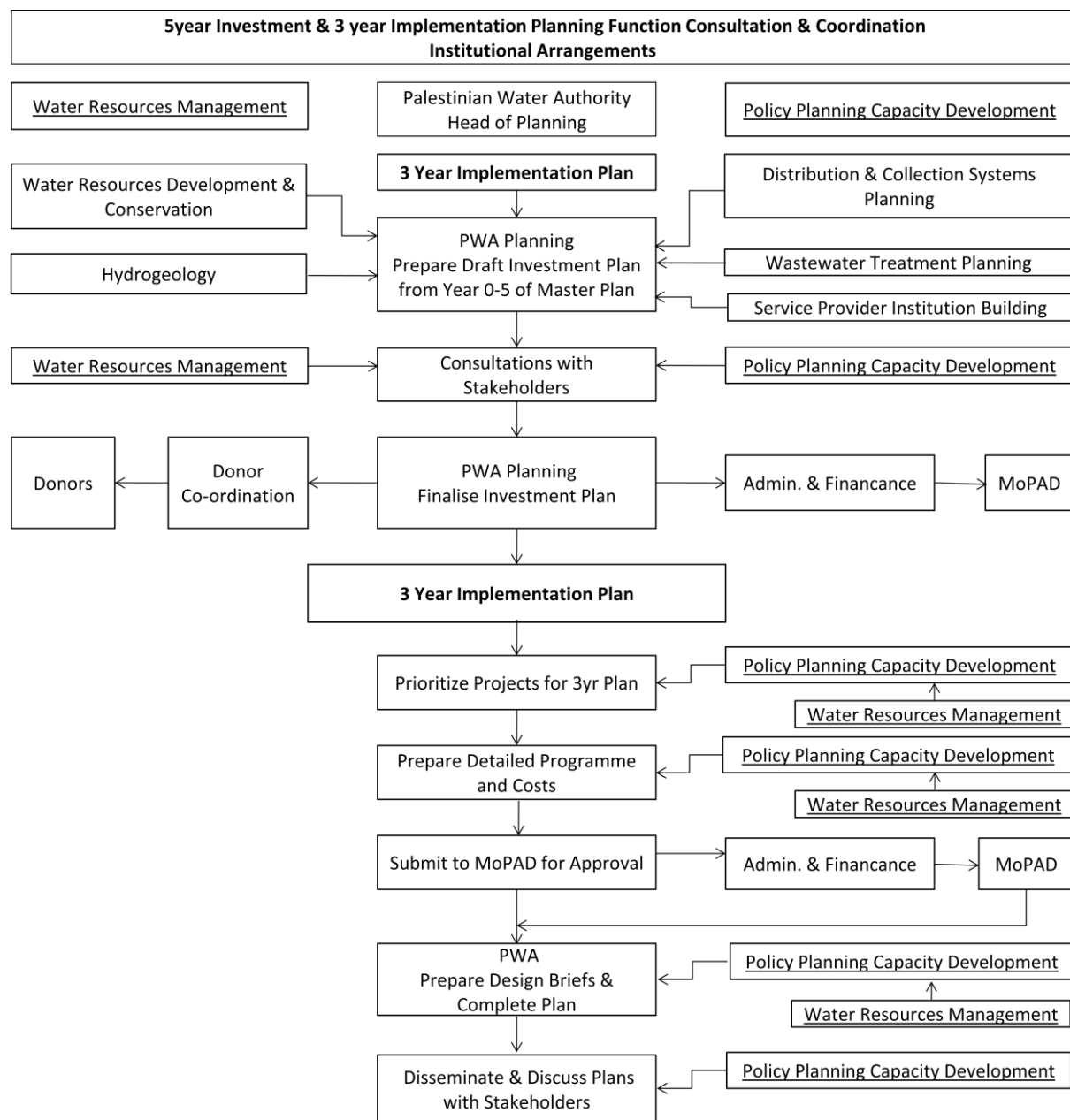


Figure B2.2 Investment & Implementation Planning



Appendix C Financial and Economic Analysis

Appendix C1 Plans and Costing

1. Planning Process

As explained elsewhere, the planning process covers:

- Master plans;
- Investment plans; and
- Implementation plans.

It is expected that all plans will align with PWA's strategies. In terms of financial and economical analysis the emphasis will be on feasibility studies.

2. Strategies

High-level strategies are in place and these provide guidance as to PWA's future direction. Strategies will direct where resources should be allocated and will ensure that resources are focused on key priorities. Costs in the strategies are high-level costs. An important factor in relation to strategies is the need for flexibility i.e. there should be a willingness to change priorities as circumstances change.

3. Master Plans

Master plans should be realistic as well as being feasible and viable. Master plans are assumed to cover a twenty-year period. A number of master plans will be prepared to cover different parts of the country. The ultimate objective should be a list of costed investments ranked in order of implementation priority. Each master plan will try to ensure that resources are allocated efficiently and effectively. There are a number of different stages required to successfully complete each master plan and these are dealt with elsewhere in this document. In general, master plans entail extensive data compilation and analysis, appraisal and selection of specific projects and programmes, and detailed proposals for implementation. Investments should be chosen within the context of a long-term perspective and should aim to maximise benefits (financial, social, environmental etc.) for all parties concerned.

With respect to master plans it is expected that a number of investment packages will initially be identified to fulfil the requirements of the master plan and that a number of options will be put forward for each such investment package. The costs of these options will be indicative rather than detailed. Even so, it is important that capital costs and recurrent costs (mainly O&M, operations and maintenance costs) are considered as well as revenue prospects. For each investment package the aim will be to generate discussions as to the appropriateness of each option and to choose one specific option for further investigation.

It is expected that for each investment package only one option will be chosen for further investigation. Costs for each option chosen in the master plan will be subject to a more detailed appraisal including financial and economic analysis. Only investments deemed feasible following a feasibility study should be included in the approved master plans. It is intended that the main efforts around feasibility studies will be carried out at master plan level and that subsequently there will only be a need for minor modifications at investment plan and implementation plan levels. Feasibility studies are dealt with in more detail in a separate section below.

As previously indicated, efforts should be devoted to estimating recurrent costs (mainly O&M, operations and maintenance costs) as well as capital costs. Master plans should also include capacity building and institutional strengthening improvement measures.

One cost-related suggestion is that the cost of intervention per head of population should be determined for each investment package – it would be worthwhile if some form of data base could be established to enable benchmarking to be carried out to safeguard that costs are reasonable. In addition such benchmarking would be of help in ensuring that resources are used effectively.

4. Funding

Master plans should include, as far as is practical, detailed proposals for funding. It is considered that in the present circumstances funds will be provided mainly by donors and to a limited extent by the Government. To facilitate this process, it is necessary that there are clear selection criteria and priorities, lists of prioritised investment projects with total and year-by-year funding requirements etc. Even though they are relatively limited, due consideration should also be given to connection fees and community contributions (cash and/or in-kind) as a source of funds.

5. Costing

Master plans (and indeed investment plans) should ensure that all relevant capital costs are taken into consideration including design, supervision, research, capacity building, institutional issues, community participation (stakeholders engagement, public consultation and information programmes) etc. In addition it should be noted that the choice of technologies can make a big difference to costs as can operational flexibility, modes of construction, phasing of developments, implementation models, etc. It is also important to consider operation and maintenance costs (O&M), the full life cycle of assets, the costs of replacement after the design life expires etc.

6. Investment Plans

An investment plan will be prepared for each master plan. Investment plans are assumed to cover a five-year period. The ultimate objective should be properly costed feasible investments ready for implementation. It should be ensured that limited resources are focused on key priorities.

As indicated above, an investment plan will include only investments deemed feasible following feasibility studies at master plan level. Investment plans should include capacity building and institutional strengthening improvement measures.

7. Implementation Plans

An implementation plan will be extracted from each investment plan (as indicated previously, investment plans will be sufficiently detailed to enable implementation). Investment plans are assumed to cover a three-year period. The ultimate objective should be properly costed feasible investments ready for inclusion in the budget cycle of the Ministry of Finance.

8. Feasibility Studies

Master plans should include investments that are realistic, feasible and viable. As indicated above, only investments deemed feasible following a feasibility study should be included in the master

plans (feasibility studies will mainly be carried out at master plan level with minor modifications at investment plan and implementation plan levels).

Feasibility studies should be carried out for the individual investments of the master plans. Within each investment there may be a number of sub-components and these should also be addressed. In order to identify the most appropriate interventions, a feasibility study should assess the technical, financial /economic, institutional /capacity building, social and environmental aspects of each investment as well as the timing (phases) of the investment. In addition it may be necessary to consider regulatory and legal issues, stakeholders perceptions etc.

Cost-benefit analysis should be carried out as part of a feasibility study. Finance-related matters to be covered in a feasibility study include:

- Capital costs (including contingencies, design /engineering, supervisory contracts etc.);
- Relevant replacement costs during the lifetime of the investment;
- O&M costs over the lifetime of the investment;
- Revenues over the lifetime of the investment;
- Costs for capacity building measures;
- Costs for institutional arrangements; and
- Other relevant costs.

Where possible costs should be broken down into foreign exchange and local currency costs.

It is important that the life-time feasibility cycle is properly addressed and that like is compared with like e.g. in a twenty year investment project the cost of an asset with a lifetime of ten years should be included twice (say in year 1 and again in year 11) whereas the cost of an asset with a lifetime of twenty years should only be included once (say in year 1).

Sustainability, realism and affordability are crucial factors. O&M costs should be covered by tariffs i.e. in simple terms over an investment's lifetime costs (based on efficient operations) should be minimised and revenues (based on cost recovery principles) should be maximised. O&M costs should be analysed and the level of cost recovery required to ensure sustainable operations should be clearly identified. Tariff issues should be addressed at the earliest possible stage of the investment and a phased politically acceptable plan for introducing cost recovery tariffs should be agreed. Most likely some form of cross-subsidised tariffs will need to be introduced. Related factors to be considered include affordability and willingness-to-pay as well as poverty alleviation and benefits to the poor, particularly women and children. Realistically wastewater tariffs will not always be sufficient to cover the full O&M costs in the short-term and the need for subsidies should be addressed together with possible sources.

All assumptions underlying the feasibility study should be clearly described including the main inputs required to ensure success. Different scenarios may be appropriate and other matters to be specifically addressed include:

- Risks analysis; and
- Sensitivity analysis.

In addition it may be necessary to prepare an analysis of the existing financial position, assets and liabilities, commercial performance etc. of the municipality and/or service provider expected to be the beneficiary(ies) of the investment(s).

9. Private Sector Participation

If possible consideration should be given to identifying projects, facilities and services which may be suitable for private sector participation. In such cases indicative investment costs, operating costs, revenue projections etc. should be available for prospective partners.

Appendix C2

Financing Water and Wastewater Investments

1. General

General points relevant to funds include:

- Funds for new capital investments should be provided by donors and the government;
- Funds for continuing operating costs should be provided, on a facility by facility basis, by tariffs (more specifically tariff revenue collections for each facility's service area); and
- Connection fees and community contributions (cash and/or in-kind) should be considered as a source of funds.

2. Screening and Sustainability

To ensure sustainability of proposed investments there should be a focus on operating (O&M) costs, operational efficiencies and on controlling costs without jeopardizing technical and service standards. As part of this, each new investment should be screened before the final investment is authorized to ensure that the likely local resources are sufficient to fund continuing operating (O&M) costs. If this is not the case, the choice of technology, service standards etc. should be revalidated. In some cases the availability of "free" funds (e.g. donor funds) may encourage the design of over-engineered and/or over-dimensioned solutions with resulting unsustainable O&M costs. "Free" funds may also encourage capital intensive solutions and this should be guarded against to ensure an optimal spread of investments as well as an equitable use of funds.

For all new investments, if there is an O&M financing gap a solution should be provided before the capital investment goes ahead. It should not be accepted for unfunded O&M commitments to exist in the pre-implementation planning phase of any investment.

Compromises may be required on service standards, choice of technology, technical standards etc. to ensure that the widest possible minimally acceptable coverage is achieved within the available funding limits and within a reasonable time period. A range of realistic minimal (clean) water supply and wastewater services standards should be adopted which reflect realities on the ground in a variety of different geographies and/or physical locations. They should also take into consideration the community circumstances of various populations and beneficiary groups.

3. Key Factors

Each investment should, as far as is practical, reflect the following factors:

- designs should not be over-engineered and/or over-dimensioned;
- value for money;
- benefits of economies of scale, modular solutions, upgradable options etc.;
- sustainability of O&M and related tariff issues;
- practical logistical aspects; and
- the technology (or technologies) should be supported locally.

4. O&M Costs

Continuing operating (O&M) costs include purchased (bulk) water, salaries, chemicals, materials, electricity, power, fuel, distribution costs, regular maintenance costs, spare parts, other supplies,

billing and collection costs, general expenses etc. and also financial and administrative costs. If possible depreciation costs should also be included.

5. Tariffs

Tariffs for each facility, on a facility by facility basis, should be sufficient to fund the costs of the continuing operations and maintenance (O&M) of that facility's service area. Predictable regular tariff revenues should be collected on a continuous basis. Funds from all other sources (including government) are not regular and the amounts are not predictable. Without a stream of predictable revenue it will be impossible to operate the related facility over the medium-term in a proper manner and to provide reliable services to beneficiaries.

6. Funds

Donor and Government funds should be directed towards specific capital investments. Government funds could, in theory, also be used for subsidies but this is not recommended as governmental transfers tend to be rather unreliable in their timing and amounts (similar reasoning applies to donor funds but here the uncertainties are of a somewhat different nature).