

Annex 4.19
Training Material for Business Planning in Fall 2017



In the name of Allah, the Beneficent, the Merciful

بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

MODULE - 1

Day-1 Session-1

Introduction of Business Planning Course

Muhammad Kashif
Municipal Financial Specialist



PROJECT

1

Project for Improving the Capacity of WASAs Staff and
Water Sector Service Providers in the Pakistan



BENEFIT MORE FROM THE COURSE

2

- **BE ON TIME** for each session
- **LISTEN** to understand, not to contradict
- **REFLECT** and think through what you hear
- Enhance your understanding by **ASKING QUESTIONS**
- Volunteer to **SHARE YOUR VIEWS** and experience
- **LET OTHERS** have a chance to speak
- **RESPECT** the views of others
- Challenge the ideas, **NEVER THE SPEAKERS**

BENEFIT MORE FROM THE COURSE

3

- **DISAGREE AGREEABLY**, if you must disagree
- **ASK YOURSELF** how the new knowledge can be used
- Respect the **NON-SMOKING RULES** within the building
- Help to keep the building **CLEAN**
- **SWITCH OFF** mobiles phones during the session
- Participants will **MARK ATTENDANCE** in both sessions.

COURSE EVALUATION

4

		Marks	Evaluation Marks
Module 1:	SWOT and GAP Analysis Report	10	
Module 2:	Performance Improvement Plan (Project Cost & Prioritization) Communication Plan	20 10	
Module 3:	Training Plan	10	
Module 4:	Revenue Improvement Plan	10	
Module 5:	Business Plan	40	
		100	

Attendance (1 Marks for each day)

Class Participation

80%

10%

10%

Please Note:

Participants with active participation, maintaining 80% attendance and passing their activities with at least 70% score will be awarded certificates.

TRAINING EVALUATION

5

Purpose

To determine the quality of delivered content, trainers' quality, and overall learning experiences during the training

Form A Course Evaluation

Form B Trainer Evaluation

Participants are required to share their true feelings and ideas. Provide recommendations for further improvement.

COURSE TEAM

6

JICA Expert



Mr. Yasuyuki Kuroda
Water Utilities
Management Expert

Course Leaders



Mr. Muhammad Kashif
Municipal Finance
Specialist



**Engr. Abid Shah
Hussainy**
Senior Capacity
Development Specialist

Course Team

Ms. Sadaf Shah Hussainy
Curriculum Design Specialist
M.Phil Teacher Education and Charles Wallace Fellow

Engr. Rao Ali Raza
Senior Research Analyst
Electrical Engineer

Mr. Asif Iqbal
Financial Management Specialist
Chartered Financial Analyst (CFA)
and MBA (Finance)

Mr. Nizam-ud-Din
Senior. Instructor GIS
M.Sc GIS (Sweden)
Ph.D Scholar (GIS/RS)

Mr. Muhammad Samie
Sr. Instructor, Business Planning
CA, Finalist and MBA

Ms. Aneeqa Azeem
Research Analyst
M.Phil Environment Sciences

COURSE OVERVIEW

7

MODULE

1: Business Planning and GAP Analysis

2: Strategies for Service Delivery Improvement

**3: Strategies for Human Resource
Development**

**4: Strategies for Financial Management System
Improvement**

5: Implementation of Business Plan

DETAILS

Lectures

Individual Assignment

Group Assignment

Simulation Exercise

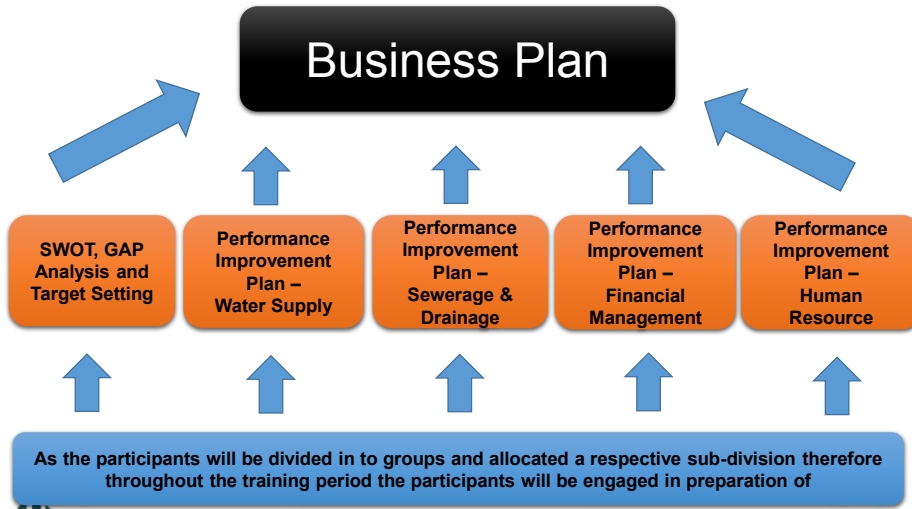
Case Studies

Videos

Role Play

COURSE OUTCOME

8



Form B-01: EXPECTATION FROM COURSE

9

Each Class Participant is requested to fill the following form
(5 Minutes)

Business Planning Course	
Expectation of Class Participants	
Name:	
Designation	
Organization	
Expectation from this Course	
1.	
2.	
3.	
4.	
5.	

REALITY CHECK

GOOD PERFORMANCE AMONG PUBLIC WSS UTILITY



Source: Characteristics of Well Performing Public Water Utilities, Water Supply & Sanitation Working Notes, World Bank, 2006

REALITY CHECK

GOOD PERFORMANCE AMONG PUBLIC WSS UTILITY

Reform Process is **INHERENTLY POLITICAL** and requires the Full Commitment of its Policy Makers to correctly balance Financial & Political Objectives

Success is often Unattainable without reforming the **EXTERNAL ENVIRONMENT** with emphasis on the role of **OWNER**

Fundamental Reforms are **NOT A QUICK FIX** and cannot be substituted by Private Sector Participation.

CERTIAN DECISIONS must be left to Utility Managers

CUSTOMERS AND HUMAN RESOURCE can be an important voice for improving performance

Source: Characteristics of Well Performing Public Water Utilities, Water Supply & Sanitation Working Notes, World Bank, 2006

MODULE 1: OVERVIEW

1) Learning Outcomes

2) DAY 1

- a) Session 1: Introduction to Business Planning and International Best Practice.
- b) Session 2: SWOT & GAP Analysis along with Energy Management Plan
- c) Session 3: GAP Analysis of Energy Management

LEARNING OUTCOME

1) Knowledge Outcome:

- a) Identify Components of Business Plan
- b) Understand the SWOT Analysis concept.
- c) Understand the KPIs of WSS Utilities

2) Skill Set Outcome:

- a) GAP Analysis through Qualitative and Quantities Data
- b) Target Setting on the basis of GAP Analysis

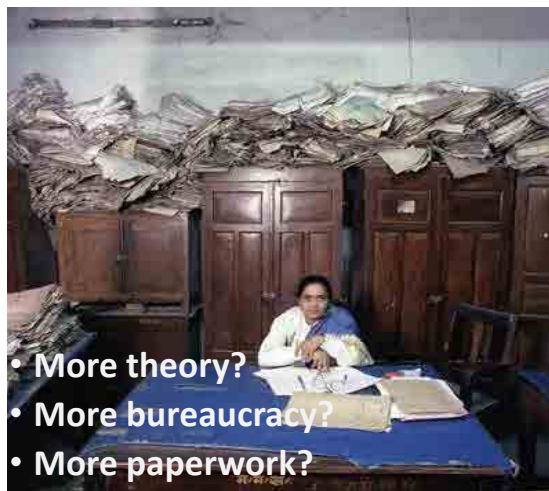
3) Professional Attitude Outcome:

- a) Logical and Analytical thinking
- b) Team Work

INTRODUCTION OF BUSINESS PLANNING COURSE

THANK YOU

Just another PLAN!

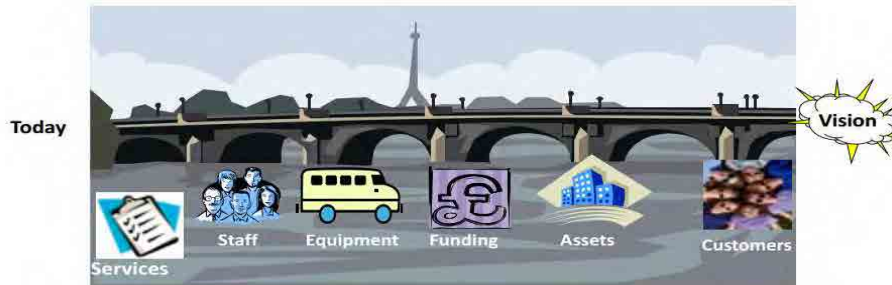


- More theory?
- More bureaucracy?
- More paperwork?

BUSINESS PLAN AND ITS COMPONENTS

14

What is a Business Plan?



Source : www.gov.scot/Resource/0048/00485457.pdf assessed on 4th Jan 2016

The Business Planning as defined by International Benchmarking Network for Water and Sanitation Utilities in "The IBNET Water Supply and Sanitation Performance Blue Book" is defined as

"A business plan presents a detailed roadmap that can guide a utility from its current condition to a desired future state"

Why Business Planning

14

"Can a ship sail without a map and a rudder?"

Without Business Planning any organisation will fail to move towards the intended direction

But...

- Water supply utilities are not ordinary businesses**
- Operate on a highly political level**
- Provide goods and services that are essential for health and poverty reduction**



BUSINESS PLAN AND ITS COMPONENTS

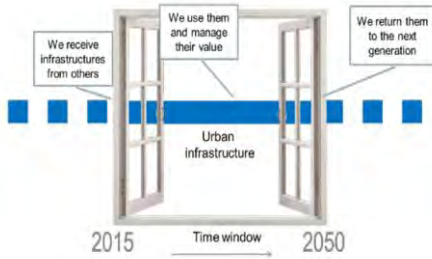
15

Mission and Vision

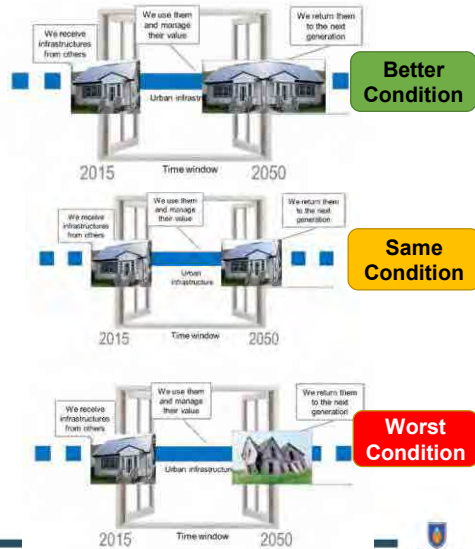
Mission: Where do we need and want to be?

Vision: How do we get there?

Strategy: “How much” of “what” will be accomplished by “When”?



Source : "Integrated Planning of Urban Water Service: A global approach" Manual 1 by European Union Seventh Frame Programme



BUSINESS PLAN AND ITS COMPONENTS

16

Strategies and Action Plan

Strategy:

“How much” of “what” will be accomplished by “When”

Action Plan:

What change will happen, who will do what and when to make it happen

KPIs:

The yardstick to measures the objectives

Strategy	Details	Action Plan				KPIs
		Details	Responsible Official	Start	End	
Metering up to 20%	New Metering Program	Awareness Campaign	Dy Director Admin	Jan-17	Jan-18	Metering Level
		Procurement of Meters for consumers	Dy Director Procurement	Jan-17	Jun-17	
		Installation of Meters	Dy Director O&M	Jun-17	Dec-17	

Source : <http://ctb.ku.edu/en/table-of-contents/structure/strategic-planning/vmosa/main>

BUSINESS PLAN AND ITS COMPONENTS

17

Vision/Mission of International WSS Utility



Vision:
Water for All: Conserve, Value and Enjoy

Mission:
To ensure an efficient, adequate & sustainable supply of water

Source : <https://www.pub.gov.sg/about/missionvision>



Vision:
To be a leading company on water solution in Japan

Mission:
To provide better quality service of water supply and sewerage to the world society

Source : <http://yokohamawater.co.jp/en/company.php>

CAN WE COLLECT OBJECTIVE AND STRATEGIES FROM THE VISION AND MISSION

Strategies:
"How much" of "what" will be accomplished by "When"

BUSINESS PLAN AND ITS COMPONENTS

18

What is the Vision/Mission of your WSS Utility?

WASA LAHORE

FUNCTIONS
WASA is an agency of LDA and is responsible for:
Planning, Designing and Construction of Water Supply, Sewerage & Drainage facilities for:
• New Works
• Rehabilitation and Augmentation of the existing system
Operation and Maintenance of Water Supply, Sewerage & Drainage System.
Billing and Collection of all rates, fees and charges for the services provided to Consumers.

VISION
WASA Lahore to be quality service providing utility, exceeding consumers' expectations through dedicated employees committed to excellence.

MISSION
WASA Lahore would contribute towards making Lahore city cleaner and environment friendly.

- Offering quality consumer services in the field of Water Supply and Sewerage.
- Ensuring cost effective measures in Development works and operation & maintenance.
- Adhering to professional ethics and zero tolerance for corruption.
- Revenue generation at least sufficient to meet with the non development expenditure and to make the system self sustainable.

Source : <http://wasalahore.page.it/Functions-Vision-and-Mission.htm>

WASA RAWALPINDI

Objectives
The Water and Sanitation Agency's objectives are defined as follows:
- To support ecologically sustainable development and to meet the community needs through the provision and maintenance of effective services.
- To provide high quality water supply complying with recognized drinking water standards and to transport and treat sewage for disposal to meet the city's environmental standards.

Our Customer:
To effectively anticipate and to respond appropriately to customer needs.

Our Environment:
To maintain sustainability of the Rawalpindi environment and to the sustainability of the wider environment.

Our People:
To establish and maintain productive and valued staff.

Our Assets:
To apply best practice in operating and maintaining our assets.

Our Finances:
To maintain the WASA as a competitive and financially responsible and accountable entity.

Our Sustainability:
To manage the business to be commercially successful in the longer term.

Our Accountability:
To demonstrate accountability to all stakeholders.

Functions
- Provision and O&M of Water Supply
(i) Sources: Rawal Lake Filtration Plant, Khanpur Dam, Tomar Service Reservoir and Tubewells.
(ii) Distribution Networks including Water Works
- O&M of Sewerage System and related Appliance Billing and Revenue (water charges) collection to attain Financial Sustainability.
- Enforcement against Defaulters / Unauthorised Connections etc.
- Short Term and Long Term Planning for Tapping Additional Water Sources & Implementation to meet water supply and Sewerage demand projected on the period. The long term Projects are:
(i) Rawalpindi Environmental Improvement Project (ADB Funded Project)

Source : <http://www.wasa.rda.gov.pk/AboutUs.htm>

BUSINESS PLAN AND ITS COMPONENTS

What is the Vision/Mission of your WSS Utility?

19

WASA FAISALABAD

The Vision

To be an extraordinary service provider for the citizens of Faisalabad and thereafter to be the Centre of excellence in water sector of the country.

The Mission

To make our customers feel welcome, appreciated, and worthy of our best efforts in everything we do for providing water supply, sewerage and drainage services.

Source:

<http://wasafaisalabad.gov.pk/Home/WASAProfile>

WASA MULTAN

MISSION

1. Improvement of service level of existing Water Supply and Sewerage facilities.
1. Extension of these facilities for entire population of the City including newly developed areas.
1. Improvement of recovery of user charges to make it the self-financing Agency.

Functions

- * Forecasting of demand for services of Water Supply, Sewerage and Drainage, preparation of plans and design for their extension, rehabilitation and replacement.
- * Construction, Improvement, Maintenance and Operation of Water Works, Sewerage Works and Main Storm Water Drainage Channels, and Pumping Stations.
- * Billing and collection of all rates, fees and charges, for the services so provided to the consumers.

Source:

<http://www.multan.gov.pk/page.php?data=60qg>

BUSINESS PLAN AND ITS COMPONENTS

What is the Vision/Mission of your WSS Utility?

20

WASA GUJRANWALA

The Vision

To be an extraordinary service provider for the citizens of Multan and thereafter to be the Centre of excellence in water sector of the country.

The Mission

To make our customers feel welcome, appreciated, and worthy of our best efforts in everything we do for providing water supply, sewerage and drainage services.

Source: <http://www.wasag.gov.pk/Home/WASAProfile>

North Sindh Urban Services Corporation Limited

Vision

To be a leader in sustainable water supply, sewerage and solid waste management, delivery of quality customer services.

Mission: Core Purpose

To deliver sustainable water supply, sewerage and solid waste services in a safe, efficient and effective manner.

Source: <http://www.nsusc.org.pk/firmGeneralPage.aspx?MID=1&PageTitle>About%20Us>

BENCHMARKING AND KPI

21

CONCEPT - Benchmark and Indicator

Thermometer indicates the Degrees Of Temperature - **INDICATOR**



98.6°

Normal Body Temperature - **BENCHMARK**

DEFINITION – Benchmarking in WSS Utilities

“Benchmarking is a tool for performance improvement through systematic search and adaptation of leading practices”

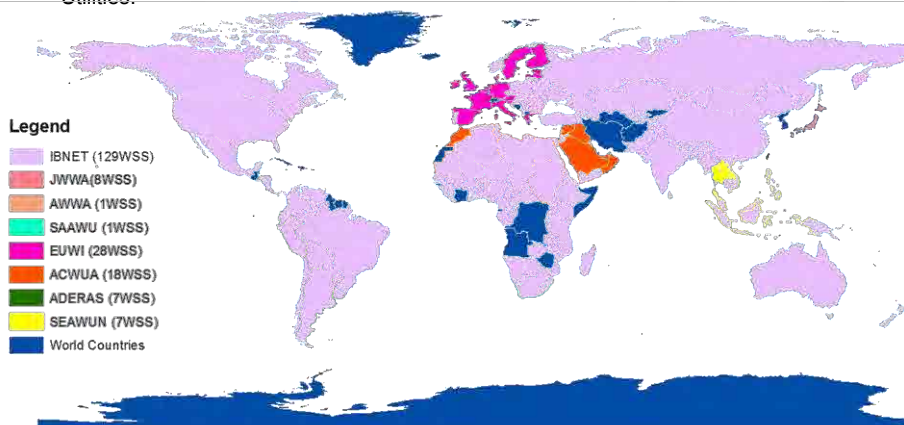
Source : Benchmarking Water Services – Guiding Water Utilities to Excellence by International Water Associations and American Water Works Associations

BENCHMARKING AND KPI OF WSS UTILITIES

22

International Practice of Benchmarking

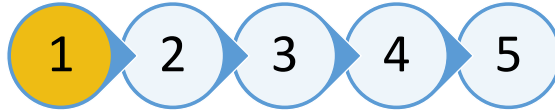
Around **160** Benchmarking Initiatives associated with about **700** Water and Sanitation Utilities.



Source: "Water Utility Benchmarking" Measurement, Methodologies and Performance Incentive by IWA Publishing

BENCHMARKING METHODOLOGY

23



Organize a Benchmarking Team

Do your WSS Utility has notified the team?

NOTIFICATION

The Competent Authority is pleased to endorse and notify Action Plan prepared by WASA Rawalpindi on the subject as per DLIS.

Directorate of Planning will be responsible directorate to monitor and implement the action plan and its activities in coordination with other departments of WASA.

Raja Ehsanul Mahmood
Managing Director, WASA

Copy to:-
1. The Urban Unit
2. All WASA Concerned staff
3. Office File.

4 Key Performance Indicator & Benchmarking

The WASA Rawalpindi as per notified Indicators by HUD&PHED has adopted the KPI for Bench Marking and Reporting.

Designation of focal person & team:

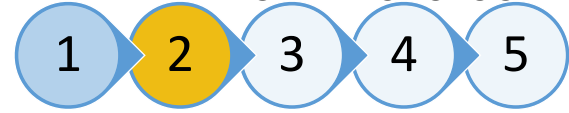
- > Director Planning is the focal person for the whole activity
- > The focal person will directly report to the MD of WASA.

Broad TORs of the focal person are:

- a) Constitute a team of staff members within WASA for his assistance
- b) Develop a six monthly activity plan with team and get it approved by MD
- c) Develop a process and strategy for data generation against agreed indicators
- d) Establish a new robust filing system to track all record when required
- e) Establish a mechanism of coordination with stakeholders
- f) Take lead role in analyzing the periodic data, comparison with previous data and recommendations

BENCHMARKING METHODOLOGY

24



Identify Objective

Do your WSS Utility has identified objectives ?

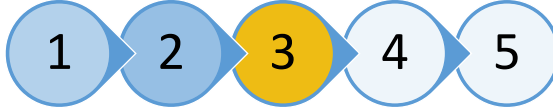
Action Plan for Phased Extension of WASAs' Services in Cities as per City Boundary

The Objective of the Phase Action for Resource Planning is:

1. Develop a system of resource planning in WASA Multan
2. Set up an organizational arrangement at Planning Department with responsibilities and resources to plan for resources and phase extension of services
3. Plan for phase extension for service delivery
4. Monitors the condition and requirement of service delivery of assets
5. Report compliance to HUD&PHED and stakeholders
6. Improve service delivery

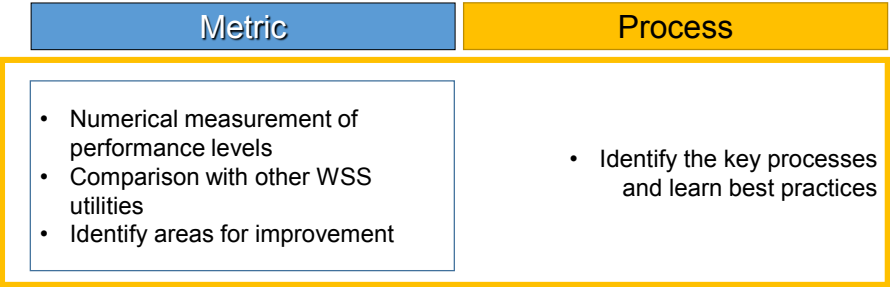
BENCHMARKING METHODOLOGY

25



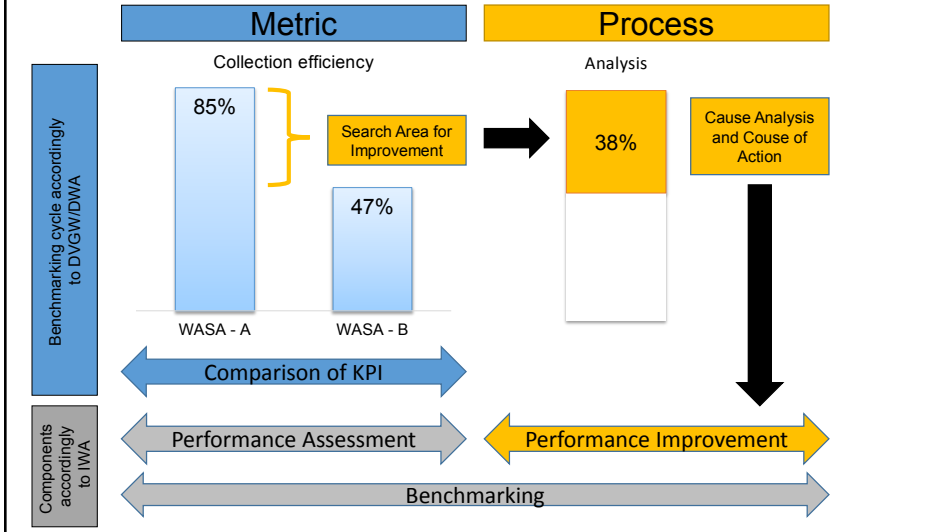
Select Types

TYPES OF BENCHMARKING



TYPES OF BENCHMARKING

26



Source: <http://www.slideshare.net/BorisavMilutinovic/benchmarking-and-performance-indicators-borisav-milutinovic>
 Benchmarking cycle according to DVGW and DWA (2008)

TYPES OF BENCHMARKING

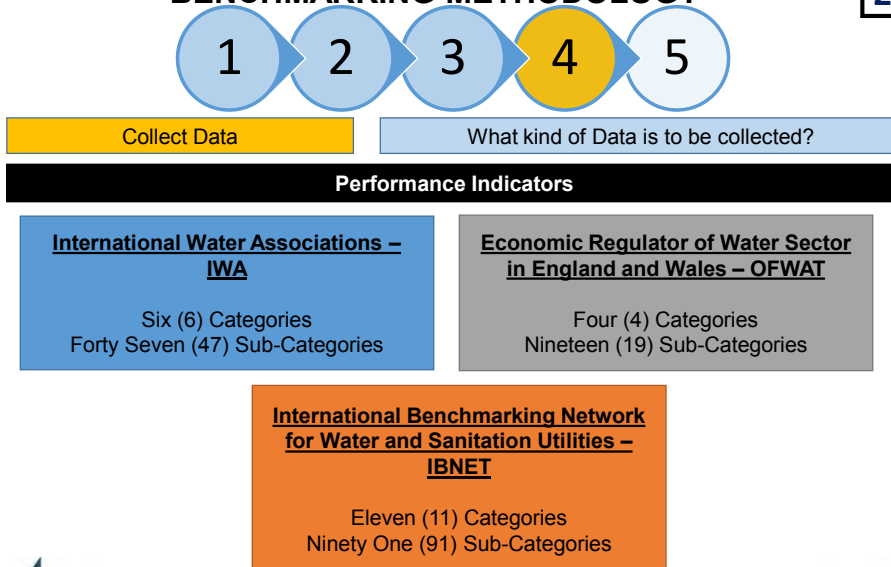
27

Tick (✓) the type of Benchmarking from the following:

Sr No.	Benchmarking	Metric	Process
1	Water Service Coverage (%)		
2	Arrear Recovery Strategy		
3	Energy Management Plan		
4	Water Production (lpc)		
5	Pipe Breakage (km)		
6	Revenue Collection Mechanism		
7	Metering (%)		
8	Assets Management Process		
9	WSS Staff per 1000 connections		
10	Operating Ratio		

BENCHMARKING METHODOLOGY

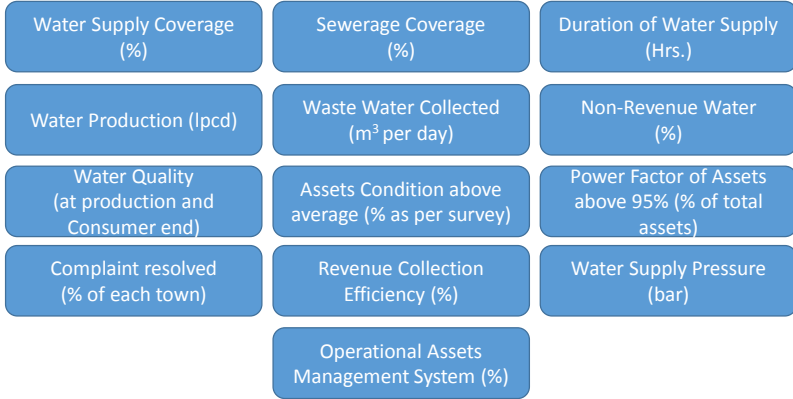
28



KEY PERFORMANCE INDICATORS

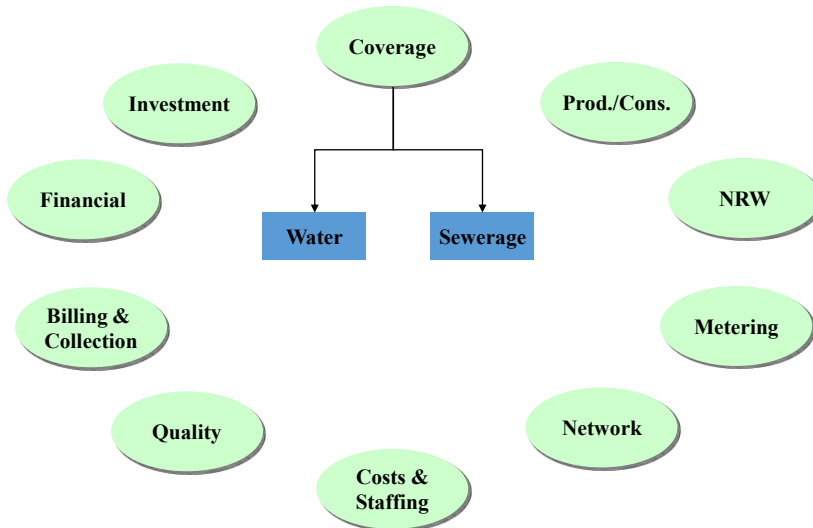
29

Notified Thirteen (13) Key Performance Indicators by Planning and Development Department, Government of Punjab



KEY PERFORMANCE INDICATORS

30



KEY PERFORMANCE INDICATORS

31

Water Coverage

Sewerage Coverage

Definition:

*"Population with access to water services (either with direct service connection or within reach of a public water point) as a percentage of the total population under utility's nominal responsibility"**

Unit: Percentage

Formula:

$$\frac{\text{Population served with water supply}}{\text{Total population in WSS Service Area – Water}} \times 100$$

Definition:

"Population with sewerage services (direct service connections) as a percentage of the total population under utility's notional responsibility"

Unit: Percentage

Formula:

$$\frac{\text{Population served with sewerage services}}{\text{Total population in WSS Service Area – Sewerage}} \times 100$$

Population served with WSS services?

1. Residential Houses
2. Hotels
3. Hospitals
4. Commercial Markets & Shops
5. Industries
6. Government Office & others.....

Source : http://www.ib-net.org/en/texts.php?folder_id=101&mat_id=82&L=1&S=2&ss=1

KEY PERFORMANCE INDICATORS

32

Water Coverage

Sewerage Coverage

Definition:

*"Population with access to water services (either with direct service connection or within reach of a public water point) as a percentage of the total population under utility's nominal responsibility"**

Unit: Percentage

Formula:

$$\frac{\text{Population served with water supply}}{\text{Total population in WSS Service Area – Water}} \times 100$$

Where,

Population served with water supply = ((A+B)×C)+D+E+(G-F)

Ref.	Particular
5.4(d)	A Water residential connections – metered
5.4(g)	B Water residential connections- unmetered
2.4	C Household size
2.5	D Population served – public water points
2.7	E Population served – direct water supply
2.6	F Population without water and Wastewater services
2.3(a)	G Total population in W & S operator area of responsibility – water supply

Definition:

"Population with sewerage services (direct service connections) as a percentage of the total population under utility's notional responsibility"

Unit: Percentage

Formula:

$$\frac{\text{Population served with sewerage services}}{\text{Total population in WSS Service Area – Sewerage}} \times 100$$

Where,

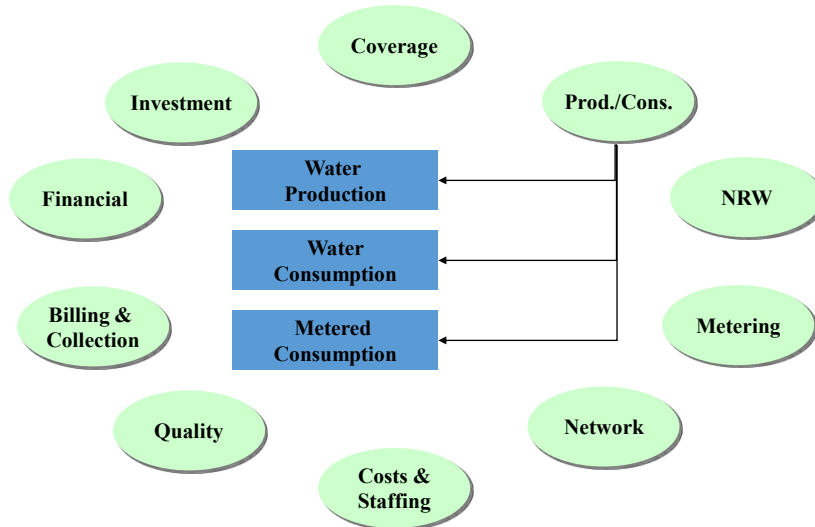
Population served with sewerage services = ((A×B)+C)+(E-D)

Ref.	Particular
6.5(a)	A Sewer residential connections
2.4	B Household size
2.8	C Population served – Wastewater services
2.6	D Population without water and Wastewater services
2.3(b)	E Total population in W & S operator area of responsibility – Wastewater

Source : http://www.ib-net.org/en/texts.php?folder_id=101&mat_id=82&L=1&S=2&ss=1

KEY PERFORMANCE INDICATORS

33



KEY PERFORMANCE INDICATORS

34

Water Production

Definition:

"Total water supplied to the distribution system (including purchased water, if any) expressed by population served per day"*

Unit: Liters per Capita per Day (lpcd)

Formula:

$$\frac{\text{Total Water Production (Litres)}}{\text{Population served with water supply} \times \text{Nos. of Days}}$$

Total Water Production (Litres)?

1. No-Bulk Water Meters Installed
2. Bulk Waters Installed – Non Functional
3. Bulk Waters Installed – Functional

KEY PERFORMANCE INDICATORS

35

Water Production

Definition:

*“Total water supplied to the distribution system (including purchased water, if any) expressed by population served per day”**

Unit: Liters per Capita per Day (lpcd)

Formula:

$$\frac{\text{Total Water Production (Litres)}}{\text{Population served with water supply} \times \text{Nos. of Days}}$$

Ref.	Particular				
5.4(d)	A	Water residential connections – metered	4.7	H	Water meter reading (closing)
5.4(g)	B	Water residential connections - un-metered	4.6	I	Water meter reading (opening)
2.4	C	Household size	4.10	J	Volume of water produced with bulk meter
2.5	D	Population served – public water points	4.11	K	Volume of water produced
2.7	E	Population served – direct water supply		m	Total no. of tubewells with operating bulk meters
2.6	F	Population without water and Wastewater services		n	Total no. of tubewells without operating bulk meters
2.3(a)	G	Total population in W & S operator area of responsibility – water supply		o	Total no. of surface water sources

Source : http://www.ib-net.org/en/texts.php?folder_id=101&mat_id=82&L=1&S=2&ss=1

BENCHMARKING METHODOLOGY

36



Verify Data	Confidence in data (Confidence Band)
<ul style="list-style-type: none"> Missing Data? Confidence in Data? 	<ol style="list-style-type: none"> 1. Data derived from different sources 2. Reliability of the sources
Band	Description
A	Based on reliable records, procedures, investigations or analyses, that are properly documented and recognized as the best available
B	Generally as in band A, but with minor shortcomings, e.g. some documentation is missing, the assessment is old, or some reliance on unconfirmed reports or extrapolation is made
C	Extrapolation from a limited sample for which Band A or B information is available
D	Based on the best estimates of utility staff without measurement or documented evidence

Source : http://www.ib-net.org/en/texts.php?folder_id=118

BENCHMARKING METHODOLOGY

37



Verify Data Confidence in data (Confidence Band)

DATA FOR KHAIRPUR

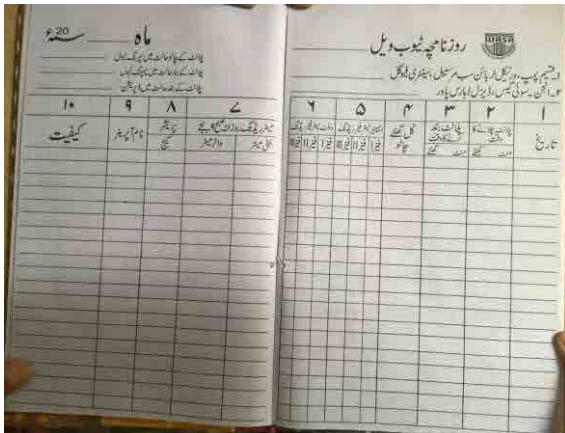
Ref	Data Item	Comment	Unit	Input	Confidence	Source
Water service						
40	Population served	Population <i>under responsibility of the utility</i> with access to water through house connections, yard taps and public water points (either with direct service connection or within 200m of a standpost). Any population outside the utility's area of responsibility who are served (e.g. people who come from outside to the Utility's water points) should be excluded.	'000 inhabitants	24.8	D	Operating Plan
40a	Population served – direct supply & shared taps	Population under responsibility of the utility with access to water through house connections and shared yard taps (where 2 or more houses share a private yard with a tap).	'000 inhabitants	22.3	D	Estimated
40b	Population served – public water points	Population under responsibility of the utility with access to water through public water points.		2.5	D	Estimated
41	Number of water connections	Number of active water connections at year-end. All active connections should be counted – residential, non-residential etc - but inactive connections to vacant buildings should be excluded.	'000	3.6	D	Operating Plan

CONFIDENCE BAND

38

Reading from Bulk Water Meter and Log Book of Tube well has a Confidence Band of:

A B C D



Benchmarking and KPIs

39

THANK YOU

MODULE - 1

Day-1 Session-2

International Best Practice for Business Plan Case Study of SUDAN

Mr. Kuroda YASUYUKI
JICA Expert



Business Plan of State Water Corporations (SWCs) in Sudan, preparation process

- Collect current management data of the pilot SWCs
- Formulate Business Goals
- Set Performance Indicators (PI)
- Collect current PI benchmarks (year April 2017)
- Set target PI benchmarks (year 2020)
- Set annual target PI benchmarks (year 2017, 18, 19)
- Prepare a management/ profit improvement plan of June-December 2017
- Obtain an approval of the Business Plans and management/ profit improvement plan of June- December 2017 from a Board member or Director General.



Management Goals

The two (2) pilot SWCs set common management goals.

- 1 • Sustainable supply of drinking water in quantity and quality
- 2 • Management improvement
- 3 • Customer satisfaction
- 4 • Work environment improvement and human resource development



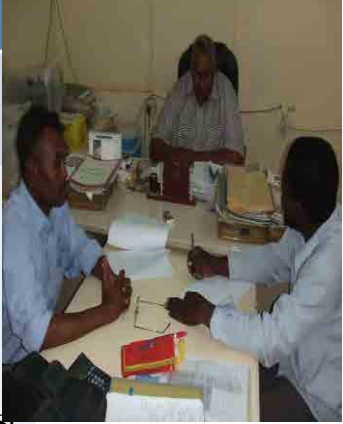
Investment plan to achieve “Sustainable supply of drinking water”

Kassala	White Nile
Pipeline network replacement/ extension (500KM)	Pipeline network replacement/ extension (800KM)
Additional intake well construction or existing well rehabilitation (15)	
Water meter installation (130) Observation well (25)	Water meter installation (300)




Financial improvement plan to improve management

Kassala	White Nile
Revenue increase with customer expansion	
<ul style="list-style-type: none"> ▪ Reduction of unpaid water charges ▪ Revenue increase with equipment rental ▪ Activation of commercial teams 	<ul style="list-style-type: none"> ▪ Reduction of water supply service stop consumers 616 →250 ▪ Revenue increase with equipment rental



Training plan of Human Resource Development

Kassala	White Nile
17 courses: geophysical survey, well management, construction of water yards, rehabilitation of water yards, QGIS/ ArcGIS, English, O & M, chemical analysis, accountings and others. Target of the course participants will be: 218 staffs in 2017-18.	14-17 courses every year: water treatment plant management, pipe network management, water tariff management and others. Target of the course participants is: 506 staffs in 2018-2020.



Performance Indicators (PIs) , Current and target benchmarks

	Kosti city, 2017	Kassala city, 2017	Kosti city, 2020 target	Kassala city, 2020 target
Total population	296,657	268,397	330,819	318,762
Population with water supply service	112,729 38%	233,745 87%	185,259 56%	243,205 76%
Water production	18,000 M3/day	36,735 M3/day	33,000 M3/day	45,000 M3/day
Water connections	18,858	42,499	27,108	44,219

	Kosti city, 2017	Kassala city, 2017	Kosti city, 2020 target	Kassala city, 2020 target
Pipeline network replacement/ exte.	34	400	To be decided	500
Water meters	0	0	300	130
Chlorine injection	1,800 kg/ year	4,188 kg/ year	To be decided	To be decided
Water quality parameters being tested	5	New well: 12 Treatment plant: 3	To be decided	New well: 12 Treatment plant: 3

	Kosti city, 2017	Kassala city, 2017	Kosti city, 2020 target	Kassala city, 2020 target
Number of staffs (staffs per 1,000 connections)	305 staffs (16 staffs)	343 staffs (8 staffs)	To be decided	475 staffs
Amount of bill collection	10.6 million SDG	16.6 million SDG	14.0 million SDG	17.6 million SDG
Number of no water complaints	48- 300	East Gash 8-87 West Gash 10-20	0	East Gash 5-15 West Gash 5-8

Kassala/ White Nile SWC will formulate action plans of the year 2018

Kassala SWC		Management/ profit improvement plan, June-December 2017	Improve ment plan, 2018
Isam Khjali	Project managem ent	Leader, follow up and monitoring management committee activities progress, supervision of pipe network construction works (10KM) and preparation of GIS map. Preparation of tender document for all projects of SWC.	
Amal Usman	Water Quality	Deputy Leader, 1-1.) Quotation in Khartoum (Jun 2017). 1-2.) Purchase (Oct 2017) 1-3.) Installation of equipment (Nov-Dec 2017). 2-1.) Measuring residual chlorine in houses: 5 houses/week. 2-2.) Measuring chemical elements in WTP: Every 2 weeks. 2-3.) Measuring 20 elements in new wells: 10 elements up to Apr and 12 elements from May. 2-4.) Test of bacteria in WTP and Wau Nour reservoir before chlorination: Up to Apr, 2-3 times monthly. From June- Dec. 2017	

Kassala/ White Nile SWC will formulate a management/ profit improv. plan of the year 2018

Kassala SWC		Management/ profit improvement plan, June-December 2017	Improvement plan, 2018
Yossif Mohamed	Operation and maintenance, East Office	Implementation 210 connections and water meter installation plan. (Cross divisional activities) Lead the Maintenance/ Public Relation/ Finance and other departments to carry out leakage maintenance works, GIS map preparation, dialogue with residents and increase of public awareness, coping with those complaints or arears	
Babeker Hib Allah	Personnel Department	Implementation/ Monitoring of staff database preparation. Assignment of 30 new staffs to improve the performance up to 2019 (10 each year). 1) Planning of 10 staffs increase. Place: East/West Office Period: Jun-Dec 2017 2) Implementation: Recruitment of 3 engineers, and 7 workers	
Muhajballah	Training center	2-1. Visit other training centers in Sudan to learn the training system. 2-2. Contract with lecturers from university 2-3. Upgrade DWST graduates to lecturers.	



بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ
In the name of Allah, the Beneficent, the Merciful

Business Planning & GAP Analysis

ENERGY MANAGEMENT PLAN

Mr Ali Rao
Senior Analyst

OBJECTIVES

- Overview of the WASA
- KPI of Business Planning
- Gap Analysis
- Target Setting
- Formulation of Strategy

KPI OF BUSINESS PLANNING

What to
Increase?

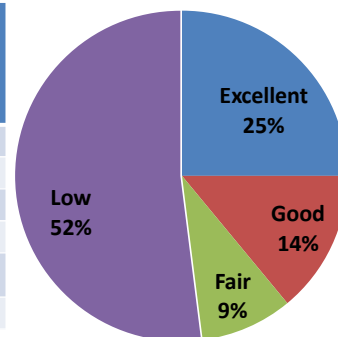
1. Connected Customers
2. Pumping Efficiency & Asset Condition
3. Billing Collection
4. Bill Delivery
5. Water Quality
6. 24/7 Water Supply
7. Planning

What to
decrease?

1. Expenses (Energy and O&M) / Production Cost
2. Non Revenue Water
3. Complaint Re-addressal Time

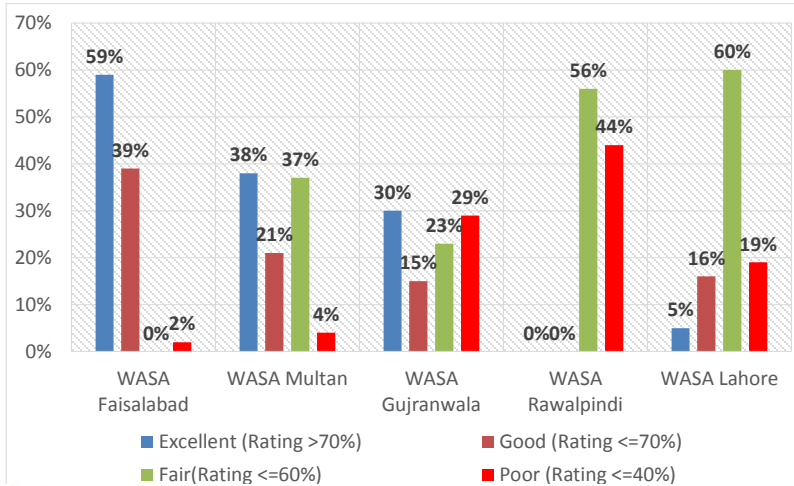
GAP 1: LOW AND FAIR PUMPING EFFICIENCY

#	City	LOW	FAIR	GOOD	EXCELLENT
1	Lahore	278	75	91	207
2	Multan	79	17	11	18
3	Rawalpindi	323	19	12	22
4	Gujranwala	37	9	19	22
5	Faisalabad	29	12	67	89
	Total	746	132	200	358



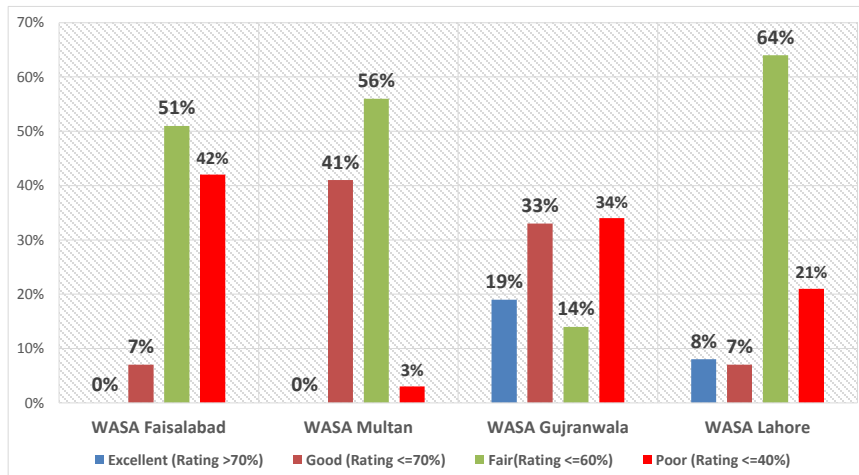
Source: Energy Management Opportunities in WASAs of Punjab (NEC Consultants Pvt Limited)

GAP 2: TUBE WELL CONDITION



Source: Energy Management Opportunities in WASAs of Punjab

GAP 3: DISPOSAL CONDITION



Source: Energy Management Opportunities in WASAs of Punjab

GROUP ACTIVITY 1: TARGET SETTING TO IMPROVE ASSET CONDITION

7

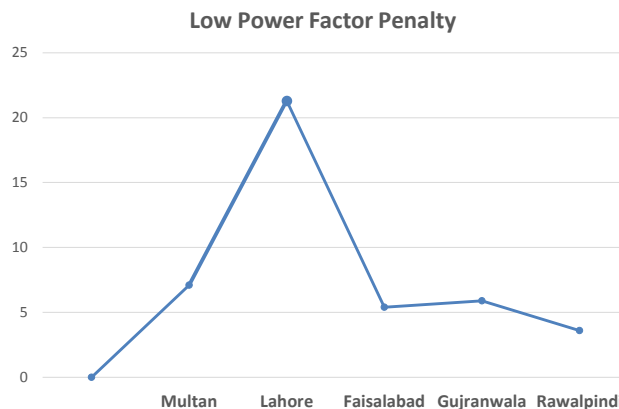
Time: 10 Min

WASA	GAPS	Base Line		Target Year 1		Target Year 2		Target Year 3	
		Poor D	Fair C	Poor D	Fair C	Poor D	Fair C	Poor D	Fair C
LHR/ GUJ/ MUL/ FSD/ RWP/ NSUSC	Pumping Efficiency								
	Tube well Condition								
	Disposal Condition								
	OHR Condition								

GAP 4 : POWER FACTOR PENALTY

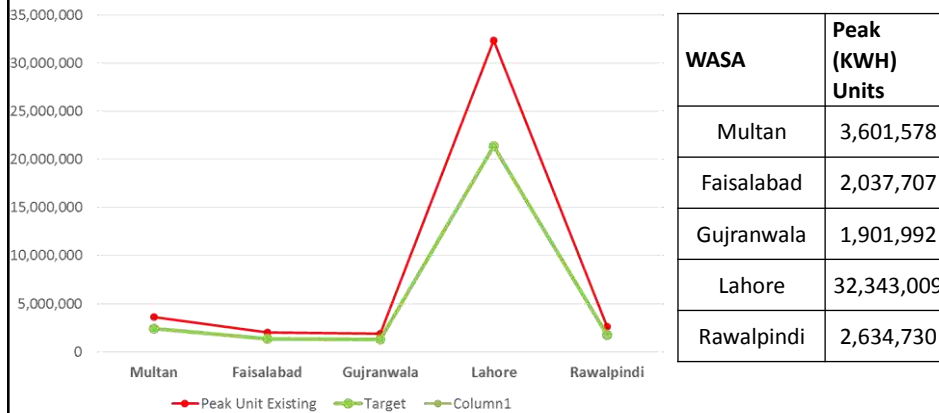
8

WASAs	Low Power Factor Penalty (PKR-In Million)
Multan	7.1
Lahore	21.3
Faisalabad	5.4
Gujranwala	5.9
Rawalpindi	3.6



Source: Energy Management Opportunities in WASAs of Punjab

GAP 5 : PEAK UNITS CONSUMPTION



Source: Energy Management Opportunities in WASAs of Punjab

GAP NO.6 NON REVENUE WATER

Name	Water Connections	Water Production (M cum)	% NRW	Water Loss (M Cum)
KW&SB	1.04 M	1,178	35	413
L-WASA	631,000	680	40	272
F-WASA	110,000	51	45	23
G-WASA	35,980	92	40	37
R-WASA	96,780	91	30	37
M-WASA	49,980	36	22	8
WSSP	83,650	-		
CDA	80,480	110	35	39
NSUSC	30,000	30.99	40	12
Total	2.15 M	2,268	37.5%	841

Source: World Bank report on Non-Revenue Water

The challenge

11

**Fix the institutions that
should fix the pipes**



GROUP ACTIVITY 2 : TASK TARGET

12

SETTING

Time: 10 Min

WASA	GAPS	Base Line	Target Year 1	Target Year 2	Target Year 3
Lahore/ Gujranwala/ Multan/ Faisalabad/ Rawalpindi/ NSUSC	Pumping Efficiency (Low + Fair Pumps)				
	Peak Unit Consumption (PKR M)				
	MDI Unit Consumption (PKR M)				
	Power Factor Penalty (PKR M)				

GROUP ACTIVITY 3: COSTING FOR IMPLEMENTATION

13

Time: 10 Min

WASA	Tasks	Cost Year 1	Cost Year 2	Cost Year 3	Total Cost
Lahore/ Gujranwala/ Multan/ Faisalabad/ Rawalpindi/ NSUSC	Pumping Efficiency (Low + Fair Pumps)				
	Peak Unit Consumption (PKR M)				
	MDI Unit Consumption (PKR M)				
	Power Factor Penalty (PKR M)				

CHARACTERISTICS OF WELL-PERFORMING UTILITIES

14

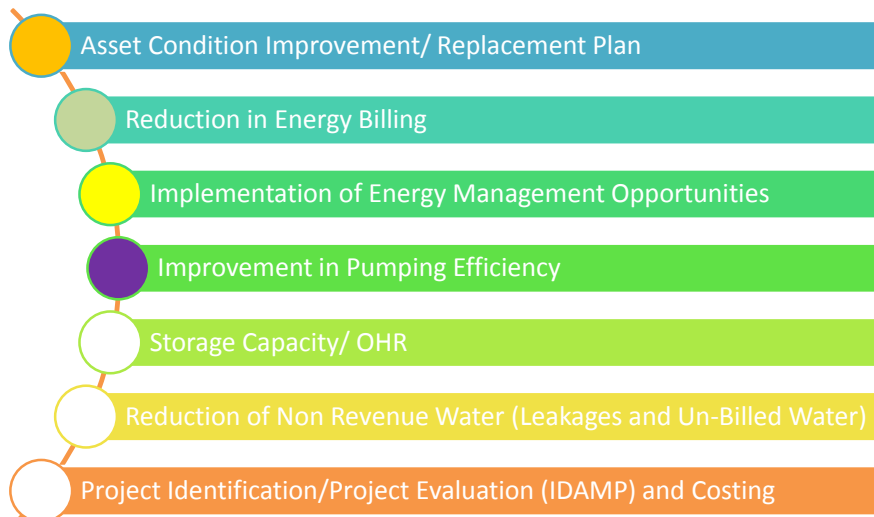
- Accountability towards its stakeholders
- Autonomy to develop sustainable business principles
- Customer focus to ensure a good service delivery
- Market orientation to use the best practices (efficiency).



TARGET /PHASING

Gaps	Total	Year 1	Year 2	Year 3
Power Factor	43.3	15	20	8.3
Peak Unit Consumption	42.5	15	20	7.5
MDI Consumption (x10000)	24.6	0.10	0.10	0.4
Pumping Efficiency	878	220	358	300

STRATEGIES



Thank You!

EFFICIENCY ENHANCEMENT

Revenue Saved Per Pump (Rs.) =

Unit Price (per KWH) * Load (%) * (1/old
Efficiency – 1/New Efficiency)

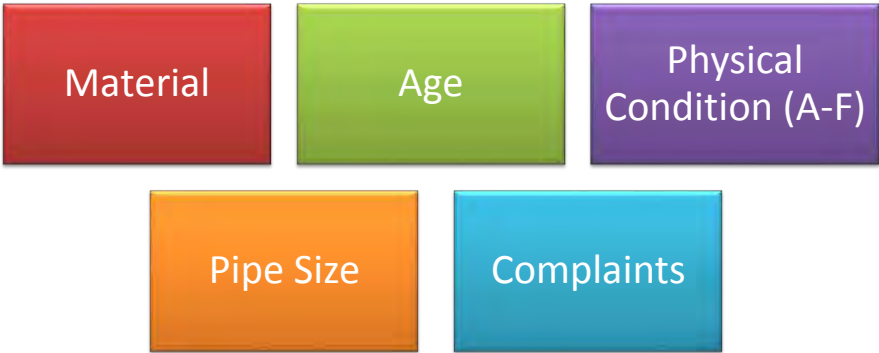
Avg. Revenue Saved Per WASA =

(No. of Tube wells) * Unit Price (per KWH) * Load
(%) * (1/avg. old Efficiency – 1/Avg. New Efficiency)

CONDITIONAL SURVEY PARAMETERS FOR TUBEWELLS



CONDITIONAL PARAMETERS FOR WATER SUPPLY LINES/SEWER LINES



EXERCISE

No. of Tube wells In WASA = 630 (WL), 415 (WR), 88 (WF), 66 (WG), 108 (WM)

Load (%) = 85

Unit Price (KWH) = Rs. 15

Avg. Old Efficiency of Pump = 0.42

Avg. New Proposed Efficiency = 0.72

Calculate revenue saved per year if operation time of tube wells is 16 hours a day.



1

MODULE - 2

Business Planning & GAP Analysis

PHNOM PENH WATER SUPPLY COMPANY (PPWSA)

Mr. Yasuyuki Kuroda
JICA Expert

THE BENEFICIAL PRACTICES OF PHNOM PENH WATER SUPPLY COMPANY (PPWSA)

2

PLEASE WATCH THE VIDEO IN THE FOLLOWING SLIDE

NOTE

While you watch the video, please try to relate and prepare answers for the following questions relating the video

VIDEO PERTINENT QUESTIONS

1. How many consumers with ID in your WASA?
2. How many consumers without ID in your WASA?
3. How many illegal connections in your WASA?
4. How to prevent water leakage or overflow in your WASA?

OUTLINE OF PHNOM PENN WATER SUPPLY AGENCY IN THE YEAR 1992 4

- Low quality piped water at very low pressure
- Limited supply: 10 hour a day
- 20 % of Phnom Penh residents
- Non revenue water: 72% due to illegal connections, leakage
- Extremely low tariff
- Underpaid staffs
- No metering
- Less than half of bills were collected

STRONG LEADERSHIP BY A NEW MANAGING DIRECTOR 5

- Staffs engaged in corrupt activities were fired
- Bill payment were enforced
- Illegal connections were regularized
- Metering was introduced
- Autonomy gained in financial and personnel matters
- Water quality improvement: the MD said “if you get stomachache after drinking the tap water, I will pay you compensation”
- Tariff increase in 1994, 1997, 2001, full cost recovery, get a profit to increase staff salary
- Subsidized tariff to poor communities

IMPROVEMENT OF BENCHMARKS

Indicators/ year	Year 1993	Year 1999	Year 2003	Year 2009
Phnom Penh population	680,000	880,000	1,030,000	1,440,000
Water supply coverage	25%	62%	82%	90%
Connections	26,881	60,482	105,777	191,092
Water supply capacity (m3/day)	65,000	120,000	235,000	300,000
Water supply pipe length (km)	288	455	921	1,500
Water quality standards	unknown	unknown	WHO guideline	WHO guideline
Water supply pipe net work pressure	0.2	2.0	2.5	2.5
Water supply duration a day (hours/ day)	10	24	24	24
Non Revenue Water (NRW)	72.0%	48.5%	17.1%	5.9%
Staff per 1, 000 water supply connections	22.0	7.8	3.9	3.2
Water supply charge collection rate	48.0%	98.9%	99.8%	99.9%

Source: Miracle of Phnom Penh, March 2015, Kuwaitima/ Suzubi, IICA

B-115: GROUP DISCUSSION

GROUPS FORMATION

1. Four (4) Groups will be formed
2. Each Group will represent their respective Utility preferably

REQUIRED

1. Discuss what good practices could be applied at their WASA, e.g.
 - Increase of connections
 - Dialogue with consumers
 - Improvement of water quality
2. How to measure to what extent you improve the above works.

THANKS



Business Planning & GAP Analysis

In the name of Allah, the Beneficent, the Merciful بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

SWOT Analysis & GAP Analysis

Mr Asif Iqbal
Financial Management Specialist

SWOT ANALYSIS

13

BENEFITS

- Identify Strengths
- Address weaknesses
- Deter threats
- Capitalize on opportunities

LIMITATIONS

- Doesn't priorities issues
- doesn't provide solutions or offer alternative decisions
- can generate too many ideas but not help you choose which one is best
- can produce a lot of information, but not all of it is useful.

Strengths – something that you are doing right or are good at. It may be a skill, a competence or a competitive advantage that you have over rivals.

Questions to ask:

- What are your advantages?
- What do you do well?

Weaknesses – something that you lack or do poorly when compared with rivals. A condition that puts you at a disadvantage.

Questions to ask:

- What could be improved?
- What is done badly?
- What should be avoided?

Opportunities – a realistic avenue for future growth in the business. Something to be used to develop a competitive advantage.

Questions to ask:

- What are the market trends?
- How can they be exploited?
- What chances are there for me?

Threats – a factor that you may or may not have control over that could lead to a decline in business.

Questions to ask:

- What obstacles do you face?
- What is your competition doing?
- What effect will increasing technology have?

ADVANCED SWOT ANALYSIS

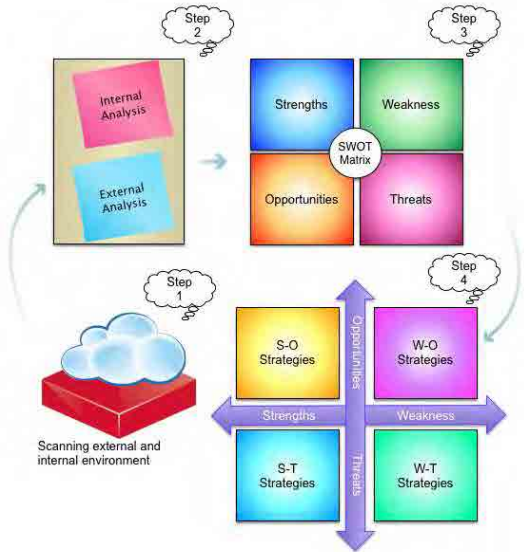
14

BENEFITS

- Identify Strengths, Address weaknesses, Deter threats and Capitalize on opportunities
- Identify S-O, W-O, S-T and W-T Strategies

LIMITATIONS

- Doesn't priorities issues
- doesn't provide solutions or offer alternative decisions
- can generate too many ideas but not help you choose which one is best
- can produce a lot of information, but not all of it is useful.



Source: <http://www.entrepreneurshipinbox.com/763/swot-analysis-4-steps/>

ADVANCED SWOT ANALYSIS

15

	Internal Factors	Strengths (S)	Weaknesses (W)
External Factors	<p>S1. Adaptation water scarcity. S2. The NWC and PWA. S3. The water law of 2002 S4. The awareness on water scarcity. S5. The existence of NGOs S6. The challenge of providing 150 l/cap/day for domestic users.</p>	<p>W1. Low water availability. W2. Insufficient and inefficient water services W3. The fragmented of institutional status. W4. Low cost recovery. W5. Insufficient Awareness. W6. Lack of community participation.</p>	
Opportunities (O)	<p>O1. Potential water management alternatives and technologies. O2. Donor community. O3. Potential pricing systems that ensures cost recovery. O4. Palestinian water rights O5. The existence of community societies. O6. Research in water management. O7. Well qualified professionals.</p>	<p>strengths and opportunities (SO) 1. Using S1, S 4 to benefit from O1, O2, O4, O6 to introduce new technologies for water saving. 2. Establish regulations using S3 to support point 1 and to improve the pricing system O3. 3. Activate NWC S2 in order to acquire water rights O4.</p>	<p>weaknesses and opportunities (WO) 1. Using O1, O2, O4 to overcome W1, W2 by introducing emerging new technologies. 2. Using O3 to alleviate W4 by introducing a new pricing system. 3. Using O5 to overcome W6. 4. Using O7 to overcome W3 and W5.</p>
Threats (T)	<p>T1. The Israeli control over the water resources. T2. There is no clear agreement regarding water allocation. T3. Pollution of the water resources. T4. Population growth.</p>	<p>strengths and threats (ST) 1. Using S2 to overcome T1 and T2 by making use NWC to help in the negotiations with regard to the water issues. 2. S3 can be used to overcome T3 by applying and enforcing the laws regarding pollution.</p>	<p>weaknesses and threats (WT) 1. The threats T1, T2 regarding Israeli control over water can only be overcome through negotiations and pushing the world community to support this issue.</p>

Source: "From Water Scarcity to Sustainable Water Use in the West Bank, Palestine" by Dima Wadi Nazer

Video on Advanced SWOT Analysis



Conducting a SWOT analysis

Conducting a SWOT analysis is the construction of a non-financial balance sheet. Existing or potential assets are in the left columns representing the strengths and opportunities, and existing or potential liabilities are in the right columns representing the weaknesses and threats. The analysis is undertaken using a grid to consider how you will match the strengths to the opportunities and how you will overcome the



Brainstorming guidelines

We will focus on strengths and weaknesses as the opportunities and threats are less important to WASA & NSUSC because your business objectives are contractually defined and you do not face significant competition

1. What are the strengths of WASAs & NSUSC that we should build on to outperform our contractual obligations?
2. What are the weaknesses of WASAs & NSUSC that we should resolve so we can outperform our contractual obligations?

Brain-storming rules:

- 15 minutes maximum for strengths and 15 minutes maximum for weaknesses
- No right or wrong answers

ADVANCED SWOT ANALYSIS

GROUP EXERCISE - (60 Minutes)

GROUPS FORMATION

Six (6) Groups will be formed. Each Group will represent their respective Utility

GAP Analysis through SWOT technique for IDAMPs of FIVE WASAs

		INTERNAL	
		STRENGTHS	WEAKNESS
EXTERNAL	OPPORTUNITIES	STRENGTHS-OPPORTUNITIES STRATEGY	WEAKNESS - OPPORTUNITIES STRATEGY
		S-O	W-O
	THREATS	STRENGTHS-THREATS STRATEGY	WEAKNESS - THREATS STRATEGY
		S-W	W-T

Source: <http://www.entrepreneurshipinbox.com/772/swot-analysis-template/>

REQUIRED:

Each Group will conduct Advanced SWOT Analysis of your WSS Utility by:

- 1- list down at least 5 points in Opportunities, Threats, Strengths and Weaknesses,
- 2- Create strategies for SO, ST, WO and WT **(20 Minutes)**
- 3- Present it to other group **(5 Minutes)**
- 4- Q&A session **(5 Minutes)**

THANK YOU





In the name of Allah, the Beneficent, the Merciful بسم الله الرحمن الرحيم

1

MODULE - 2

Business Planning & GAP Analysis

COLLECTION EFFICIENCY & OPERATIONAL DEFICIT (with Simulation Exercises)

Mr Asif Iqbal

Financial Management Specialist



In the name of Allah, the Beneficent, the Merciful بسم الله الرحمن الرحيم

2

MODULE - 1

Business Planning & GAP Analysis

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT (PART - I)

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 3

LEARNING OUTCOMES:

Use of MS EXCEL in:

LO1: Detailed understanding of WASA budget and its components including the concepts of operational and normal deficit

LO2: Introduction to collection efficiency and the related exercises in module 4

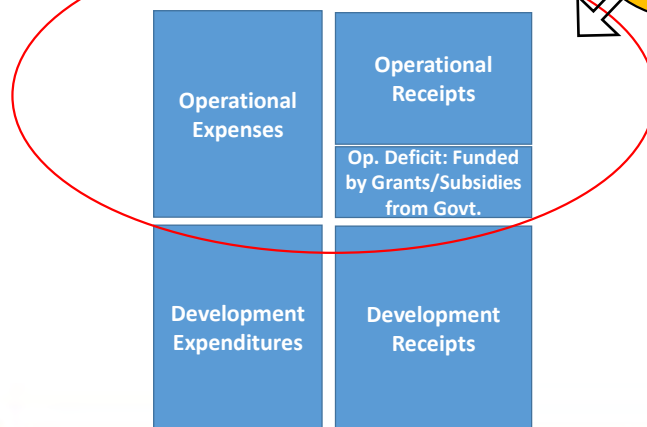
LO3: Computation of **total operational receipts** and **total operational expenses**

LO4: Using **pie charts** to perform **figurative analysis** of sources to finance operational expenses over a period of three years.

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 4

WASA Budgetary Structure

WASA Operations



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 5

WASA Budgetary Structure

Dissecting the Operations' Aspect

Receipt Side

Operational Receipts = [Water & Sewerage Charges] + [Urban Immovable Property Tax (UIPT)] + [Other Receipts]

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 6

WASA Budgetary Structure

Dissecting the Operations' Aspect

Expense Side

Operational Expenses = [Salary & Payroll] + [Power & Energy] + [O & M] + [Petroleum expenses] + [Other operational expenses]

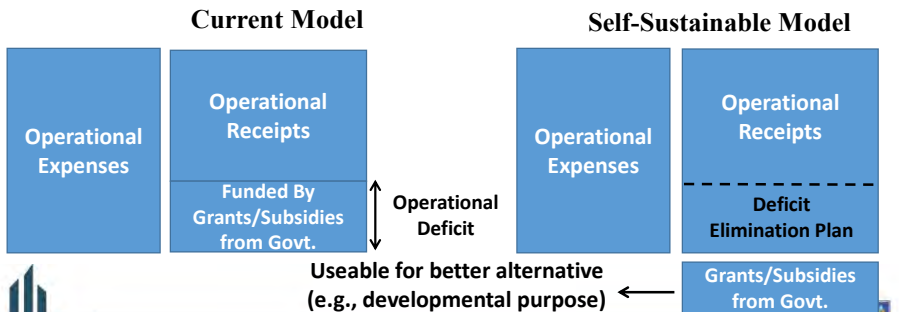
BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 7

What is Operational Deficit (OD) and Working Ratio (WR)?

$$\text{Operational Deficit (OD)} = [\text{Operational Expenses}] - [\text{Operational Receipts}]$$

VS.

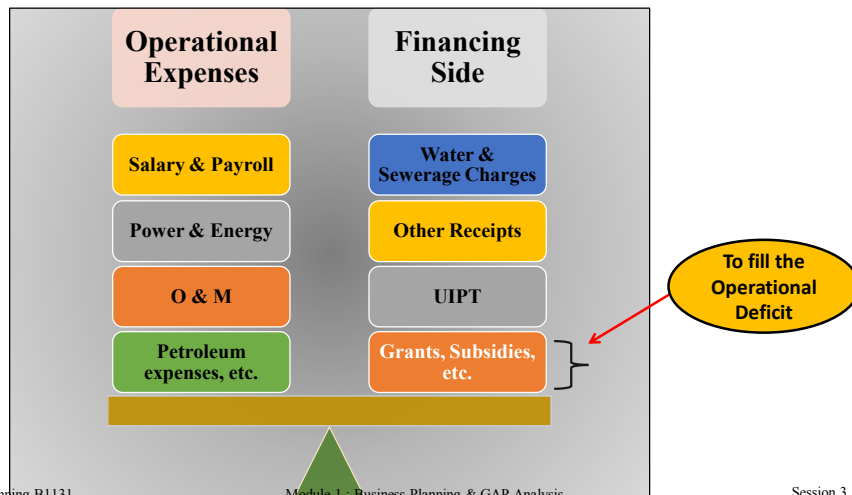
$$\text{Working Ratio (WR)} = [\text{Operational Expenses}] / [\text{Operational Receipts}]$$



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 8

Current Situation Equation

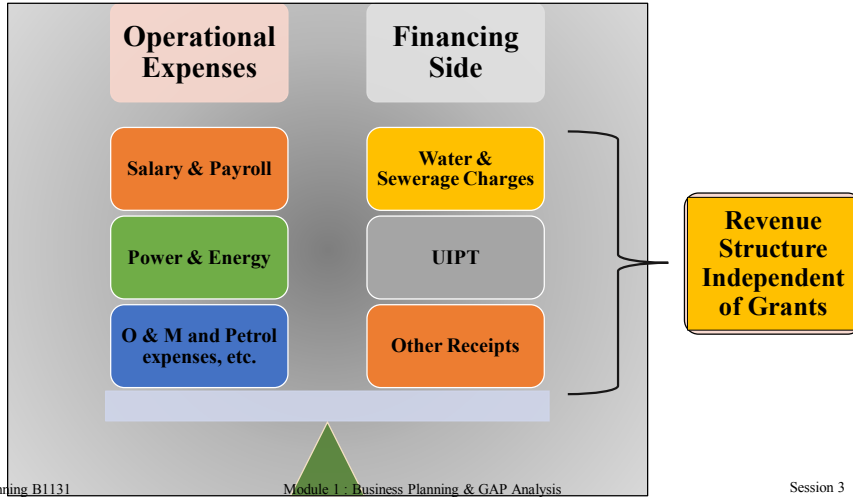
$$[\text{Total Operational Expenses}] = [\text{Water \& Sewerage Charges}] + [\text{UIPT}] + [\text{Other Receipts}] + [\text{Grants, Subsidies, etc.}]$$



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 9

Golden Equation:

$$[\text{Total Operational Expenses}] = [\text{Water \& Sewerage Charges}] + [\text{UIPT}] + [\text{Other Receipts}]$$



10

MODULE - 1

Business Planning & GAP Analysis

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT (SIMULATION EXERCISE)

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 11

Computation of total operational receipts and total operational expenses

1. Caption the row below the row titled “Other receipts” as “Total Operational Receipts” as shown below.

1. Caption
“Total
Operational
Receipts”

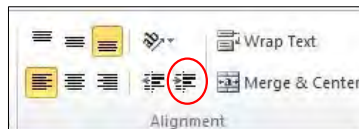
Operational Receipts				
	2014-15	2015-16	2016-17	
	Rs. in (million)			
9	Water and Sewerage Charges (Including Recovery of Arrears)	2,135	2,530	3,182
10	UIP Tax Share	990	1,182	1,234
11	Other receipts	170	182	195
12	Total Operational Receipts			

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 12

Computation of total operational receipts and total operational expenses

- 1) Make it **bold** – Shortcut key, “Ctrl +B”
- 2) Right indent the text by 2 spaces to make the caption prominent. Use the following button:

2. Format the caption “Total Operational Receipts” -



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 13

Computation of total operational receipts and total operational expenses

Formatted tabular layout

		2014-15	2015-16	2016-17
11				
12		Rs. in (million)		
13				
14	Water and Sewerage Charges	2,135	2,530	3,182
15	UIP Tax Share	990	1,182	1,234
16	Other receipts	170	182	195
17	Total Operational Receipts			
18				

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 14

Computation of total operational receipts and total operational expenses

- For calculating total operating receipts for 2014-15, use the **SUM()** function as follows:

	2014-15	2015-16	
			Rs. in (m)
Water and Sewerage Charges (2,135		
UIP Tax Share	990		
Other receipts	170		
Total Operational Receipts	=sum(D9:D11)		3R x 1F

Hint for usage: Within the function, use navigation keys after typing “=sum(“ and closing brackets “)” and press “Enter”

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 15

Computation of total operational receipts and total operational expenses

For calculating total operational receipts for remaining years, *drag the cell, from bottom right cell holder, containing the formula to the adjacent cells* to copy the formula. The output is shown below:

	2014-15	2015-16	2016-17	
	Rs. in (million)			
14	Water and Sewerage Charges	2,135	2,530	3,182
15	UIP Tax Share	990	1,182	1,234
16	Other receipts	170	182	195
17	Total Operational Receipts	3,295	3,894	4,611

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 16

B-11: INDIVIDUAL ACTIVITY

Repeat the steps to compute total operational expenses for each year.

(Time Available: 5 minutes)

DESIRED OUTPUT

	2014-15	2015-16	2016-17	
	Rs. in (million)			
25	Power & Energy	2,553	3,189	2,946
26	Payroll, Pension & Benefits	2,545	2,345	2,986
27	Repair and Maintenance/O&M	992	1,200	970
28	Utilization of PCGIP funds	469	490	623
29	Petroleum (POL)	412	270	384
30	Other expenses	211	151	474
31	Total Operational Expenses	7,182	7,645	8,383

Note: Save the computations performed till now as it would be useful in achieving learning outcome 3. Shortcut Key – “Ctrl + S”

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 17

Step1: Preparation of tabular format to create pie chart

- Name three continuous columns with the years for which the data is available. Apply “**bold**” format and add borders.

Following output shall appear.

2014-15	2015-16	2016-17
---------	---------	---------

- Label the rows in the column left to the column labeled 2014-15 with “**Water and Sewerage Charges**”, “**UIP Tax Share**”, “**Other receipts**”, “**Operational Deficit**” and “**Total Operational Expenses**”. Following is the desired output.

	2014-15	2015-16	2016-17
<i>Water and Sewerage Charges</i>			
<i>UIP Tax Share</i>			
<i>Other receipts</i>			
<i>Operational Deficit</i>			
<i>Total Operational Expenses</i>			

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 18

Step2: Filling the table

- Use the value already computed for “**Operational Expenses**”
- Use the value already available for “**Water and Sewerage Charges**”, “**UIP Tax Share**” and “**Other receipts**” for each year. Use ‘=’ in the cell in which the value of some other cell is to be

inserted and give the source cell address using **navigation keys**. Refer to an example on the right.

		2014-15	2015-16	2016-17
		Rs. in (million)		
25	Power & Energy	2,553	3,189	
26	Payroll, Pension & Benefits	2,545	2,345	
27	Repair and Maintenance/O&M	992	1,200	
28	Utilization of PGP funds	469	490	
29	Petroleum (PDL)	412	270	
30	Other expenses	211	151	
31	Total Operational Expenses	7,182	7,645	
38		2014-15	2015-16	2016-17
39	<i>Water and Sewerage Charges</i>	2,375	2,530	3,182
40	<i>UIP Tax Share</i>	992	1,182	1,234
41	<i>Other receipts</i>	170	182	195
42	<i>Operational Deficit</i>			
43	<i>Total Operational Expenses</i>			

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 19

Step2: Filling the table (Cont'd)

- Copy formulae to adjacent cells of remaining years. Desired output is:

	2014-15	2015-16	2016-17
<i>Water and Sewerage Charges</i>	2,135	2,530	3,182
<i>UIP Tax Share</i>	990	1,182	1,234
<i>Other receipts</i>	170	182	195
Operational Deficit			
Total Operational Expenses	7,182	7,645	8,383

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 20

Step2: Filling the table (Cont'd)

- Use current situation equation to compute the operational deficit. In 2014-15, subtract all receipt items from operational expenses as demonstrated below:

	2014-15	2015-16	2016-17
<i>Water and Sewerage Charges</i>	2,135	2,530	3,182
<i>UIP Tax Share</i>	990	1,182	1,234
<i>Other receipts</i>	170	182	195
Operational Deficit	=D43-D39-D40-D41		
Total Operational Expenses	7,182	7,645	8,383

- Copy formulae to adjacent cells. Desired output is:

	2014-15	2015-16	2016-17
<i>Water and Sewerage Charges</i>	2,135	2,530	3,182
<i>UIP Tax Share</i>	990	1,182	1,234
<i>Other receipts</i>	170	182	195
Operational Deficit	3,887	3,751	3,773
Total Operational Expenses	7,182	7,645	8,383

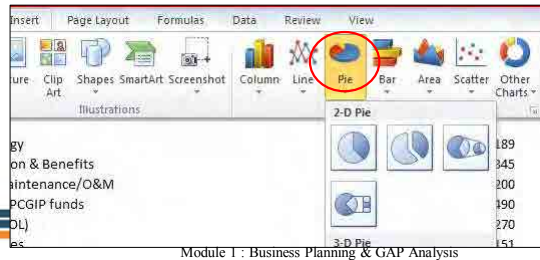
BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 21

Step3: Creating the Pie Chart

- Select the entire table excluding the columns for 2015-16 and 2016-17 and the row representing **operational expenses** as shown below:

	2014-15	2015-16	2016-17
Water and Sewerage Charges	2,135	2,530	3,182
UIP Tax Share	990	1,182	1,234
Other receipts	170	182	195
Operational Deficit	3,887	3,751	3,773
Total Operational Expenses	7,182	7,645	8,383

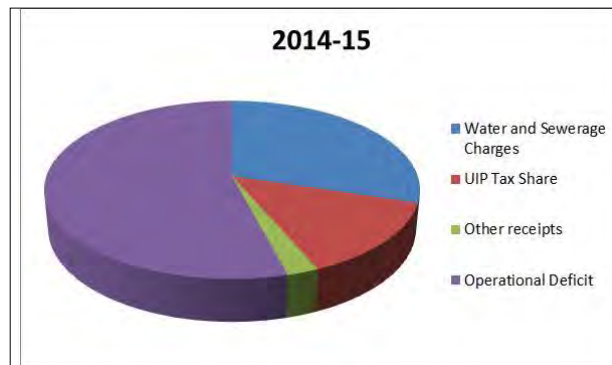
- In the “Insert” tab, click “Pie” in the section titled, “Charts”. Click the first pie chart type in the 3-D section to create a 3-D pie chart as shown below.



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 22

Step3: Creating the Pie Chart

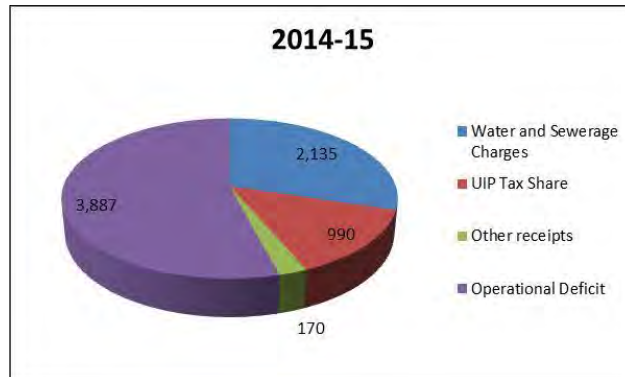
Resulting graph for year 2014-15 would be as follows.



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 23

Step 4: Managing the chart style/data/format

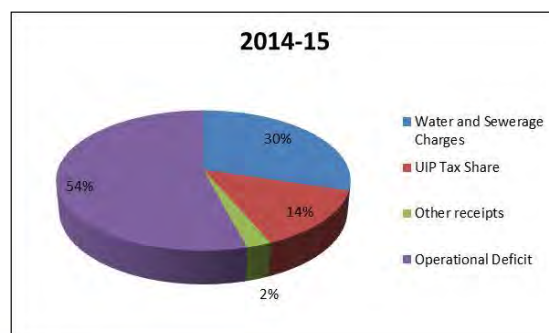
- “Data Labels” can be added – Right click pie chart – Select “Add Data Labels”. Following output would be produced.



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 24

Step 4: Managing the chart style/data/format (Cont'd)

- To convert data labels in percentage terms, Right click pie chart – Select “Format Data Labels”. Tick the option of “Percentage” and un-tick the option of “Values”. Following chart shall be generated.
- This chart shows each component as a percentage of total operational expenses.



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 25

B-12: INDIVIDUAL ACTIVITY

Repeat the steps to **prepare separate pie chart graphs for years 2015-16 and 2016-17.**

Note: Add data labels in percentage to the pie charts.

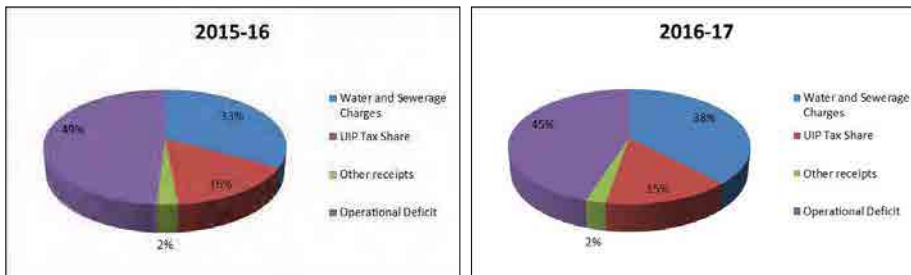
(Time Available: 15 minutes)

Hint: For selection of differently located contiguous cells, combination of mouse and keyboard would be required.
Usage of **“Ctrl” button** and **“left click”**

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 26

INDIVIDUAL ACTIVITY

DESIRED OUTPUT FOR 2 YEARS



BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 27

B-15: GROUP EXERCISE

GIVEN

1. Total Operational Receipts
2. Total Operational Expenses
3. Operational Deficit (Rs.)
4. Operational Deficit (as %age of total operational expenses)
5. Pie charts portraying percentage source of financing for operating expenses over a period of 3 years.

GROUPS FORMATION

Four (4) Groups will be formed
Each Group will represent their respective Utility preferably

REQUIRED

1. Enumerate possible reasons for operational deficit (**reasons for GAPS** between operational receipts and operational expenses).
2. Perform **Target Setting** for **Operational Deficit** (as %age of total operational expenses) for the next 3 years.
3. Perform **Target Setting** for **Working Ratio** for the next 3 years.

(Time Available: 30 minutes)

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 28

GROUP EXERCISE FORMAT: Reasons for GAP

Sr. No.	Reasons For Operational Deficit	Priority			
		Critical	High	Medium	Low
1					
2					
3					
4					
5					
6					
7					
8					

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 29

GROUP EXERCISE FORMAT: Target Setting

Indicator	Unit	Current Status	Target		
			2017-18	2018-19	2019-20
Operational deficit	(% of Operational Expenditures)				
Working Ratio	Ratio				

Note: Insert these workings in business plan format (Annex-E)

31

MODULE - 1

Business Planning & GAP Analysis



In the name of Allah, the Beneficent, the Merciful بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

COLLECTION EFFICIENCY

(PART - 2)

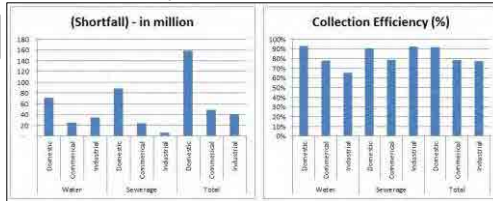
COLLECTION EFFICIENCY ASSESSMENT

32

LEARNING OUTCOMES

Use of MS EXCEL in calculating the Collection Shortfall (Rs.) and Collection Efficiency (%) and preparation of charts

3. Creation of graphs for analysis



2. Determination of Shortfall & Collection Efficiency

	Water			Sewerage			Total		
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial
(Shortfall) - in million	71	24	34	88	24	7	159	48	41
Collection Efficiency (%)	93%	78%	65%	90%	79%	92%	92%	78%	77%

1. Detail of Bills Issued & Collected – Source Data

	Water			Sewerage			Total		
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial
Amount of Bills Issued (Rs. in million)	551	112	98	923	110	82	1,874	222	180
Amount of Bills Collected (Rs. in million)	880	88	64	835	86	75	1,715	174	139

COLLECTION EFFICIENCY ASSESSMENT

33

Terminologies

- Bills Issued
- Bills Collected
- Collection Shortfall (Rs./No.)
- Collection Efficiency (%)

Pedagogical Approach (Module 4)

1. Detail of Bills Issued & Collected – Source Data
2. Determination of Shortfall (Rs./No.) & Collection Efficiency (%) - Calculations
3. Creation of graphs for analysis – Graphical Analysis



MODULE - 1

Business Planning & GAP Analysis

COLLECTION EFFICIENCY ASSESSMENT (SIMULATION EXERCISE)

COLLECTION EFFICIENCY ASSESSMENT

Step1: Create a new row for calculating Shortfall in Rupees with repeated column headers

Note: Amount of bills received (Rs.) does not include the receipt of arrears

- Copy and paste the column headers of the existing data on two rows below the existing data space.

	Water			Sewerage			Total		
	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial
Amount of Bills issued (Rs. in million)	921	112	96	923	110	82	1,874	222	190
Amount of Bills Collected (Rs. in million)	880	88	64	835	86	75	1,715	174	139

- Give the caption of “Shortfall” to the cell near the pasted column headers as shown below.

	Water			Sewerage			Total		
	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial
(Shortfall) - in million									

COLLECTION EFFICIENCY ASSESSMENT

36

Step 2: Calculation of Collection Shortfall (Rs.)

Under each consumer category, against the Row label captioned in step 1, calculate the collection shortfall using the formula as shown below.

	A	B	C	D
1				
2				Water
3			Domestic	Commer
4		Amount of Bills Issued (Rs. in million)	951	
5		Amount of Bills Collected (Rs. in million)	880	
6				
7				
8				Water
9			Domestic	Commer
10		(Shortfall) - in million	=C4-C5	
11				

COLLECTION EFFICIENCY ASSESSMENT

37

Step 2: Calculation of Collection Shortfall (Rs.) (Cont'd)

For calculating the shortfall for all the consumer categories, hover the mouse pointer on the bottom right of the cell cursor in which the formula has been used in sub-step 1. The pointer would change into the **black bold plus sign**. Drag the cursor to cover all the consumer categories:

	Water			Sewerage			Total		
	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial
(Shortfall) - in million	71								

The formula would automatically get pasted into the adjacent cells. The desired output shall be as follows:

	Water			Sewerage			Total		
	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial
(Shortfall) - in million	71	24	34	88	24	7	159	48	41

COLLECTION EFFICIENCY ASSESSMENT

38

Step 3: Calculation of Collection Efficiency (%)

- Repeat step 1 and give the caption of “**Collection Efficiency (%)**” near the copied headers.
- Under each consumer category, against the Row label as captioned above, **calculate the collection efficiency** using the formula as shown below.

	A	B	C
1			
2			
3			Domestic
4		Amount of Bills Issued (Rs. in million)	951
5		Amount of Bills Collected (Rs. in million)	880
6			
7			
8			
9			Domestic
10		(Shortfall) - in million	71
11			
12			
13			
14			Domestic
15		Collection Efficiency (%)	=C5/C4
16			

COLLECTION EFFICIENCY ASSESSMENT

39

Step 3: Calculation of Collection Efficiency (%) (Cont'd)

- Repeat sub-step 2 of step 2 to copy the formula to the adjacent cells to compute collection efficiency for all the consumer categories. Following is the desired output.

Water			Sewerage			Total		
Domestic	Commerical	Industrial	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial
0.925640456	0.781555827	0.65	0.904403047	0.785262261	0.92	0.915177908	0.783391584	0.773

- Selecting the entire row and convert all the efficiency figures into **percentage equivalent**. Key - “**Ctrl + Shift + %**”

Water			Sewerage			Total		
Domestic	Commerical	Industrial	Domestic	Commerical	Industrial	Domestic	Commerical	Industrial
93%	78%	65%	90%	79%	92%	92%	78%	77%

COLLECTION EFFICIENCY ASSESSMENT

40

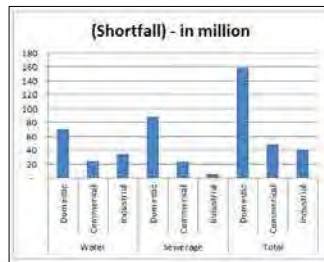
Step 4: Creation of Column Charts - Shortfall

- 1) Select the entire table containing the values of collection shortfall for each consumer category as shown below:

(Shortfall) - in million	Water			Sewerage			Total		
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial
	71	24	34	88	24	7	159	48	41

Collection Efficiency (%)	Water			Sewerage			Total		
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial
	93%	78%	65%	90%	79%	92%	92%	78%	77%

- 2) Insert tab, click “**Column**” in the section titled, “**Charts**”. Click the first 2-D column chart type to generate a 2-D column chart. The following would be the resulting graph generated.



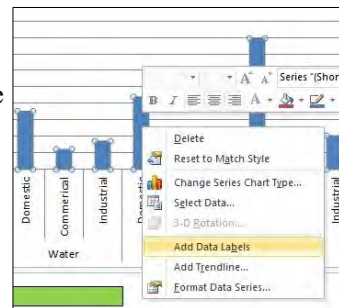
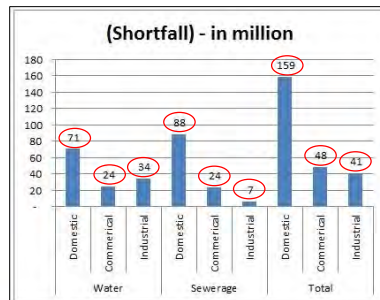
COLLECTION EFFICIENCY ASSESSMENT

41

Step 5: Managing the chart style/data/format

- 1) Right-click on any column to generate a drop-down menu. Click on the option, “**data labels**” to add the data labels.

- 2) After adding data labels, the graph would have the following outlook.



COLLECTION EFFICIENCY ASSESSMENT

42

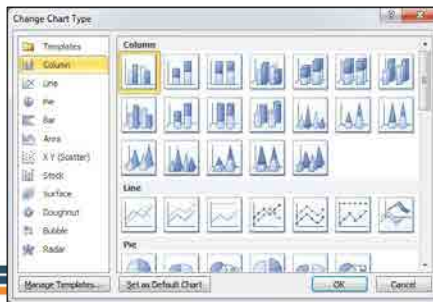
Step 6: Managing the chart style/data/format (Cont'd)

1. If chart type is to be changed, Chart type can be changed once.

Chart Tools - “Design” tab - click on “Change Chart Type” icon.



2. The following dialogue box would appear from which the requisite template can be selected.

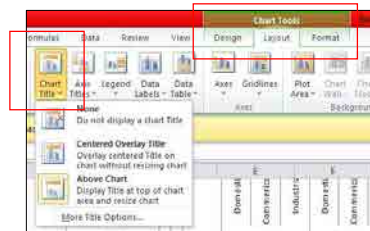


COLLECTION EFFICIENCY ASSESSMENT

43

Step 5: Managing the chart style/data/format (Cont'd)

1) Addition/deletion/alignment adjustment of **Chart Title** using “Chart Title” icon in “Layout” Tab of “Chart Tools” option on title bar.



2) **Data labels** can be added, deleted or aligned using the “Layout” tab by clicking on “Data Labels” icon.

3) **Axis titles** can be added, deleted or aligned using the “Layout” tab by clicking on “Axis Titles” icon.

4) **Axis labels** can be added, deleted or aligned using the “Layout” tab by clicking on “Axis” icon

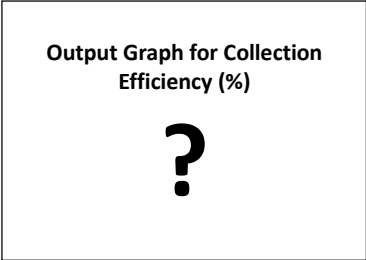
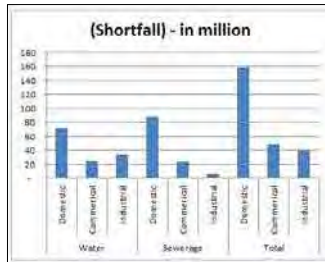
5) **Data Table** can be annexed to the horizontal axis using the “Data Table” icon.

COLLECTION EFFICIENCY ASSESSMENT

44

Step 6: Analysis (Identification of GAPS) on final output

Output Graphs



Data Tables

(Shortfall) - in million	Water			Sewerage			Total		
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial
	71	24	34	88	24	7	159	48	41

Collection Efficiency (%)	Water			Sewerage			Total		
	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial	Domestic	Commercial	Industrial
	91%	78%	65%	90%	79%	92%	92%	78%	77%

COLLECTION EFFICIENCY ASSESSMENT

45

ACTIVITIES & GROUP EXERCISE

- ACTIVITY B-13:** Creation of column chart for Collection Efficiency (%).
- ACTIVITY B-14:** Application of entire exercise on “Number of Bills”
- Group Exercise B-16:** GAP analysis and Target setting for Collection Efficiency.

COLLECTION EFFICIENCY ASSESSMENT

B:13 - INDIVIDUAL ACTIVITY

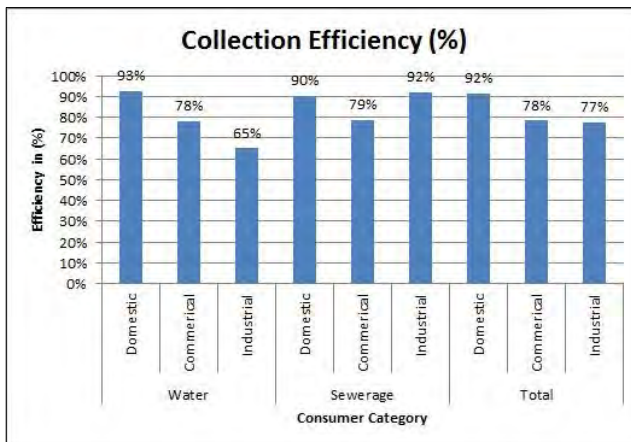
Repeat step 4 on collection efficiency table to:

- a) **Create the graph** of your choice and:
 - a) Add **Data Labels**;
 - b) Align Chart Title as “**Above Chart**”; and
 - c) Display Vertical and Horizontal axis titles

(Time Available: 15 minutes)

COLLECTION EFFICIENCY ASSESSMENT

ACTIVITY 3: OUTPUT



COLLECTION EFFICIENCY ASSESSMENT

B-14: INDIVIDUAL ACTIVITY

Repeat all 5 steps on number of bills data to:

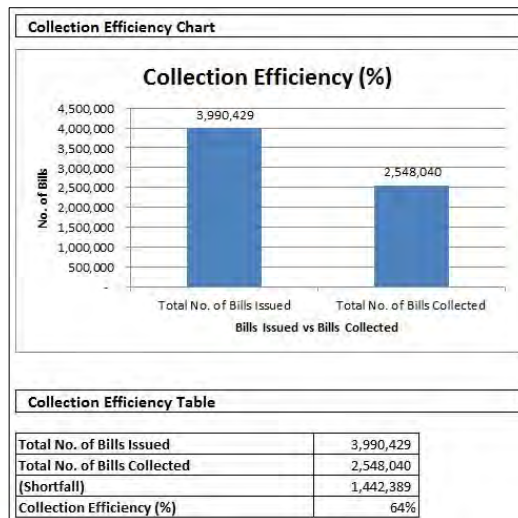
- Compute the **Collection Shortfall (No.)** in tabular form.
- Compute the **Collection Efficiency (%)** in tabular form.
- Create the graph** of your choice that compares “total number of bills issued” and “total number of bills collected” and:

- Add **Data Labels** to the columns;
- Insert and align Chart Title as “**Above Chart**”; and
- Display Vertical and Horizontal axis titles

(Time Available: 20 minutes)

COLLECTION EFFICIENCY ASSESSMENT

ACTIVITY 4: OUTPUT



COLLECTION EFFICIENCY ASSESSMENT

B:16 - GROUP EXERCISE

GIVEN

1. **Shortfall** in monetary terms
2. **Shortfall** in numeric terms
3. **Collection efficiency (%)** – Amount of Bills
4. **Collection efficiency (%)** – Number of Bills

GROUPS FORMATION

Four (4) Groups will be formed

Each Group will represent their respective Utility preferably

REQUIRED

1. Enumerate possible reasons for collection inefficiency (**GAP Analysis**)
2. Perform **Target Setting** for the **Collection Efficiency (%)** in **amount of bills** and **number of bills** for the next 3 years.

(Time Available: 30 minutes)

COLLECTION EFFICIENCY ASSESSMENT

GROUP EXERCISE FORMAT: B-16

Sr. No.	Reasons for discrepancy	Priority			
		Critical	High	Medium	Low
1					
2					
3					
4					
5					
6					
7					
8					

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 52

GROUP EXERCISE FORMAT: Target Setting

Indicator	Unit	Current Status	Target		
			2017-18	2018-19	2019-20
Collection Efficiency (Physical)	%				
Collection Efficiency (Financial)	%				

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 53

AMOUNT OF ARREARS

Arrears as at	Target				
	Multan	Rawalpindi	Faisalabad	Gujranwala	Lahore
June 30, 2016	966.81	860.641			

Rs. in Million

BUDGETARY STRUCTURE ANALYSIS & DEFICIT ASSESSMENT 53

B:16A - GROUP EXERCISE

TARGET SETTING FOR REDUCTION OF ARREARS

Indicator	Unit	Current Status	Target		
			2017-18	2018-19	2019-20
Reduction in Arrears	Amount (Rs.)				

Note: Insert the outcome of home assignment in business plan format (Annex-E)

54

THANKS



Business Planning & GAP Analysis

Gap Analysis and Target Setting

For Under ground Assets - WASAs

Abid Hussainy
 Senior Capacity Development Specialist

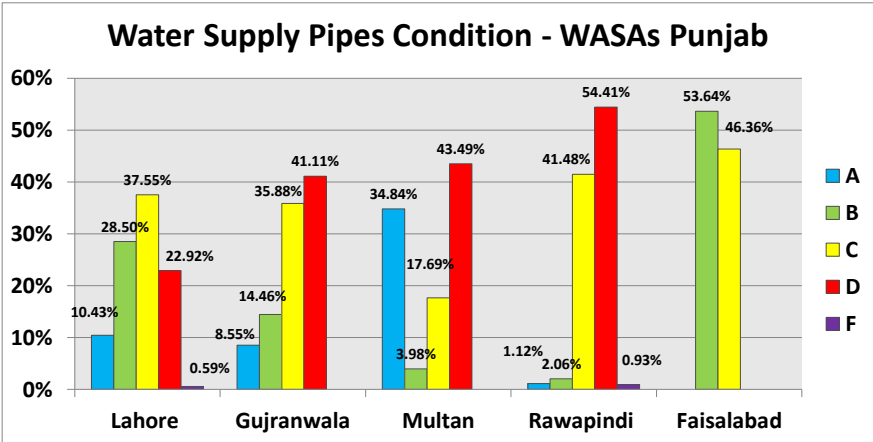
OBJECTIVES

- ✓ **Baseline of Underground assets**
- ✓ **Gaps Analysis**
- ✓ **Target Setting**
- ✓ **Formulation of Strategy**

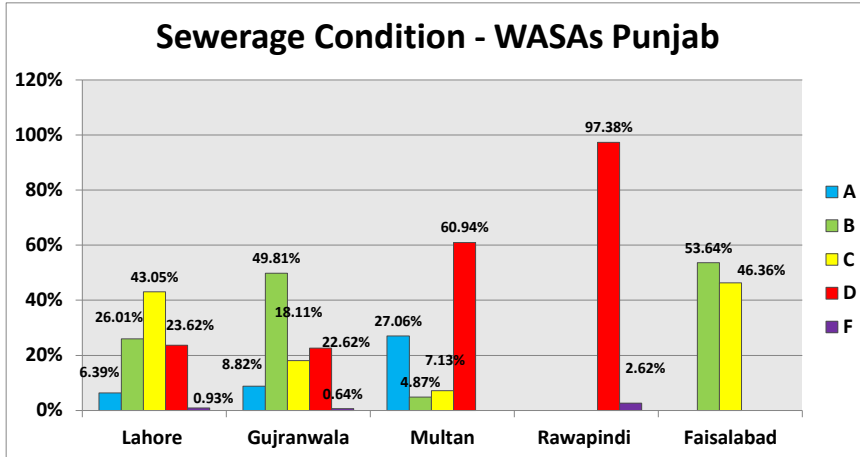
Baseline

Water and Sewerage - WASAs

Water Supply System



Sewerage System



Gaps Identification

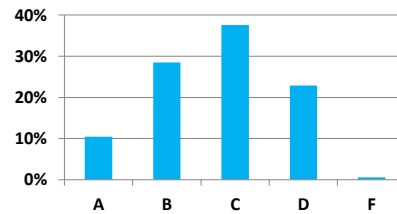
Water and Sewerage - WASAs

WASA Lahore

Water Supply Lines

Condition	Length (m)	% age
A	468158	10.43%
B	1278895	28.50%
C	1685124	37.55%
D	1028403	22.92%
F	26696	0.59%
Total	4487276	100%

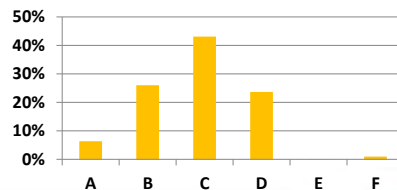
Lahore WS Condition



Sewerage Lines

Condition	Length (m)	%age Length (m)
A	253909	6.39%
B	1033531	26.01%
C	1710620	43.05%
D	937348	23.59%
F	36783	0.95%
Total	3973136	100.00%

Sewerage Condition - Lahore

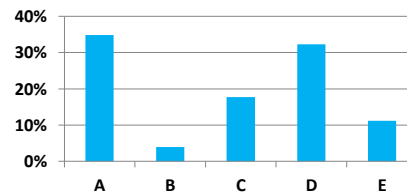


WASA Multan

Water Supply Lines

Condition	Length m	%age of Length
A	72119	34.84%
B	8244	3.98%
C	36618	17.69%
D	66819	32.28%
F	23200	11.21%
Total	207000	100.00%

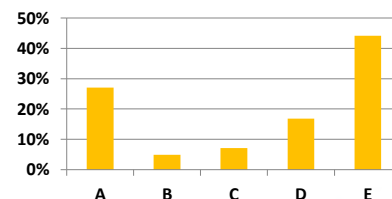
Multan WS Condition



Sewerage Lines

Condition	Length m	%age of Length
A	79403	27.06%
B	14305	4.87%
C	20931	7.13%
D	49351	16.82%
F	129490	44.12%
Total	293480	100.00%

Sewerage Condition - Multan



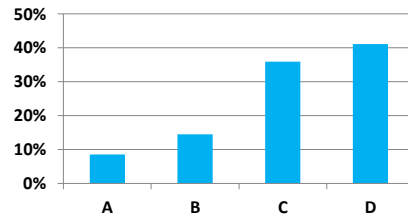
WASA Gujranwala

9

Water Supply Lines

Condition	Length (m)	% age of Length
A	71974	8.82%
B	406284	49.81%
C	147677	18.11%
D	184466	22.62%
F	5241	0.64%
Total	815641	100.00%

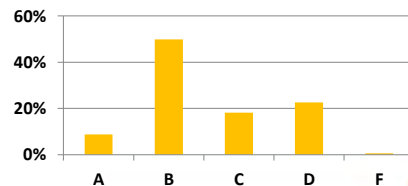
Gujranwala WS Condition



Sewerage Lines

Condition	Length m	%age of length
A	43316	8.55%
B	73248	14.46%
C	181777	35.88%
D	208281	41.11%
Grand Total	506623	100.00%

Sewerage Condition- Gujranwala



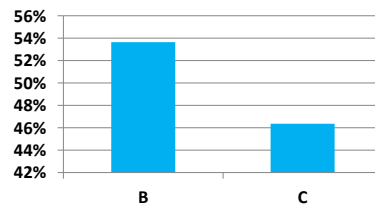
WASA Faisalabad

10

Water Supply Lines

Condition	Length m	%age of Length
B	14017	90.44%
C	1481	9.56%
Total	15498	100.00%

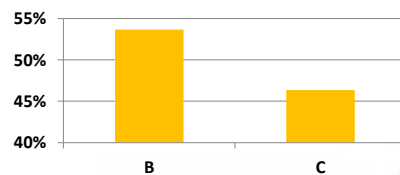
Water Supply Condition



Sewerage Lines

Condition	Length m	%age of Length
B	943854	53.64%
C	815594	46.36%

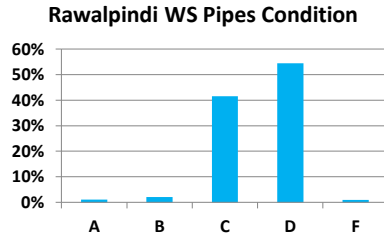
Sewerage Condition - Faisalabad



WASA Rawalpindi

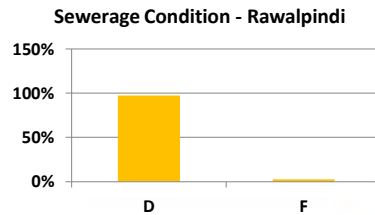
Water Supply Lines

Condition	Length m	%age of Length
A	8065	1.12%
B	14752	2.06%
C	297470	41.48%
D	390222	54.41%
F	6678	0.93%
Total	717187	100.00%



Sewerage Lines

Condition	Length	%age of Length
D	130796	97.38%
F	3526	2.62%



Exercise of Identifying Gaps by using MS Excel

Exercise of identifying gaps using MS Excel

Excel Data of Water Supply & Sewerage Pipes

Sub_Div	Dia	Material	Year_of_Co	Level_	Condition	Risk	Year_of_Re	Rep_Dia	Length m
Zone3-B	4"	AC	1982	T	C	M	1	6"	0.106936
Zone1-Northern	4"	AC	1982	P	C	M	1	6"	10.26912
Zone3-A	6"	AC	1982	P	C	M	1	8"	276.7541
Zone3-A	3"	AC	1982	S	C	M	1	4"	175.483
Zone1-Southern	4"	AC	1980	S	D	M	1	6"	121.3562
Zone1-Southern	4"	AC	1980	S	D	M	1	6"	93.08071
Zone1-Southern	4"	AC	1980	S	D	M	1	6"	17.38018
Zone1-Southern	6"	AC	1980	S	D	M	1	8"	253.9245
Zone1-Southern	4"	AC	1980	S	D	M	1	6"	13.77523
Zone3-B	4"	PVC	2008	P	B	M	12	6"	244.1071
Zone3-B	4"	AC	1980	T	D	M	1	6"	145.1322
Zone3-B	4"	AC	1980	T	D	M	1	6"	32.19875
Zone3-B	4"	AC	1980	T	D	M	1	6"	108.7276
Zone3-B	4"	AC	1980	T	D	M	1	6"	103.22
Zone3-B	4"	AC	1980	T	D	M	1	6"	58.31624

Asset attribute/information

Asset parameters include :

1	Diameter (inch)
2	Material (pipe material)
3	Year of Installation
4	Level (P,S T)
5	Condition (A,B,C,D,F)
6	Risk (H,M L)
7	Replacement Year
8	Replacement dia
9	Town Name
10	Subdivision/Zone Name

➤ Asset Condition

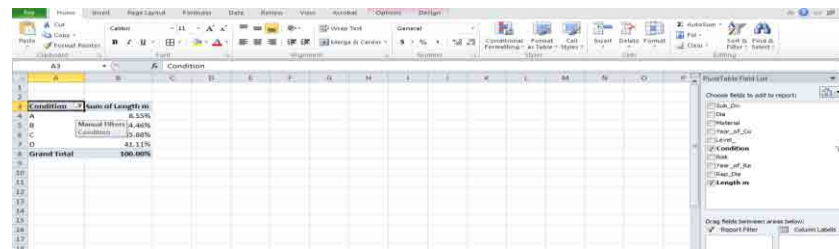
Asset condition explains its state in term of defined ranking. For example

A =	Excellent: No noticeable defects. Some aging or wear may be visible.
B =	Good: Only minor deterioration or defects are evident.
C =	Fair: Some deterioration or defects are evident, but function is not significantly affected.
D =	Poor: Serious deterioration in at least some portion of the structure. Function is inadequate.
F =	Failed: No longer functional. General failure or complete failure of a major structural component.



Using Excel tools for Analysis

1. Open Excel data given
2. Select the data
3. Go to Insert table and Click on Pivot Table
4. Drag and Drop the Condition field to Row Labels & Length Field to Values



TARGETS SETTING

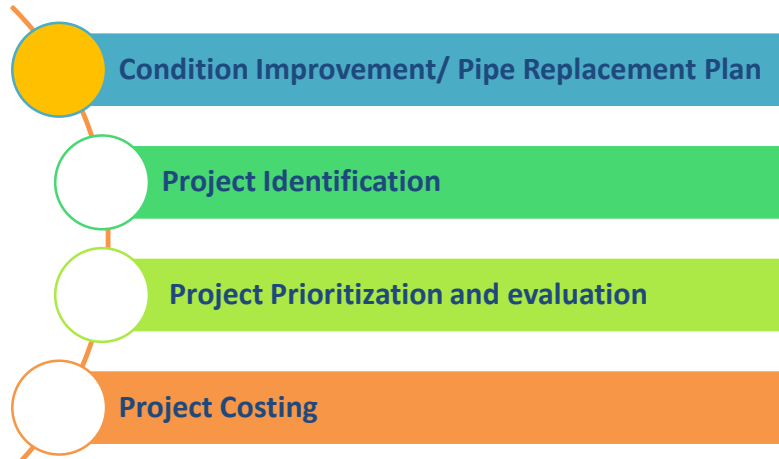


Setting Targets to improve asset condition


	Baseline			Targets		
	C	D	F	Year 1	Year 2	Year 3
WASA	Length (m)	Length (m)	Length (m)	C (m)	D (m)	F (m)
Lahore						
Gujranwala						
Multan						
Rawalpindi						
Faisalabad						



Strategies



1



کے نام سے شروع ہو جائے گا اور ہماری نجات ہے
 بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ
 In the name of Allah, the Beneficent, the Merciful

Business Planning & GAP Analysis


Integrated Development & Asset Management Plan (IDAMP)

Asif Iqbal
 Financial Management Specialist



Business Planning B1131

Module 1 : Business Planning & GAP Analysis




ALJAZARI
 Session 2

2

TABLE OF CONTENTS


➤ **Integrated Development and Asset Management Plan (IDAMP)**

- **Introduction**
- **Role in Development Planning**
- **Methodology**
- **Step By Step Approach.**
- **Implementation of IDAMP Through ADP**



Business Planning B1131

Module 1 : Business Planning & GAP Analysis



ALJAZARI
 Session 2

3

WHAT IS INTEGRATED DEVELOPMENT & ASSET MANAGEMENT PLAN?



4

INTRODUCTION

- Midterm (3 year) rolling Planning & Asset Management Tool.
- Annual development plan (ADP) will become Objective and result oriented.
- Evidence based planning creates linkage between (level of services (Los) with development and non development activities within a city.
- Helps entities better justify expenditure needs.
- Leads policy makers to better monitoring of performance of entities



5

How Do You Plan?

A. Development?

B. Non-Development/ Asset Management?



6

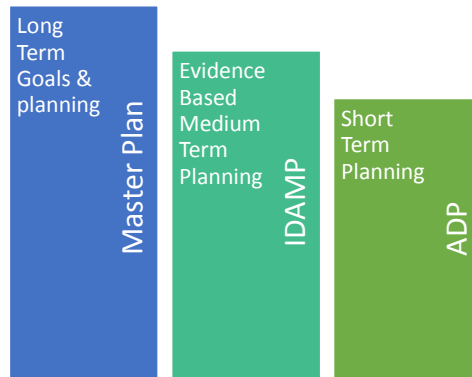
ANNUAL DEVELOPMENT PLAN

DATE	ACTION
January, 2016	Circulation of ADP guidelines
1 st Feb to 15 th March	Submission of scheme-wise first draft ADP to the Planning & Development by the departments duly cleared by Minister In-charge.
16-25 March	Scrutiny of draft ADP by the Members P&D and submission to Coordination Wing of P&D Department
26 March to 7 April	Departmental meetings / briefing with Chairman, P&D to discuss draft ADP
10 th April	Submission of 2 nd draft ADP to P&D by the Departments
Up till 15 May	Approval of new schemes proposed for inclusion in ADP by the competent forum



7

Do you link ADP Schemes to Level of Services? Is ADP process an Evidence Based Planning?



8

Methodology of IDAMP

The following steps have been formed after reviewing international literature and practices including iso 55000, cdia toolkit, world bank literature etc;

- Step 1 • Development of GIS based Asset Inventory
- Step 2 • Notification of Level of services (LOS)
- Step 3 • Development of Project Proposal
- Step 4 • Preparation of Operational & Maintenance (O&M) Costs
- Step 5 • Compilation of Project Package
- Step 6 • Financial Capacity Analysis
- Step 7 • Projects selection and approval
- Step 8 • Capital Investment Plan
- Step 9 • Finalization of Integrated Development & Asset Management Plan

9

Step1: Development of GIS based Asset Inventory



10

Asset Inventory – WASAs

1. Pipelines (Water Supply and Sewerage)
2. Tube wells
3. Disposal Stations & Disposal Pumps
4. Water Treatment Plants
5. Overhead Reservoirs
6. Machinery & Equipment
7. Vehicles
8. Land
9. Buildings

Below Ground**Above
Ground**

11

Sources of Inventory

1. Below Ground:
 - A Comprehensive Database is formed for all 5 WASAs by UU and Respective WASA.
 - Updated and endorsed in IDAMP
2. Below Ground:
 - AMIS with attributes like cost, life, risk, condition, replacement year etc
 - Updated and endorsed in IDAMP



Microsoft Excel
Worksheet

Regular updation is required

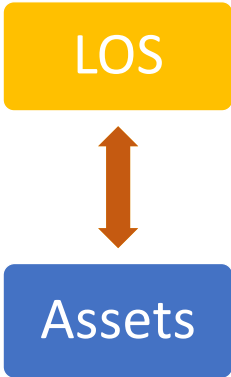



12

STEP 2: NOTIFICATION OF LEVEL OF SERVICES




13







**Microsoft Excel
Worksheet**




LOS - WASA



**Microsoft Excel
Worksheet**




Business Planning B1131 Module 1 : Business Planning & GAP Analysis




14

STEP 3: DEVELOPMENT OF PROJECT PROPOSALS



Business Planning B1131 Module 1 : Business Planning & GAP Analysis



15

After completing and updating Existing Inventory record and performance targets, Asset Managers shall assess; what shall be done to achieve those targets. To fulfill the service delivery gap between existing LOS and target LOS, Asset Manager shall identify projects to be done to achieve the target. Asset Manager shall develop project proposal. Project Proposal shall include the following activities:

1. Projects Identification
2. Preparation of Projects
3. Project Appraisal
4. Project Screening and Phasing

Further all the projects identified need to be mapped on GIS system for the identification of respective project lines/area.

16

PROJECT PROPOSAL FORM

- The following project proposals format is used by Asset Managers for each project:



**Microsoft Excel
Worksheet**

17

STEP 4: PREPARATION OF OPERATION & MAINTENANCE (O&M) COSTS



18

The operation and maintenance (O&M) costs will be compiled on basis of Asset Management Plan and computed for all the assets by the respective Asset Managers. The O&M costs is bifurcated into following sections:

- 1.O&M costs of existing assets
- 2.O&M costs of the proposed projects.
 - Annual O&M shall include Staff costs, Fuel cost, Electricity costs and Repair & Maintenance Cost for all existing and proposed assets.



19

O&M FORM

The following performan/ Form is used for calculation of O&M cost:

For example O&M for tube well:



Microsoft Excel
Worksheet



20

STEP 5: COMPILATION OF PROJECT PACKAGE



21

After completion of above mentioned steps, Asset Manager shall consolidate this working to produce a Project Package. Project Package shall include following at minimum;

1. Screened Project along with allocated score
2. O&M Cost along with AMP
3. Supporting Document(s) that are used by Asset Manager to allocate score

Asset managers shall submit their Project Package to the IDAMP Technical Team for evaluation and approval



22

STEP 6: FINANCIAL CAPACITY ANALYSIS

WASAs shall analyze potential financial sources, financial health of organization, operational sustainability and criticality of Service Delivery.



23

Step 7: Project Selection & Approval



24

Once Planning Department of WASAs has analyzed the potential financial sources and received Project Package from Asset Managers, these shall be presented to Technical Team for selection of projects.

Technical Team shall evaluate the proposed projects against following factors and score to each project

1. Relevance
2. Short Term Assumptions Performance
3. Efficiency
4. Effectiveness
5. Sustainability



25

STEP 8: CAPITAL INVESTMENT PLAN



26

After having the details of existing and proposed assets, requirements of their operations and maintenance, current and desired level of service delivery, WASAs will prepare their Capital Investment Plan.

Capital Investment Planning involves the following activities:

- Identification of sources of financing
- Assessment of Own Source Revenue
- Assessment of Available Government Grants/ External Financing
- Prioritization of available funds.



27

STEP 9: FINALIZATION OF INTEGRATED DEVELOPMENT & ASSET MANAGEMENT PLAN



28

Finalized Assets shall be compiled in the Form of IDAMP Budget Book

IDAMP budget book shall include the budgeted development expenditures and associated non development expenditures.

Finalized IDAMP book shall be approved and authorized by the competent authority



29

IMPLEMENTATION OF PROJECTS AS IDENTIFIED IN IDAMP



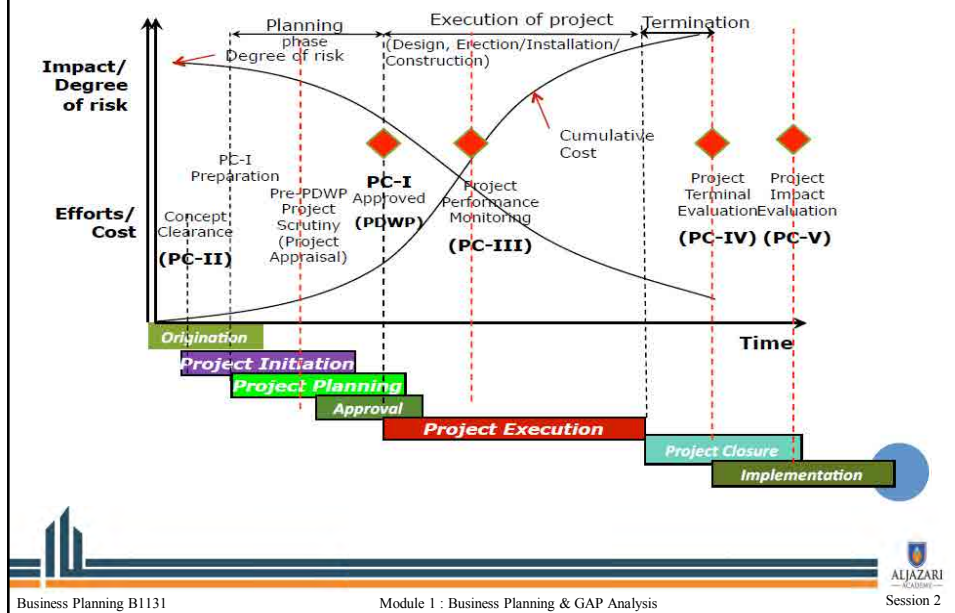
30

**Do you link ADP Schemes to Level of Services?
Is ADP process an Evidence Based Planning?**



31

PROJECT CYCLE MANAGEMENT (1/2)



32

PROJECT CYCLE MANAGEMENT (2/2)

PC-I Detailed project document

PC-II For preparation of pre-feasibility and feasibility surveys

PC-III For submission of monthly/annual monitoring/progress report of project

PC-IV For submission of completion report of project

PC-V For submission of evaluation/implementation report on annual basis for five years

33

Questions?



34

CONTACTS

Name	Designation	Contact No.	E-Mail
Asif Iqbal	Fin Mgmt Specialist		



THANK YOU!





In the name of Allah, the Beneficent, the Merciful بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ

1

Performance Improvement Plan

Water Supply and Sewerage System

Mr Ali Rao and Ms Aneeqa Azeem

Sr. Research Analyst

Service Improvement by Replacement & Extension of Water Supply & Sewerage Network

2

Steps:

1. Marking of lines to be replaced on GIS base map
2. Marking of New lines on GIS base map for improving % of water supply coverage
3. Tube well Rehabilitation
4. Operationalization of OHRs
5. Making Project in phased manners
6. Costing of Projects based on pipe length

Costing

Project Cost

Water Supply Pipe replacement or New Installation

Diameter	Length	Unit Cost (Per meter)	Pipe Cost (A)	Construction Cost (B)	Total Cost (A+B)
3"					
4"					
6"					





کے نام سے شروع جو بڑا مہربان نہایت رحم والا ہے
 بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ
 In the name of Allah, the Beneficent, the Merciful

Business Planning & GAP Analysis

Project Selection and Approval By Technical Committee

Asif Iqbal
 Financial Management
 Specialist



TABLE OF CONTENTS

- **Project Selection and Approval by Technical Committee**
 - **Introduction of Criteria**
 - **Methodology**
 - **Step By Step Approach**
 - **Role Play Activity**



PROJECT FINALIZATION AND APPROVAL BY TECHNICAL TEAM

Technical Team shall evaluated and approved the projects on basis of following criteria;

Criteria 1: *Relevance*

Criteria 2: *Short Term Assumption Performance*

Criteria 3: *Efficiency*

Criteria 4: *Effectiveness*

Criteria 5: *Sustainability*

Criteria 1: *Relevance*

Relevance

- Whether the project design is fundamentally suited for achieving the goals associated with the project?
- Whether the proposed project complied with the applicable legal regulations?

Lowest score	Highest score
01	20

Criteria 2: *Short Term Assumption Performance*

Short Term Assumption Performance

- Has funding been secured/allocated within the Local Government budget for this project?
- If required then whether the external sources of funding have been secured?

Lowest score	Highest score
01	20

Criteria 3: *Efficiency*

Efficiency

- Whether the proposed project is financially and/ or economical viable?
- Whether the proposed project would be able to attain time & cost efficiency?
- Will the proposed project going to improve the overall efficiency of the service delivery?

Lowest score	Highest score
01	20

Criteria 4: *Effectiveness*

Effectiveness

- Does the project contribute towards long term sustainable development, e.g. renewable energy, clean water supply, waste treatment, recycling, etc.?
- Does the project improve the social status and access to social services (health, education, etc.) for women and children?
- Whether the project will be able in achieving the associated *wide objectives*?

Lowest score	Highest score
01	20

Criteria 5: *Sustainability*

Sustainability

- If there is risk, does the project design include a risk mitigation strategy?
- Whether the proposed project would be able to sustain if external financial or technical support has been withdrawn after completion?

Lowest score	Highest score
01	20

Scoring Criteria

Final project score derived on basis of scores allocated by Technical Team and Asset Manager to the individual project. Score given by Technical Team and Asset Manager were clubbed by **70%** and **30%** respectively. Final Approved and Phased List of Projects was prepared as per the following scores schedule;

Cumulative Average Score	Phasing Plan
71 – 100	Year 1 (2016 - 2017)
51 – 70	Year 2 (2017 - 2018)
21 – 50	Year 3 (2018 - 2019)
1 – 20	Rejected
Technical Team score less than 20	Rejected

Group Activity: Role Play

CONTACTS

Name	Designation	Contact No.	E-Mail
Asif Iqbal	Fin Mgmt Specialist		





Public Communication Plan

Memoona Arslan Bhatti
Communication Specialist

February 10, 2017



Public Communication Plan – Overview

- Urban Unit has developed this communication plan with an objective to develop and implement a communication strategy for water and sewerage issues while ensuring that we, along with our program partners, spearhead a relentless awareness campaign.
- The proposed vigorous campaigns, fast track dissemination of information as guided by this plan will benefit residents of targeted cities.





Significance of Communication Plan

- Development of harmonized document in order to put in place a comprehensive and accurate referral document providing guidelines which are globally accredited vital for realizing public communication objective of any urban development project.
- Guidelines and key communication specifics, along with the actual activities that will be expected to define the project's annual calendar.



Effective Communication Strategy

- Ensure the most efficient and effective utilization of resources through a process of prioritization and rationalization
- Provide practice guidelines and clear direction for daily activities
- Identify the drivers of change as well as the best means to engage with them
- Ensure predictability and continuity, while enabling a continuous review of current organizational activities and indicative milestones against which we will measure success.



Elements of Effective Communication Strategy

- Policy Objectives
- Key Audiences of the Plan
- Communication Plan for WASAs
- Specific Approaches



Policy Objectives

- Audiences & their Profiles
- Key Messages
- Channels, Tools and Activities
- Communication's Budget
- Monitoring & Evaluation



Key Audiences of the Plan

Different audiences can be divided into three categories:

- Internal audiences
- External audiences
- Media

All channels of communication and messages have to be tailored accordingly to suit each of these.



Communication Plan for WASAs

Objectives of the Strategy

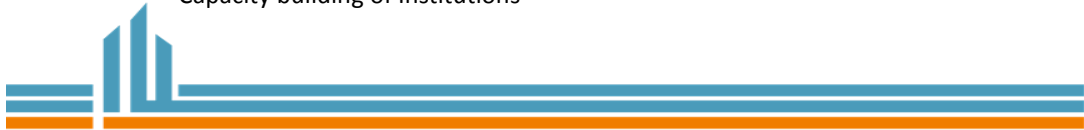
- To increase awareness, improve knowledge standards and build support for key stakeholders
- To promote positive water and sanitation management practices among all key stakeholders
- To create demand for use of the improved services





Specific Approaches

- Internal communication
- Public participation mechanisms
- multi-media communication program
- Media advocacy
- Capacity building of Institutions



Internal Communication

- Team briefing system
- Interaction facilitation with staff to address sensitive issues regarding job, organizational changes etc.
- Special events arrangement for staff
- A quarterly internal newsletter production
- Star of the Month to be announced and celebrated
- Frequent internal meetings
- Briefing documents



Internal Communication

- Consultations sessions
- Use of circular communication process with an emphasis on feedback
- Management debriefing meetings once a month
- Celebrate major accomplishments
- Ensure wide spread availability of information through notices, e-mail communication; newsletter, website and all other channels for purposes of general information
- Provide proper orientation to all new/ incoming staff
- Publish materials including books (if required), reports and various IEC materials of interest to the WASAs and their various stakeholders
- Timely and clear communication to staff



Establishing Public Participation Mechanisms

- Opinion leaders
- Consultation forums
- Establishing WSS forums and celebration of relevant events and days
- Corner meetings with community representatives
- Community-led public participation activities like small gatherings, mini seminars and public speech forums



Media-Communication Program

- Proactive promotion of positive information and campaigns in media
- Develop and maintain good relationships with media
- Participate in radio and TV talk shows
- Organize for press conferences to profile WASAs activities
- Make relevant information timely and newsworthy at all times
- Arrange to write quality write-ups for leading newspapers about reforms in WASAs
- Thematic media campaigns for information of communities
- A multi-media campaign delivered utilizing both paid-for advertisements, earned media and interpersonal channels
- Advertorials and adverts in the print media
- TV and Radio infomercials
- Documentary
- Information materials – posters, brochures
- News and feature articles in both print and electronic media



Media Advocacy

- Build on positive coverage to build the right media content and treatment
- To influence the nature of coverage
- Media training workshops at the national and city levels
- Implementation of advocacy approaches to build support among all
- Confidence building exercises in collaboration with involved partners/departments
- Tailored communication keeping in view the specific needs of each target group
- Jumping onto all possible relevant activities held by other departments/NGOs etc.

Tools for Sector Specific Communication

- Briefing materials
- Seminars and workshops
- Organizational meetings
- Articles in sector publications
- Quarterly progress Newsletters

Branding and Identity

- The agreed logo shall be promoted.
- The brand identity will be projected in all its documents, including, its various types of correspondence, PowerPoint presentations, and advertisements and /or any other form of publicity.



Monitoring and Evaluation

- Close monitoring of media coverage in both print and electronic media
- Stakeholder satisfaction and awareness survey, undertaken during every phase of implementation
- Staff knowledge and satisfaction assessment
- Range, quality and depth of communication products produced for different audience segments
- Delivery of measurable improvements in the quantity of communications delivered through the website and staff intranet
- Increased brand recognition WASAs at local, national, regional and international level
- Delivery of best value communication service, and
- Stronger partnerships and networks established with different institutions other stakeholders and organized groups

Evaluation Indicators

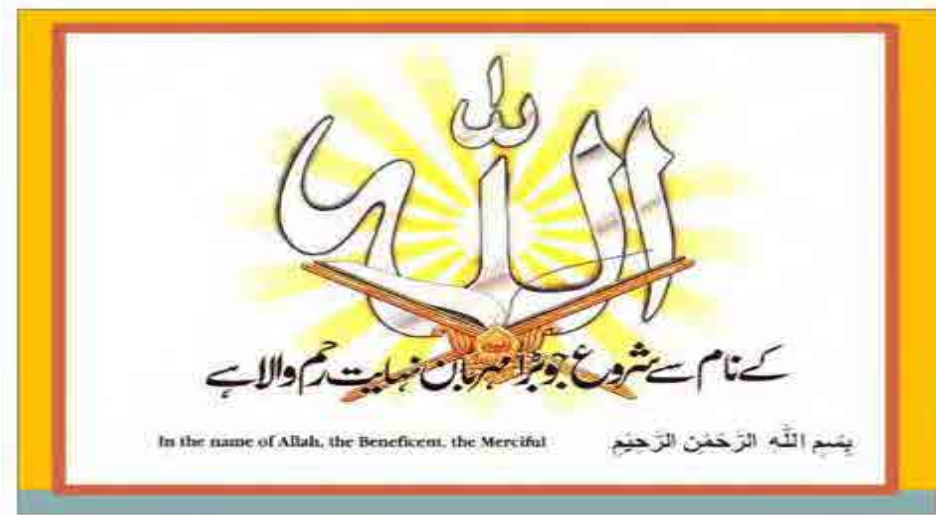
- Number of clips appearing in the newspapers
- TV clips
- Number of appearances and or references in websites and blogs
- Tone of articles, size and prominence
- Number of stakeholder engagement meetings held
- Number of workshops held
- Number of participants



Conclusion

The matrix integrates all aspects of the strategy indicating the logical link between the audience, key message themes, methodology, channels and tools, expected outcomes and implementing partners. Key message themes are based on the objective for communication for each audience and the findings from the assessment. The strategy matches audiences with specific channels depending on the appropriateness of the channel to the specific audience. The approaches combine mass media, community-level activity and interpersonal communication - all linked to specific outcomes.





MODULE - 3

Strategies for Human Resource Development



STRATEGIES FOR HUMAN RESOURCE DEVELOPMENT

(with Individual Activities, Group Exercises and Group Presentations)



Lecture Overview

1. Training Need Analysis (TNA)
2. Training Schedule and Training Calendar
3. Training Budget Forecasting
4. Training Plan
5. Monitoring and Evaluation Tools

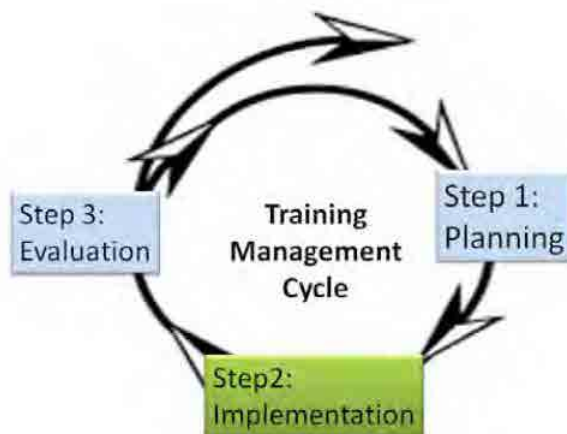
Learning Objectives

1. Ability to conduct Training Needs Analysis
2. Ability to Prepare Training schedule and Training Calendar
3. Learn about training Monitoring and Evaluation
4. Forecast Training Budget
5. Formulate Training Plan for their own WASAs

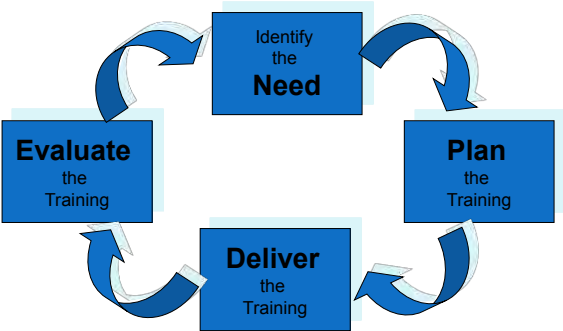
Human Resource Development

- Trainings develop employees for their current jobs and prepare employees for future roles and responsibilities.
- Trainings help employees to master skills, knowledge, positive attitudes, sense of self-worth and confidence.

Training Management Cycle



The Training Process



Training Need Assessment

Training Need Assessment

- Analyzing what the training needs are is a vital prerequisite for any effective training program or event.
- Simply throwing training at individuals may miss priority needs, or even cover areas that are not essential.
- TNA enables to channel resources into the areas where they will contribute the most to employee development, enhancing morale and organizational performance.

Training Need Assessment

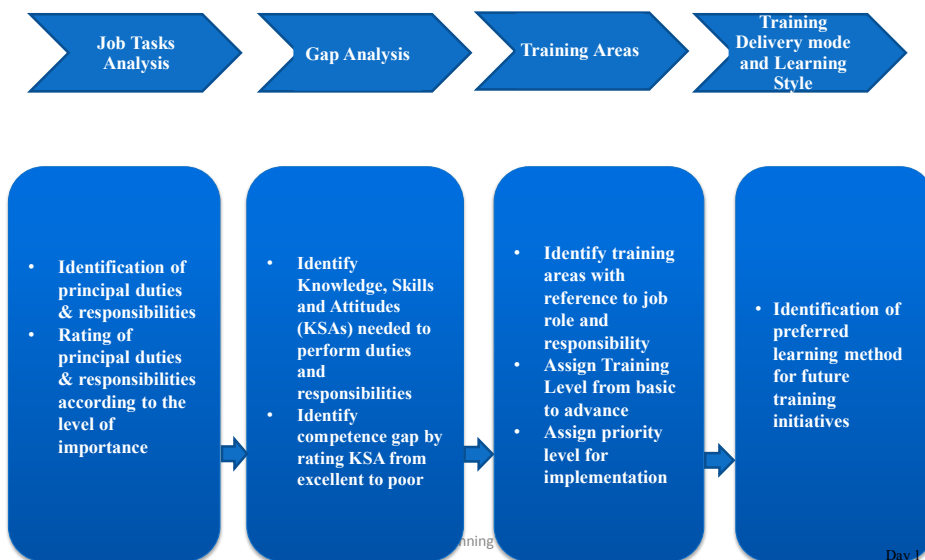
- Identify a comprehensive list of the required knowledge, skills and attitudes (KSA) needed for each job role.
- Propose training plan to develop those needed KSA.

Training Needs Assessment (TNA) Procedure

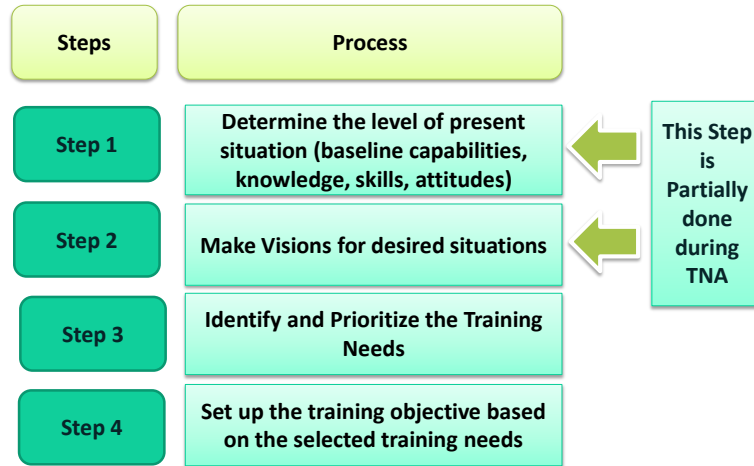
1. Job Tasks analysis – principal duties and responsibilities
2. Gap analysis- KSA
3. List of potential areas for training to fill these gaps
4. List training needs according to job roles
5. Understand preferred training modes i.e. classroom, field work, on job, etc.



TNA Process



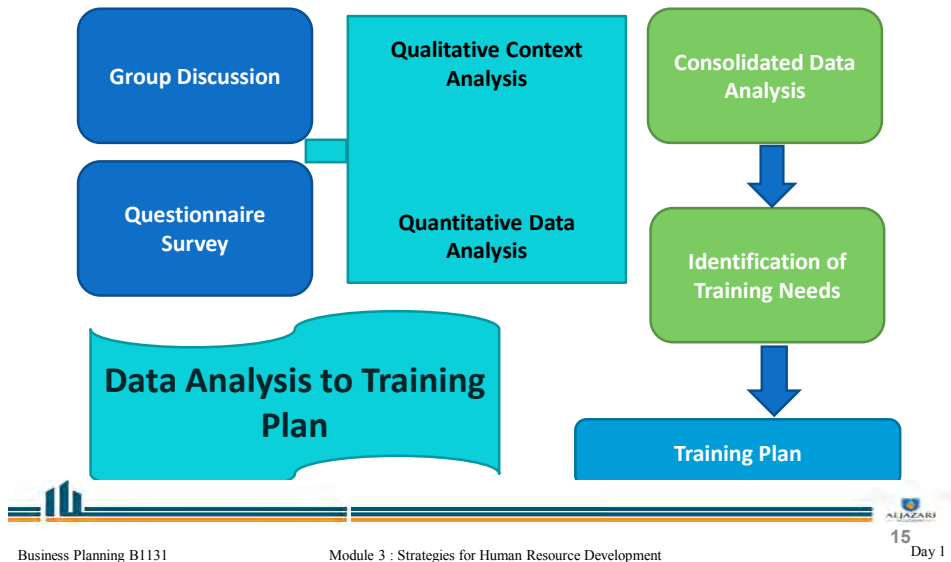
Steps in Identifying Training Needs



GAP ANALYSIS



Flow of Activities from Data Analysis to Training Plan



Activity One: Role Description and Analysis – 20 minutes

1. Record your principal duties, tasks and responsibilities– maximum 3 Which you consider most important
2. List the sub-tasks related to each task

Activity Two: Gap Analysis - 20 minutes

This activity focuses to identify list of knowledge, skills and attitudes (KSAs) needed to perform your job

1. Discuss and List relevant KSAs needed to perform each sub-task
2. Rank your existing competency (1 very poor competence – 5 excellent competence)

Activity Three: Proposed training for each job roles – prioritise

1. Identify potential training areas to develop KSAs
2. Assign training level from (basic to advance)
3. Assign priority level (high to Low)

Example: Training Priority and Course Level

Training Priority and Course Level						
Course #	Courses Name/ Title	Concepts	Details	Category of Targeted Employees	VUSA Rating	
					Priority	Course Level
TW001	Infiltrat	Pumps	Turbines column pipe spindles, shafts, pump head, gland packing, gland leakage, filter, overflow flow meters valves and pipes.	ADISE	High	Basic
		Motors	Pump types, Power factor calculations and motor replacement/adjustments	ADISE	High	Basic
TW002	Treatment Plant	Rapid Gravity Filter Media	Filter Media, Pumps, Electric Panels, Coagulants, Reagents	ADISE	Low	Basic
		Slow Sand	Filter Media, Sedimentation Tanks, SCRF	ADISE	Low	Basic
TW003	Pumping Stations	Chemisation	Health & Safety	ADISE	High	Basic
		Pumps	Variable pumps, vertical pumps, valves, bearings/Cleaning	ADISE	High	Basic
TW004	O/R (Over Head Pansyola)	Chemisation	Chemisation	ADISE	High	Basic
		Reservoirs	Periodic Inspections, Cleaning	ADISE	High	Basic
TW004	O/R (Over Head Pansyola)	Electric	Electric Panels and Circuits	ADISE	High	Basic
		Mechanical	Centrifugal pump fittings	ADISE	High	Basic
TW004	O/R (Over Head Pansyola)	Civil	Reservoirs	ADISE	High	Basic
		Distribution Panel Box	Capacitor, Magnetic Contactor, Circuit Breaker, Relays and Terminals	ADISE	High	Basic
TW001	Electric Panel	Power Factor Improvement Panel	Impedance Calculations, Common defects	ADISE	High	Basic
		HT, LT Protection Panels	Necessities, Working Rules and Manual changeover panels	ADISE	High	Basic

Priority Order	Subject	Classroom Seats 11 to 100 (lowest) and 11 to 100 (Highest)
1	TURBINES	10
2	TREATMENT PLANT	10
3	PUMPING STATIONS	10
4	O/R (Overhead Pansyola)	10
5	ELECTRIC PANELS	10

Please list **Priorities** as High, Medium and Low.
Classroom Seats will show the level of training required in a particular field. Please list this course as Advance, Intermediate or Basic.
 If a facility is running, give available seats. If not, **Not Required**.



Activity Four: Learning Style and Preferred Methods

Reflect on past training experiences – what has worked/not worked.

- Consider the variety of techniques that could be deployed - On-job; off-site; etc.



TNA Data Report Format

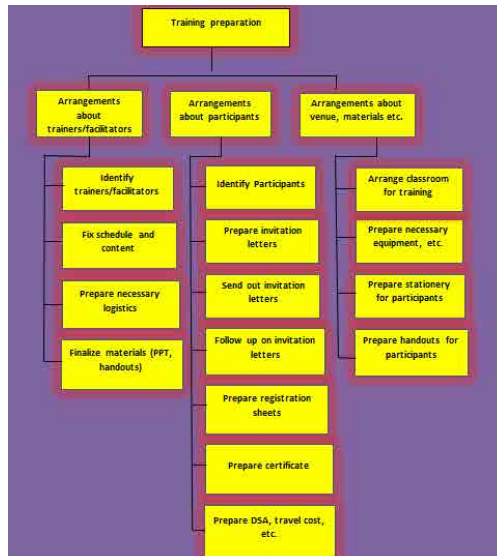
This spreadsheet represents the data collected in the Assessment Tool. The format allows the data to be manipulated, all organizational reports will be rolled into one report in this format.

1	Training										Budget					
	Name of Participant	WASA	Phone	Email	Department	Job Title	Courses	Priority			Level			No. of Employees/ Needed Training	Course Costs	Total Cost
								1	2	3	Basic	Medium	Advance			
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																Grand Total =



TRAINING PREPARATION





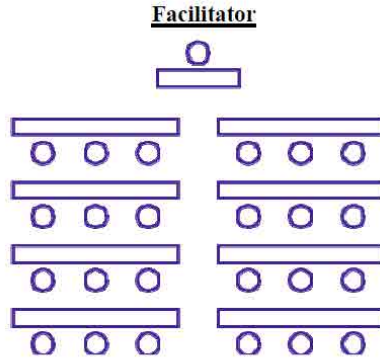
Work Schedule

	A	B	C	D	E	F	G	H	I	J	K	L
	Activity	Person in Charge	Completion Date		May				June			
					28	29	30	31	1	2	3	4
4	1. Arrangements about the trainer/ Facilitator											
5	1.1. Identify Trainers/ Facilitators											
6	1.2. Fix Schedule and Events											
7	(translaor, fees etc.)											
8	1.4. Finalize materials (PPTs, Handouts etc.)											
9												
10	2. Arrangements about participants											
11	2.1 Identify Target Participants											
12	2.2 Prepare invitation letters											
13	2.3 Send out invitation letters											
14	2.4 Follow up on invitation letters											
15	2.5 Prepare registration sheets											
16	2.6 Prepare certificates											
17	cost											
18												
19	3. Arrangements about Venue, Material etc.											
20	coffee etc)											
21	3.2 Prepare necessary equipment											
22	3.3 Prepare stationery for participants											
23	3.4 Prepare Handouts for participants											



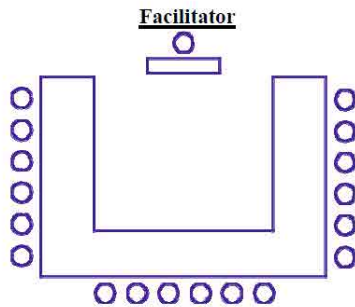
Training Room Arrangement

Traditional Classroom Arrangement

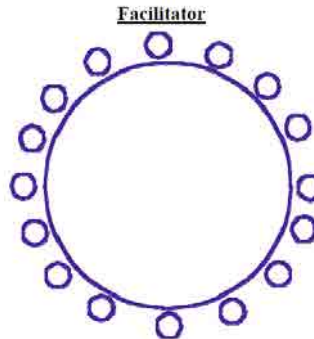


Cooperative Style Arrangement

Open Meeting Style Table Arrangement



Round Table Arrangement



Budget Forecasting Activity Format

27

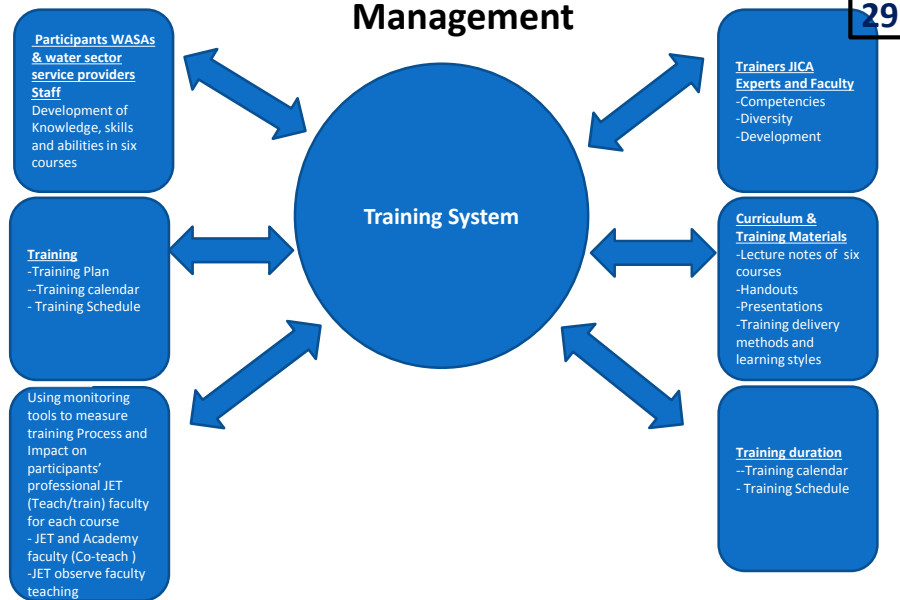
1	Items	Quantity	Unit Price	Amount PKR
2	1. Marketing			
3	Colored Brochures			
4			Subtotal	
5	2 Professional Staff			
6	Trainers/Facilitators			
7			Subtotal	
8	3. Documentation			
9	Handouts/Workbooks, Files & Folders			
10			Subtotal	
11	4. Transport & Travelling			
12	Coasters for Field Visits			
13	Fuel			
14	Maintenance			
15			Subtotal	
16	5. Equipment			
17	Safety Equipment Kits			
18	Surveyor's Wheel			
19	Sludge Measurement Tools			
20	Insulation Testers			
21			Subtotal	
22	6. Communication			
23	Telephone/Fax			
24	Internet			
25	Courier Charges			
26			Subtotal	
27	7. Lighting & Fuel			
28	Electricity			
29	Gas			
30	Water			
31			Subtotal	
32	8. Refreshments			
33	Tea Break			
34	Lunch			
35			Subtotal	
36	9. Miscellaneous Stationery, Markers, Charts etc			
37			Subtotal	
38				
39				
40	Grand Total			

Example: Training Budget

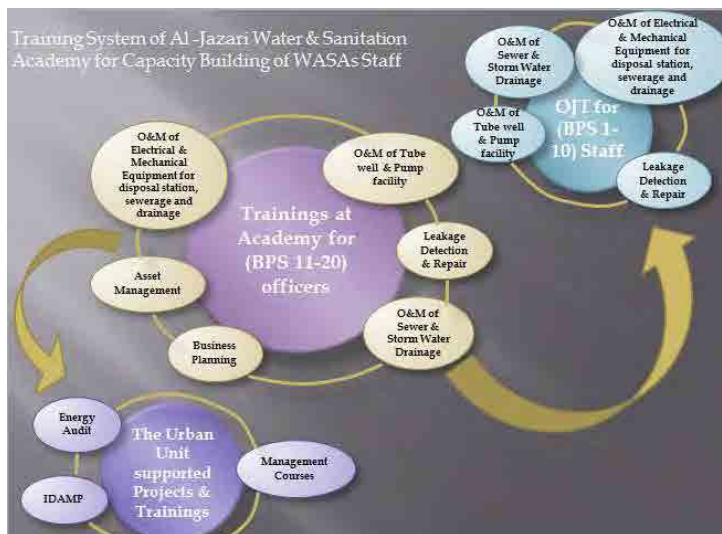
28

1	Items	Quantity	Unit Price	Amount PKR
2	1 Marketing			
3	Colored Brochures	100	50	5000
4			Subtotal	5000
5	2 Professional Staff			
6	Trainers/Facilitators	4	30,000/Day	120,000
7			Subtotal	120,000
8	3. Documentation			
9	Handouts/Workbooks, Files & Folders	20	500	10,000
10			Subtotal	10,000
11	4. Transport & Travelling			
12	Coasters for Field Visits	1	15,000	15,000
13	Fuel	1	3000/day	3000
14	Maintenance	1	5000/week	5,000
15			Subtotal	230,000
16	5. Equipment			
17	Safety Equipment Kits	20	3000	60,000
18	Surveyor's Wheel	5	4000	20,000
19	Sludge Measurement Tools	5	4000	20,000
20	Insulation Testers	5	5000	25,000
21			Subtotal	125,000
22	6. Communication Cost			
23	Telephone/Fax	2	5000/month	10,000
24	Courier Charges	100	20/packet	2,000
25	Internet	2	4000/month	10,000
26			Subtotal	22,000
27	7. Lighting & Fuel			
28	Electricity	50000/month		50,000
29	Gas	20000/month		20,000
30	Water	20000/month		20,000
31			Subtotal	90,000
32	8. Refreshments			
33	Tea Break	20	500/person	10,000
34	Lunch	20	2000/person	40,000
35			Subtotal	50,000
36	9. Miscellaneous Stationery, Markers, Charts etc			
37		20	400	8,000
38			Subtotal	8,000
39				
40	Grand Total			660,000

EXAMPLE KEY ELEMENTS OF TRAINING Management



30



Training Plan

Outline of a Training Plan

1. Tentative Course Title
2. Definition of the Training Scope
3. Identification of the Target Group
4. Identification of Key Course Topics and Generic Course Activities
5. Estimation of Development Time
6. Identification of Required Resource
7. Course Duration
8. Outline of the Course Development Budget

Example: Training Target and Expected Contents

33

No.	Courses	Number of Training Targets			Type of Trainees	Expected Contents
		2015-2016	2016-2017	2017-2018		
1.	O&M of Tube Wells and Pump Facility	12	12	12	Engineers	<ul style="list-style-type: none"> Pump Facilities Water Distribution System Centrifugal pump, Chlorine supply system
2.	Leakage Detection & Repair	25	20	20	Engineers	<ul style="list-style-type: none"> Leakage Control and detection Repair of pipes Identify buried leaks Installation of Leak Detection Equipment
3.	O&M of Sewerage & Storm Water Drainage	15	15	15	Engineers	<ul style="list-style-type: none"> Inspection of sewers, drains and networks Causes of silting, choking and clogging of sewers Testing techniques while taking in to account health and safety aspects
4.	Asset Management	10	10	10	Administration and Accountants	<ul style="list-style-type: none"> Development of Asset database Asset Replacement Planning Asset Information GIS
5.	O & M of Electrical Equipment	10	10	10	Engineers and technician	<ul style="list-style-type: none"> Electrical control panels SCADA Preventive maintenance techniques
6.	O & M of	10	10	10	Engineers and	<ul style="list-style-type: none"> Water pumps, motors, water

34

Training Schedule

Format : Training Course Schedule

Date and Time	Course Title	Level	Aims	Training Session Objectives	Training Method (s)	Location	Materials Required	Assessment Method
							(e.g. Textbook, pen/pencil, notebook)	



Example: Training Course Schedule October, 2016 – May, 2017

Sr.No	Codes	Courses Title	Days	October	November	December	January	February	March	April	May	June
1	W7221	Leakage Detection and Repair	4 (Cycle 1) 5 (Cycle 2)	1				1				
2	W1221	Operation and Maintenance of Tube Well and Pump	5		1				1			
3	S 3221	Operation and Maintenance of Sewer and Storm Water Drainage	9		1	1		1	1			
4	M 4131	Asset Management	15		1	1	1					
5	WSD 5231	Operation and Maintenance of Electrical Equipment	9		1	1	1			1	1	
6		Operation and Maintenance of Mechanical	10			1	1				1	1
7	B 1131	Business Planning	10					1	1			
Total working Days:- 180 Total Training Days :- 100 Days * Al-Jazari Academy reserves the right to revise the schedule without prior notice												



Format: Training Course delivery

37

Schedule

Training Schedule									
October, 2016 – February, 2017									
		Plan/Actual	Start Date	End Date	October	November	December	January	February
4	O&M of Tube Well and Pump Facility	Plan							
5		Actual							
6	Leakage Detection and Repair	Plan							
7		Actual							
8	O&M of Sewerage and Storm Water Drainage	Plan							
9		Actual							
10	O&M of Electrical Equipment	Plan							
11		Actual							
12	Asset Management	Plan							
13		Actual							
14	O&M of Mechanical Equipment	Plan							
15		Actual							
16	Business Planning	Plan							
17		Actual							



38

Example: Training Schedule

Sr. No.	Course	Days	Cycle	Dates
1	Leakage Detection and Repair	4	1	3 rd October 2016 – 6 th October 2016
2	Operation & Maintenance of Tube well and Pump Facility	5	1	24 th October 2016 – 28 th October 2016
3	Operation and Maintenance of Sewer and Storm Water Drainage including Health and Safety	9	1	31 st October 2016 – 2 nd November 2016 (Module 1)
				3 rd November 2016 – 4 th November 2016 (Module 2)
				14 th November 2016 – 17 th November 2016 (Module 3)
4	Asset Management	15	1	31 st October 2016 – 2 nd November 2016 (Module-1)
				3 rd November 2016 – 4 th November 2016 (Module 2)
				21 st November 2016 – 22 nd November 2016 (Module 3)
				23 rd November 2016 – 24 th November 2016 (Module 4)
				5 th December 2016 – 6 th December 2016 (Module 5)
5	Operation and Maintenance of Electrical Equipment	9	1	7 th December 2016 – 10 th December 2016 (Module 6)
				23 rd November 2016 – 25 th November 2016 (Module 1)
				30 th November 2016 – 2 nd December 2016 (Module 2)
6	Operation & Maintenance of Mechanical Equipment	12	1	7 th December 2016 – 9 th December 2016 (Module 3)
				19 th December 2016 – 21 st December 2016 (Module 1)
				26 th December 2016 – 28 th December 2016 (Module 2)
7	Business Planning	15	1	2 nd January 2017 – 4 th January 2017 (Module 3)
				9 th January 2017 – 11 th January 2017 (Module 4)
				30 th January 2017 – 3 rd February 2017
				20 th February 2017 – 24 th February 2017
				6 th March 2017 – 9 th March 2017



Holidays	
• October 11, 12, 2016	• Ashura Days
• November 09, 2016	• Iqbal Day
• December 12, 2016	• *Eid Milad-un-Nabi
• February 05, 2017	• Kashmir Day
• March 23, 2017	• Pakistan Day
• May 01, 2017	• Labour Day
*Subject to sighting of the moon	

Day Wise Training Schedule

Sr. No	Day and Date	Themes	Session 1			Session 2		Lunch 1:15-2:00pm	Session 3	
			9:00-10:00am	10:00-11:00am	Tea 11:00-11:15am	11:15am-12:15 pm	12:15-1:15pm		2:00-3:00pm	3:00-4:00pm
1	Monday (October 31, 2016)	Introduction to Asset Management Assets & Asset Condition	Definition of Assets Assets of WASAs	Three different Exercises to identify assets and asset components		Asset Coding structure Asset Condition Assessment & scale to determine Asset conditions.		Assignment 1- Discuss Asset Management System in WASAs/ KWSB/ NSLUSC with respect your organization and prepare a brief report of 300 words.		
2	Tuesday (November 1, 2016)	Risk & Application of Asset attributes Asset Management Plan	Ways to determine Risk and application of attributes of assets in effective decision making			Asset Management Plan preparation techniques and discussion on Asset Management Plan of WASA.		Assignment 2- Prepare a brief asset risk report of 300 words.		
3	Wednesday (November 2, 2016)	Accounting and reporting of assets in books of accounts Introduction of Asset Management Information System (AMIS)	Accounting practices for fixed assets in WASAs under Financial Management Manual and developed utilities Depreciation & Fixed Asset Register			Introduction of Asset Management Information System (AMIS) Registration of Users & Addition of Assets into AMIS		Assignment 3- Individual Assignment for formation of Fixed Asset Register		
4	Thursday (November 3, 2016)	Asset Management Information System (AMIS) operating skills	Searching and Editing of Assets into AMIS Reporting of AMIS Conclusion and Suggestions			Brief introduction of IDAMP, GIS & AMIS for underground asset		Assignment 4- Individual Assignment to add one to two assets for each category and prepare a brief report for		
5	Friday (November 04, 2016)	Preparation of Project & Presentation	Project 1-Preparation of Asset Management Plan of 5-10 tubewells or any area of utility service			Project 1-Preparation of Asset Management Plan of 5-10 tubewells or any area of utility		Project 1-Presentation on project		

Monitoring and Evaluation

Monitoring and Evaluation Tools

1. Design Pre/Post Test
2. Keep Record of Participants Attendance (Example)
3. Trainer Evaluation Form
4. Course Evaluation Form
5. Maintain course participants' Training Record (Example)

Format: Course Attendance

Asset Management								
Attendance		21-Oct-18	1-Nov-18	2-Nov-18	3-Nov-18	4-Nov-18	Marks Allocation	Comments
Sr No.	Name						25.00	

Assessment Criteria				

Example: Course Attendance

Asset Management								
Attendance		21-Oct-18	1-Nov-18	2-Nov-18	3-Nov-18	4-Nov-18	Marks Allocation	Comments
Sr No.	Name						25.00	
1	Mr. Sohail Siddiqui	WASA Lahore	5.00	5.00	5.00	5.00	5.00	20.00
2	Mr. Muhammad Danish	WASA Lahore	4.25	4.25	4.75	5.25	5.00	22.00
3	Mr. Adnan Sharif	WASA Lahore	0.00	3.50	3.50	3.50	5.00	8.00
4	Mr. Sohail Chohan	WASA Lahore	4.25	4.25	4.25	5.00	5.00	22.75
5	Mr. Shamaz Ayub	WASA Lahore	0.00	0.00	0.00	0.00	0.00	0.00
6	Mr. Abdul Rehman	WASA Lahore	3.50	4.25	4.50	4.25	4.25	20.25
7	Mr. Ghaffar Sadiq	WASA Lahore	4.50	4.25	3.50	3.75	5.00	21.00
8	Mr. Asghar Ali	WASA Lahore	0.00	0.00	0.00	0.00	0.00	0.00
9	Mr. Muhammad Tauseef	WASA Gujranwala	4.25	5.00	5.00	5.00	5.00	24.25
10	Mr. Tufail Ghuman	WASA Gujranwala	0.00	5.00	5.00	5.00	5.00	20.00

Assessment Criteria				
	9am - 11 am	11am - 1pm	2pm - 4pm	Absent
Marks	1.5	1.5	2	0

148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200

Format: Participant Details

Sr. No.	Name	WASA	Designation	Leakage detection and repair	Tube Well and Pump Facility	Sewerage and Storm Water Drainage	Asset Management	Electrical Equipment	Comments/Status
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									



Example: Participants' Details

Sr. No.	Name	WASA	Designation	Leakage detection and repair	Tube Well and Pump Facility	Sewerage and Storm Water Drainage	Asset Management	Electrical Equipment	Comments/Status
61	Mr. Muhammad Tariq Malik	WASA Rawalpindi	Sub Engineer	-	-	Attended	-	-	
68	Mr. Samran Zahid	WASA Rawalpindi	Sub Engineer	Attended	-	-	-	-	
69	Mr. Ahsan Ejaz	WASA Quetta	Sub Engineer	-	-	-	-	Attended	
70	Mr. Ali Akbar	WASA Quetta	Assistant Engineer	-	-	Nominated	-	-	Did not attend
71	Mr. Haji Salah ul Din	WASA Quetta	Supervisor	-	-	Attended	-	-	
72	Mr. Mohammad Asif	WASA Quetta	Sub Engineer	-	Attended	-	-	-	
73	Mr. Muhammad Ramzan	WASA Quetta	NEN	Attended	-	-	-	Attended	
74	Mr. S. Mahtab Sherzad	WASA Quetta	Assistant Engineer	-	Attended	-	-	-	
75	Mr. Saibt ul din	WASA Quetta	Supervisor	Attended	-	-	-	-	
76	Mr. Zakar Hussain	WASA Quetta	Assistant Engineer	-	-	Attended	-	-	
77	Hafiz Faraz Ak	TMA Sukkur	Sub Engineer	-	Attended	-	-	Attended	
78	Mr. Bilal Arain	TMA Sukkur	Sub Engineer	-	-	Nominated	-	-	Did not attend
79	Mr. Muhammad Ali	North Sindh Urban Services Corporation Limited	Manager Operations and Services	-	-	-	Attended	-	
80	Hassan Mehmood	PHED (North)	Assistant Engineer	-	-	-	-	Nominated	Did not attend
81	Mr. Iqbal Sabir Shah	PHED (South)	SDO	-	-	Attended	-	-	
82	Mr. Ahsan Iqbal	PHED Quetta	Sub Engineer	Attended	-	-	-	-	
83	Mr. Nasir Lebn	PHED Quetta	SDO	Attended	-	-	-	-	



STRATEGIES FOR HUMAN RESOURCE DEVELOPMENT

(Workforce Database Analysis)

Business Planning - B1131

47

Outcomes

3

By the end of this lecture participants will be able to:

1. Demonstrate the Need for Staffing Analysis
2. Using MS Excel for HR Database analysis and further planning.
3. Practice on data to extract information.

Why Workforce Data is key to strategic HR Decisions

4

- Workforce data analysis is not just about making HR better, *it's about making the business better and taking informed decisions*
- HR data driven business decisions leads to develop workforce plan that optimize talent investment while effectively monitoring recruiting, development, productivity, accountability, retention and many other workforce initiatives.

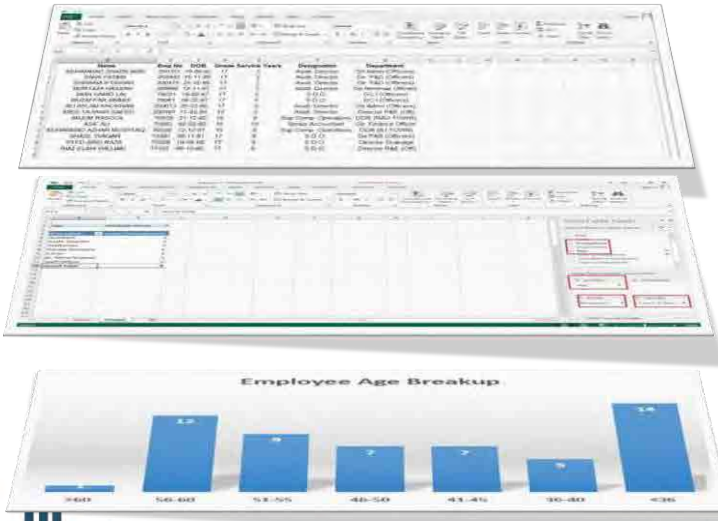
Current Situation Analysis

5

- Human Resource Data is available in all WASAs in different forms, however WASAs need to properly access them, align the information with decision-making, and act accordingly
- All WASAs expressed the need for proper HR planning, but there is need to develop culture for Data Driven Decision Making

Overview

6



Data

Information

Decision

Staff Deficit and Aging Analysis (Raw Data)

7

Step 1: Open Raw Data sheet on your desktop

Name	Emp No	DOB	Grade	Service Years	Designation	Department
MUHAMMAD SHAZIB AMIN	200351	19-06-92	17	3	Asstt. Director	Dir. Admn (Officers)
SANA FATIMA	200442	15-11-89	17	3	Asstt. Director	Dir. P&D (Officers)
SUMAIRA IFTIKHAR	200475	25-12-88	17	3	Asstt. Director	Dir. P&D (Officers)
MURTAZA HASSAN	200986	12-11-87	17	3	Asstt. Director	Dir. Revenue Officers
MIAN HAMID LAL	79221	19-02-87	17	5	S.D.O.	DC-1 (Officers)
MUZAFFAR ABBAS	79061	05-02-87	17	5	S.D.O.	DC-1 (Officers)
ALI ASLAM KHOKHAR	200613	25-03-86	17	3	Asstt. Director	Dir. Admn (Officers)
MISS TAJWAR SAEED	200497	11-02-84	17	3	Asstt. Director	Director P&E (Off)
ANJUM RASOOL	76539	21-12-82	15	8	Sup. Comp. Operations	DDR (RAW TOWN)
ASIF ALI	75683	02-02-82	16	10	Senior Accountant	Dir. Finance Officer
MUHAMMAD AZHAR MUSHTAQ	76528	12-12-91	15	8	Sup. Comp. Operations	DDR (A1 TOWN)
SHAZIL WAQAR	75581	28-11-81	17	8	S.D.O.	Dir P&S (Officers)
SYED ABID RAZA	75558	10-08-80	17	8	S.D.O.	Director Drainage
RIAZ ELAHI WILLIAM	77167	09-10-86	17	8	S.D.O.	Director P&E (Off)

Activity: Determine Age

8

- Step 2: Enter the following formula

=DATEDIF(C2,TODAY(),"Y") to get the age of employees to date

	Name	Emp No	DOB	Grade	Service Years	Designation	Department	Age
2	MUHAMMAD SHAZIB AMIN	200351	6-19-1992	17	3	Asstt. Director	Dir Admn (Officers)	24
3	SANA FATIMA	200442	11-15-1999	17	3	Asstt. Director	Dir. P&D (Officers)	26
4	SUMAIRA FTIKHAR	200475	12-25-1998	17	3	Asstt. Director	Dir. P&D (Officers)	27
5	MURTAZA HASSAN	200986	11-12-1987	17	3	Asstt. Director	Dir Revenue Officers	28
6	MIAN HAMID LAL	79221	2-19-1987	17	5	S.D.O.	DC-I (Officers)	29
7	MUZAFFAR ABBAS	79061	2-5-1987	17	5	S.D.O.	DC-I (Officers)	29
8	ALI ASLAM KHOKHAR	200613	3-25-1986	17	3	Asstt. Director	Dir Admn (Officers)	30
9	MISS TAJWAR SAEED	200497	2-11-1984	17	3	Asstt. Director	Director P&E (Off)	32
10	ANJUM RASOOL	76539	12-21-1982	15	8	Sup Comp. Operations	DDR (RAV TOWN)	33
11	ASIF ALI	75683	2-2-1982	16	10	Senior Accountant	Dir. Finance Officer	34
12	MUHAMMAD AZHAR MUSHTAQ	76528	12-12-1981	15	8	Sup Comp. Operations	DDR (ALTOWN)	34
13	SHAZL WAQAR	75581	11-28-1981	17	8	S.D.O.	Dir P&S (Officers)	34
14	SYED ABID RAZA	75558	8-10-1980	17	8	S.D.O.	Director Drainage	35
15	RAZ ELAHI WILLIAM	77167	10-9-1986	17	8	S.D.O.	Director P&E (Off)	49

Activity: Determining Age (Optional Formatting)

9

	Name	Emp No	DOB	Grade	Designation	De
1	MUHAMMAD SHAZIB AMIN	200351	6-19-1992	17	Asstt. Director	Dir Adm
2	SANA FATIMA	200442	11-15-1999	17	Asstt. Director	Dir. P&D
3	SUMAIRA FTIKHAR	200475	12-25-1998	17	Asstt. Director	Dir. P&D
4	MURTAZA HASSAN	200986	11-12-1987	17	Asstt. Director	Dir Rev
5	MIAN HAMID LAL	79221	2-19-1987	17	S.D.O.	DC-I
6	MUZAFFAR ABBAS	79061	2-5-1987	17	S.D.O.	DC-I
7	ALI ASLAM KHOKHAR	200613	3-25-1986	17	Asstt. Director	Dir Adm
8	MISS TAJWAR SAEED	200497	2-11-1984	17	Asstt. Director	Director
9	ANJUM RASOOL	76539	12-21-1982	15	Sup Comp. Operations	DDR (I
10	ASIF ALI	75683	2-2-1982	16	Senior Accountant	Dir. Fir
11	MUHAMMAD AZHAR MUSHTAQ	76528	12-12-1981	15	Sup Comp. Operations	DDR (A.I.TOWN)
12	SHAZL WAQAR	75581	11-28-1981	17	S.D.O.	Dir P&S (Officers)
13	SYED ABID RAZA	75558	8-10-1980	17	S.D.O.	Director Drainage
14	RAZ ELAHI WILLIAM	77167	10-9-1986	17	S.D.O.	Director P&E (Off)
15	MOHAMMAD YASIN	68031	30-12-60	14	Assistant	CD-II
16	NABEEL AHMED	79631	16-07-84	11	Sub Engineer	CD-II
17	ADNAN AHMED	75809	01-08-75	11	Sub Engineer	CD-III
18	MUHAMMAD KHALIL	75843	25-04-79	11	Sub Engineer	D.D (Quality Cont.)
19	MUHAMMAD WASEEM AZHAR	75856	01-04-77	11	Sub Engineer	D.D (Quality Cont.)
20	RAZ AHMAD ANSARI	62453	07-11-56	11	Draftsman	D.D DESIGN I
21	ABDUL HAKEEM	61063	11-06-57	16	Staff Officer	DC-I (Officers)
22	MOHAMMAD JAMIL	62351	07-01-58	16	Staff Officer	DC-I (Officers)

Activity: Determining Age (Optional Formatting) 10

Name	Emp No	DOB	Grade	Designation	Department	Age
MUHAMMAD SHAZIB AMIN	200351	6-19-1992	17	Asstt. Director	Dir Admn (Officers)	24
SANA FATIMA	200442	11-15-1989	17	Asstt. Director	Dir. P&D (Officers)	26
SUMAIRA IFTIKHAR	200475	12-25-1988	17	Asstt. Director	Dir. P&D (Officers)	27
MURTAZA HASSAN	200986	11-12-1987	17	Asstt. Director	Dir. Revenue Officers	28
MIAN HAMID LAL	79221	2-19-1987	17	S.D.O.	DC-1 (Officers)	29
MUZAFFAR ABBAS	79061	2-5-1987	17	S.D.O.	DC-1 (Officers)	29
ALI ASLAM KHOKHAR	200613	3-25-1986	17	Asstt. Director	Dir Admn (Officers)	30
MISS TAJWAR SAEED	200497	2-11-1984	17	Asstt. Director	Director P&E (Off)	32
ANJUM RASOOL	76539	12-21-1982	15	Sup Comp. Operations	DDR (RAW TOWN)	33
ASIF ALI	75683	2-2-1982	16	Senior Accountant	Dir. Finance Officer	34
MUHAMMAD AZHAR MUSHTAQ	76528	12-12-1981	15	Sup Comp. Operations	DDR (AITOWN)	34
SHAZIL WAQAR	75581	11-28-1981	17	S.D.O.	Dir P&S (Officers)	34
SYED ABID RAZA	75558	8-10-1980	17	S.D.O.	Director Drainage	35
RIAZ ELAHI WILLIAM	77167	10-9-1986	17	S.D.O.	Director P&E (Off)	49
MOHAMMAD YASIN	68031	30-12-20	14	Assistant	CD-II	55
NABEEL AHMED	76931	16-07-84	11	Sub Engineer	CD-II	32
ADNAN AHMED	75809	01-08-75	11	Sub Engineer	CD-III	41
MUHAMMAD KHALIL	75843	25-04-79	11	Sub Engineer	D.D (Quality Cont.)	37
MUHAMMAD WASEEM AZHAR	75865	01-04-77	11	Sub Engineer	D.D (Quality Cont.)	39
RAZ AHMAD ANSARI	62453	07-11-56	11	Draftsman	D.D DESIGN I	59
ABDUL HAKEEM	61963	11-06-57	16	Staff Officer	DC-1 (Officers)	59
MUHAMMAD JAHLIL	62351	07-01-58	16	Staff Officer	DC-1 (Officers)	58

Activity: Date of Retirement 11

- Enter the following formula

$$=DATE(YEAR(C2)+60,MONTH(C2),DAY(C2))$$
to get the date of retirement

Name	Emp No	DOB	Grade	Service Years	Designation	Department	Age	Date of Retirement
MUHAMMAD SHAZIB AMIN	200351	6-19-1992	17	3	Asstt. Director	Dir Admn (Officers)	24	6-19-2052
SANA FATIMA	200442	11-15-1989	17	3	Asstt. Director	Dir. P&D (Officers)	26	11-15-2049
SUMAIRA IFTIKHAR	200475	12-25-1988	17	3	Asstt. Director	Dir. P&D (Officers)	27	12-25-2048
MURTAZA HASSAN	200986	11-12-1987	17	3	Asstt. Director	Dir. Revenue Officers	28	11-12-2047
MIAN HAMID LAL	79221	2-19-1987	17	5	S.D.O.	DC-1 (Officers)	29	2-19-2047
MUZAFFAR ABBAS	79061	2-5-1987	17	5	S.D.O.	DC-1 (Officers)	29	2-5-2047
ALI ASLAM KHOKHAR	200613	3-25-1986	17	3	Asstt. Director	Dir Admn (Officers)	30	3-25-2046
MISS TAJWAR SAEED	200497	2-11-1984	17	3	Asstt. Director	Director P&E (Off)	32	2-11-2044
ANJUM RASOOL	76539	12-21-1982	15	8	Sup Comp. Operations	DDR (RAW TOWN)	33	12-21-2042
ASIF ALI	75683	2-2-1982	16	10	Senior Accountant	Dir. Finance Officer	34	2-2-2042
MUHAMMAD AZHAR MUSHTAQ	76528	12-12-1981	15	8	Sup Comp. Operations	DDR (AITOWN)	34	12-12-2041
SHAZIL WAQAR	75581	11-28-1981	17	8	S.D.O.	Dir P&S (Officers)	34	11-28-2041
SYED ABID RAZA	75558	8-10-1980	17	8	S.D.O.	Director Drainage	35	8-10-2040
RIAZ ELAHI WILLIAM	77167	10-9-1986	17	8	S.D.O.	Director P&E (Off)	49	10-9-2026

Activity: Days remaining to Retirement

12

- To determine the days before retirement enter formula =DAYS(H2,TODAY()).

Name	Emp No	DOB	Grade	Designation	Department	Age	Date of Retirement	Days Before Retirement
MUHAMMAD SHAZIB AMIN	200351	8-19-1992	17	Asstt. Director	Dir Admn (Officers)	24	6-19-2052	13047
SANA FATIMA	200442	11-15-1989	17	Asstt. Director	Dir P&D (Officers)	26	11-15-2049	12100
SUMARA IFTIKHAR	200475	12-25-1988	17	Asstt. Director	Dir P&D (Officers)	27	12-25-2048	11775
MURTAZA HASSAN	200986	11-12-1987	17	Asstt. Director	Dir Revenue Officers	28	11-12-2047	11366
IMAN HAMD LAL	79221	2-19-1987	17	S.D.O.	DC-I (Officers)	29	2-19-2047	11100
MUZAFFAR ABBAS	79061	2-5-1987	17	S.D.O.	DC-I (Officers)	29	2-5-2047	11086
ALI ASLAM KHOKHAR	200613	3-25-1986	17	Asstt. Director	Dir Admn (Officers)	30	3-25-2046	10769
MISS TAIYAR SAEED	200497	2-11-1984	17	Asstt. Director	Director P&E (Off)	32	2-11-2044	9996
ANJUM RASOOL	76539	12-21-1982	15	Sup. Comp. Operations	DDR (RAVI TOWN)	33	12-21-2042	9579
ASIF ALI	75683	2-2-1982	16	Senior Accountant	Dir. Finance Officer	34	2-2-2042	9257
MUHAMMAD AZHAR MUSHTAQ	76528	12-12-1981	15	Sup. Comp. Operations	DDR (AI TOWN)	34	12-12-2041	9205
SHAZL WAQAR	75581	11-28-1981	17	S.D.O.	Dir P&S (Officers)	34	11-28-2041	9191
SYED ABID RAZA	75558	8-10-1980	17	S.D.O.	Director Drainage	36	8-10-2040	8716
RIAZ ELAHI WILLIAM	77167	10-9-1966	17	S.D.O.	Director P&E (Off)	49	10-9-2026	3662
MUHAMMAD YASIN	68031	30-12-80	14	Assistant	CD-II	55	12-30-2020	1553
NABEEL AHMED	76631	16-07-84	11	Sub Engineer	CD-II	32	7-16-2044	10152
ADNAN AHMED	75809	01-08-75	11	Sub Engineer	CD-IV	41	8-1-2035	6880
MUHAMMAD KHAIL	75843	25-04-79	11	Sub Engineer	D.D (Quality Cont.)	37	4-25-2039	9243
MUHAMMAD WASEEM AZHAR	75865	01-04-77	11	Sub Engineer	D.D (Quality Cont.)	39	4-1-2037	7489
RIAZ AHMAD ANSARI	62453	07-11-56	11	Draftsman	D.D DESIGN I	59	11-7-2016	39
ABDUL HAKEEM	61063	11-06-57	16	Staff Officer	DC-I (Officers)	59	6-11-2017	255

Activity: Years remaining to retirement

13

- Enter the Formula =L2/365 to get the remaining years to retirement

Emp No	DOB	Grade	Service Years	Designation	Department	Age	Date of Retirement	Days Before Retirement	Years to Retirement
200351	8-19-1992	17	3	Asstt. Director	Dir Admn (Officers)	24	6-19-2052	13137	35.99
200442	11-15-1989	17	3	Asstt. Director	Dir P&D (Officers)	26	11-15-2049	12190	33.40
200475	12-25-1988	17	3	Asstt. Director	Dir P&D (Officers)	27	12-25-2048	11865	32.51
200986	11-12-1987	17	3	Asstt. Director	Dir Revenue Officers	28	11-12-2047	11456	31.39
79221	2-19-1987	17	5	S.D.O.	DC-I (Officers)	29	2-19-2047	11190	30.66
79061	2-5-1987	17	5	S.D.O.	DC-I (Officers)	29	2-5-2047	11176	30.62
200613	3-25-1986	17	3	Asstt. Director	Dir Admn (Officers)	30	3-25-2046	10859	29.75
200497	2-11-1984	17	3	Asstt. Director	Director P&E (Off)	32	2-11-2044	10086	27.63
76539	12-21-1982	15	8	Sup. Comp. Operations	DDR (RAVI TOWN)	33	12-21-2042	9669	26.49
75683	2-2-1982	16	10	Senior Accountant	Dir. Finance Officer	34	2-2-2042	9347	25.61
76528	12-12-1981	15	8	Sup. Comp. Operations	DDR (AI TOWN)	34	12-12-2041	9295	25.47
75581	11-28-1981	17	8	S.D.O.	Dir P&S (Officers)	34	11-28-2041	9281	25.43
75558	8-10-1980	17	8	S.D.O.	Director Drainage	35	8-10-2040	8806	24.13
77167	10-9-1966	17	8	S.D.O.	Director P&E (Off)	49	10-9-2026	3752	10.28

Activity: Retirement Status

14

- Enter the Formula in next column
`=IF(I2<0,"Error",IF(I2<365,"Less than a year",IF(I2>365,IF(I2<730,"Between 1 & 2 years",IF(I2>730,"More than 2 years"))))`

Name	Emp No	DOB	Grade	Designation	Department	Age	Date of Retirement	Days Before Retirement	Retirement Status
MUHAMMAD SHAZIB AMIN	200351	6-19-1992	17	Asstt. Director	Dir Admn (Officers)	24	6-19-2052	12931	More than 2 years
SANA FATMA	200442	11-15-1989	17	Asstt. Director	Dir. P&D (Officers)	27	11-15-2049	11984	More than 2 years
SUMAIRA FTIKHAR	200475	12-25-1988	17	Asstt. Director	Dir. P&D (Officers)	28	12-25-2048	11659	More than 2 years
MURTAZA HASSAN	200886	11-12-1987	17	Asstt. Director	Dir Revenue Officers	29	11-12-2047	11250	More than 2 years
MIAN HAMID LAL	79221	2-19-1987	17	S.D.O.	DC-1 (Officers)	29	2-19-2047	10984	More than 2 years
MUZAFFAR ABBAS	79061	2-5-1987	17	S.D.O.	DC-1 (Officers)	29	2-5-2047	10970	More than 2 years
ALI ASLAM KHOKHAR	200613	3-25-1986	17	Asstt. Director	Dir Admn (Officers)	30	3-25-2046	10653	More than 2 years
MISS TALWAR SAEED	200497	2-11-1984	17	Asstt. Director	Director P&E (Off)	32	2-11-2044	9880	More than 2 years
ANJUM RASOOL	76539	12-21-1982	15	Sup. Comp. Operations	DDR (RAVI TOWN)	34	12-21-2042	9463	More than 2 years
ASIF ALI	75683	2-2-1982	16	Senior Accountant	Dir. Finance Officer	34	2-2-2042	9141	More than 2 years
MUHAMMAD AZHAR MUSHTAQ	76528	12-12-1981	15	Sup. Comp. Operations	DDR (A1 TOWN)	35	12-12-2041	9089	More than 2 years
SHAZL WAZIR	75581	11-28-1981	17	S.D.O.	Dir P&S (Officers)	35	11-28-2041	9075	More than 2 years
SYED ABID RAZA	75558	8-10-1980	17	S.D.O.	Director Drainage	36	8-10-2040	8600	More than 2 years
RAZ ELAHI WILLIAM	77187	10-9-1988	17	S.D.O.	Director P&E (Off)	50	10-9-2026	3546	More than 2 years
MICHAHAMMAD YASIN	68031	30-12-60	14	Assistant	CD-II	59	12-30-2020	1437	More than 2 years
HABEEL AHMED	76631	10-07-84	11	Sub Engineer	CD-III	32	7-10-2044	10036	More than 2 years
ADNAN AHMED	75809	01-08-75	11	Sub Engineer	CD-VI	41	8-1-2035	6764	More than 2 years
MUHAMMAD KHALL	75843	25-04-79	11	Sub Engineer	D.D (Quality Cont.)	37	4-25-2039	8127	More than 2 years
MUHAMMAD WASEEM AZHAR	75865	01-04-77	11	Sub Engineer	D.D (Quality Cont.)	38	4-1-2037	7373	More than 2 years
RAZ AHMAD INSARI	62453	07-11-59	11	Draftsman	D.D (DESIGN)	66	11-7-2016	77	Error
ABDUL HAKEEM	61083	11-06-57	16	Staff Officer	DC-1 (Officers)	59	6-11-2017	139	Less than a year

Activity: Age Range

15

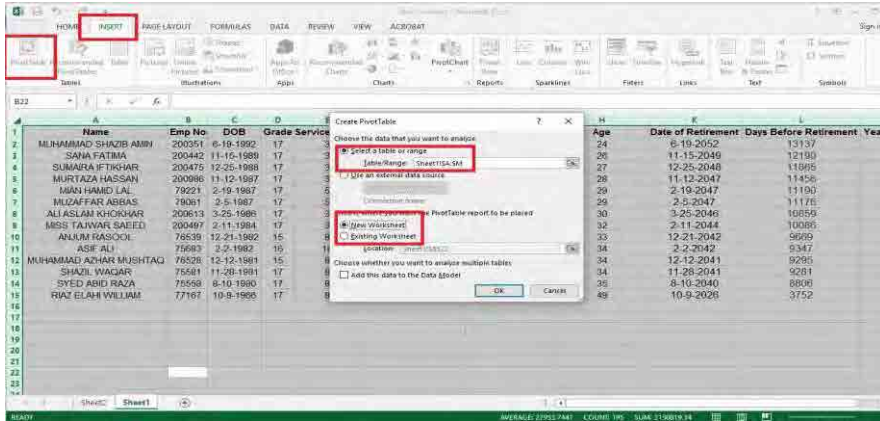
- Enter the Formula
`=IF(G2<30,"<30",IF(G2<40,"30-39",IF(G2<50,"40-49",IF(G2<60,"50-59", ">60"))))`

Emp No	DOB	Grade	Designation	Department	Age	Date of Retirement	Days Before Retirement	Retirement Status	Age Range
200351	6-19-1992	17	Asstt. Director	Dir Admn (Officers)	24	6-19-2052	12931	More than 2 years	<30
200442	11-15-1989	17	Asstt. Director	Dir. P&D (Officers)	27	11-15-2049	11984	More than 2 years	<30
200475	12-25-1988	17	Asstt. Director	Dir. P&D (Officers)	28	12-25-2048	11659	More than 2 years	<30
200886	11-12-1987	17	Asstt. Director	Dir Revenue Officers	29	11-12-2047	11250	More than 2 years	<30
79221	2-19-1987	17	S.D.O.	DC-1 (Officers)	29	2-19-2047	10984	More than 2 years	<30
79061	2-5-1987	17	S.D.O.	DC-1 (Officers)	29	2-5-2047	10970	More than 2 years	<30
200613	3-25-1986	17	Asstt. Director	Dir Admn (Officers)	30	3-25-2046	10653	More than 2 years	30-39
200497	2-11-1984	17	Asstt. Director	Director P&E (Off)	32	2-11-2044	9880	More than 2 years	30-39
76539	12-21-1982	15	Sup. Comp. Operations	DDR (RAVI TOWN)	34	12-21-2042	9463	More than 2 years	30-39
75683	2-2-1982	16	Senior Accountant	Dir. Finance Officer	34	2-2-2042	9141	More than 2 years	30-39
76528	12-12-1981	15	Sup. Comp. Operations	DDR (A1 TOWN)	35	12-12-2041	9089	More than 2 years	30-39
75581	11-28-1981	17	S.D.O.	Dir P&S (Officers)	35	11-28-2041	9075	More than 2 years	30-39

Activity: Using pivot table for reporting

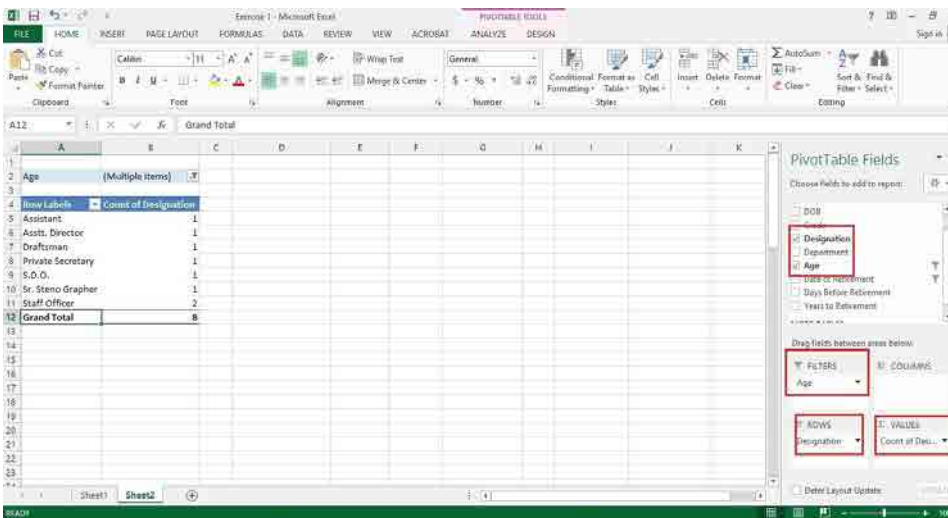
16

Press Ctrl+A. Select "Insert Tab" Click Pivot table and then press OK. Values should be left as default. A new sheet will open



Activity: Using pivot table for reporting

17



Activity: Grade wise Retirement Status Analysis using PivotTable

18

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
1																					
2																					
3		Count of pname	Column Labels																		
4		Row Labels	0	1	2	3	4	5	6	7	8	9	10	11	14	15	16	17	18	19	Grand Total
13	#	2016	2	24	3	5	13	6	8	2	4	2	4	5	9	2	1				90
14	#	2017	1	32	9	16	6	8	7	4	5	7	7	7	1	2					112
15	#	2018	1	44	4	13	8	5	6	4	2	6	3	5	2	1					104
16	#	2019	2	56	13	13	14	5	8	8	3	4	7	3	2	3					141
17	#	2020	4	81	3	16	12	6	6	5	2	2	10	4	1						152
18	#	2021	3	47	7	16	8	5	21	7	2	8	4	5	2						135
19	#	2022	5	82	8	19	10	1	24	6	1	5	1	3	3	3					171
20	#	2023	6	68	5	20	15	5	14	4		1	2	2	1	1					144
21	#	2024	2	74	12	29	8	3	10	7		1	1	1	3	1					152
22	#	2025	6	82	3	33	13	6	14	3	1	5	1	3	2	1					173
23	#	2026	5	59	21	24	14	2	13	8		2		3	1						152
24	#	2027	3	104	26	22	5	22	11		2	1	2	1	1						222
25	#	2028	7	88	29	31	17	2	7	1	2	1	2								195
26	#	2029	7	83	48	27	11		11	8	3	4		2							204
27	#	2030	15	118	52	15	25	4	9	1	1	2	1								244
28	#	2031	7	83	46	12	11		10		1	2		1							173
29	#	2032	8	84	44	5	12	2	2		1	1									159
30	#	2033	8	72	52	4	13		5	3	3	1									161
31	#	2034	14	82	34	2	11	1	6		3				1						154
32	#	2035	10	73	28	3	7		1		8	2			1						133
33	#	2036	10	98	43	3	13		5	2	1										175
34	#	2037	22	93	25	4	15		2	1	2										164
35	#	2038	22	88	26	5	8		5		3	1		1	1						160
36	#	2039	26	72	19	2	14		3	2	2		1		1						142
37	#	2040	34	90	12	1	8		2		3	1	1	1							150
38	#	2041	29	47	7	1	7		4		3	1	1	1							101
39	#	2042	36	38	2		9		5	1	2	1	1								95
40	#	2043	37	45			6	1	7	2	2										100
41	#	2044	24	47	1		4		6		3	1		1							87
42	#	2045	24	30	1		6		9												70

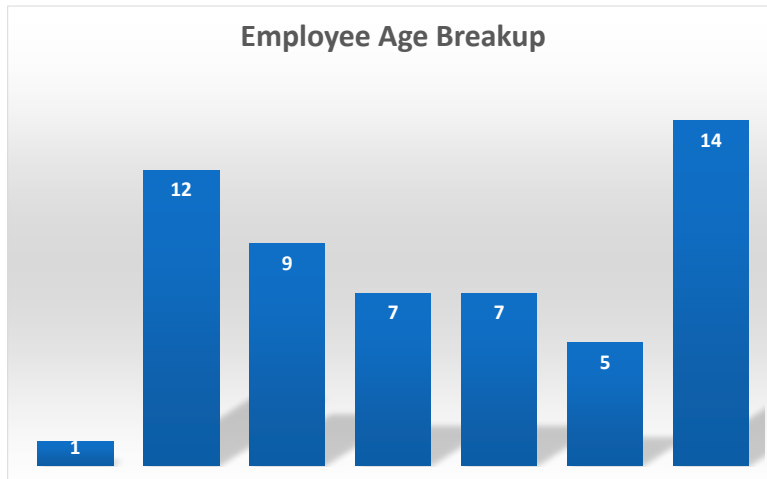
Exercise: Age Range and Data Formation

19

- Please find age groups of employees in given data and perform analysis
 - >60
 - 56-60
 - 51-55
 - 46-50
 - 41-45
 - 36-40
 - <36
- Please arrange in form of table. Select and Click Recommended Charts

Data based information

19



47



Thank You



In the name of Allah, the Beneficent, the Merciful بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

MODULE - 4

LECTURE-01

Strategies for Improvement in Revenue Management System

Mr Asif Iqbal

Financial Management Specialist



MODULE OVERVIEW

1

- 1) Learning Outcomes
- 2) Session 1: Strategies for Improvement in Revenue Management System
- 3) Session 2: Simulation Exercise – Arrears Recovery Plan
- 4) Session 3: Action Plan for Revenue Management System.



LEARNING OUTCOME

2

1) Knowledge Outcome:

- a) Identify CAUSE of Revenue Management Issue
- b) Formulate STRATEGIES for improvement
- c) Use of MS Excel for AGING OF ARREARS

2) Skill Set Outcome:

- a) ACTION PLAN for Improvement in Revenue Management System

IMPROVEMENT IN REVENUE MANAGEMENT SYSTEM

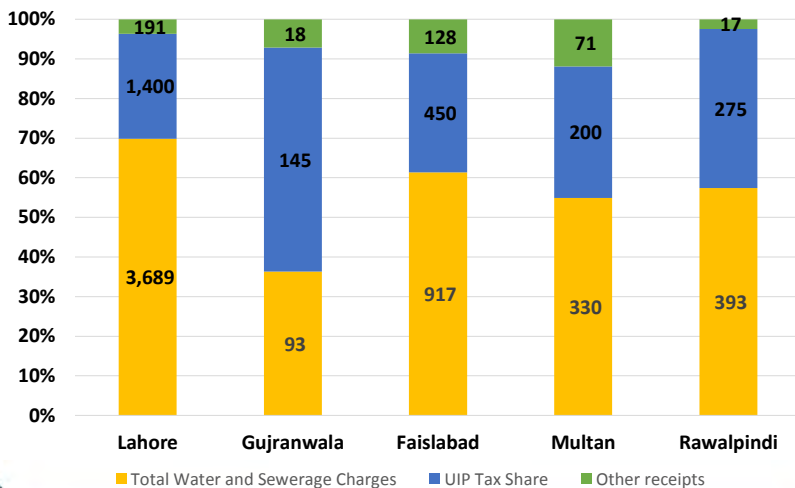
3

What are the Revenue Management Issues?

REVENUE ANALYSIS OF WSS UTILITIES

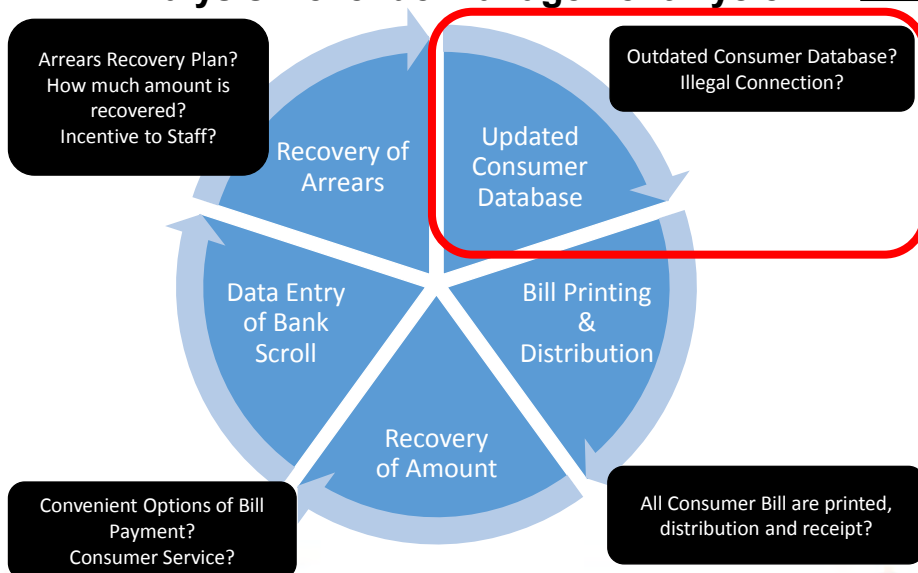
4

Break-up of Revenue and Receipts FY 2016-17 (Rs in Million)



Analysis Revenue Management Cycle

5



Issue # 1 Outdated Consumer Database

6

ISSUES

Property Sold without clearing the Arrears

Property Sold without clearing Arrears.
WASA issued notice to new property owner.

Change of Billing Category

The Domestic property is not converted into Commercial property

Incomplete Address

The street number, colony number or any other particular of address does not exist in consumer database.

Multiple Billing Category

The Domestic property is in multiple use i.e commercial usage as well.

STRATEGY

Dedicated Cell/Unit may be established where the property sold transactions occur and issuance of NOC by WSS Utility may be made part of the law in this regards.

A dedicated **Consumer Survey** shall be conducted on regular intervals to update the Consumer Database

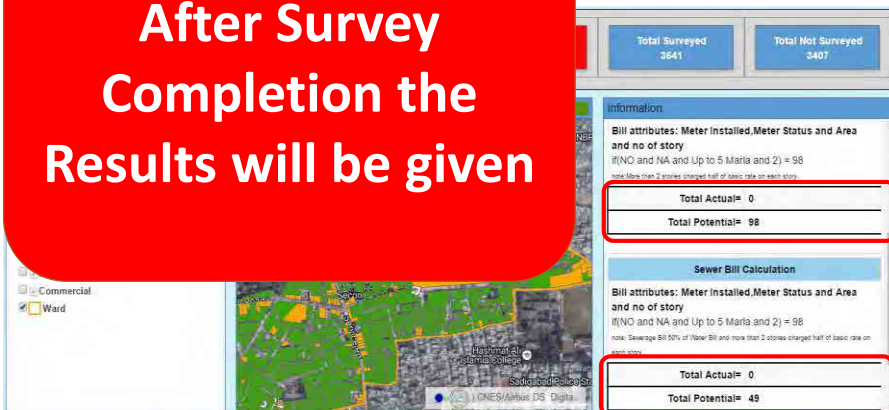
Issue # 1 Outdated Consumer Database

7

Example of WASA Rawalpindi GIS Consumer Survey Dashboard/

Reporting with Results

After Survey Completion the Results will be given



Issue # 1 Outdated Consumer Database

8

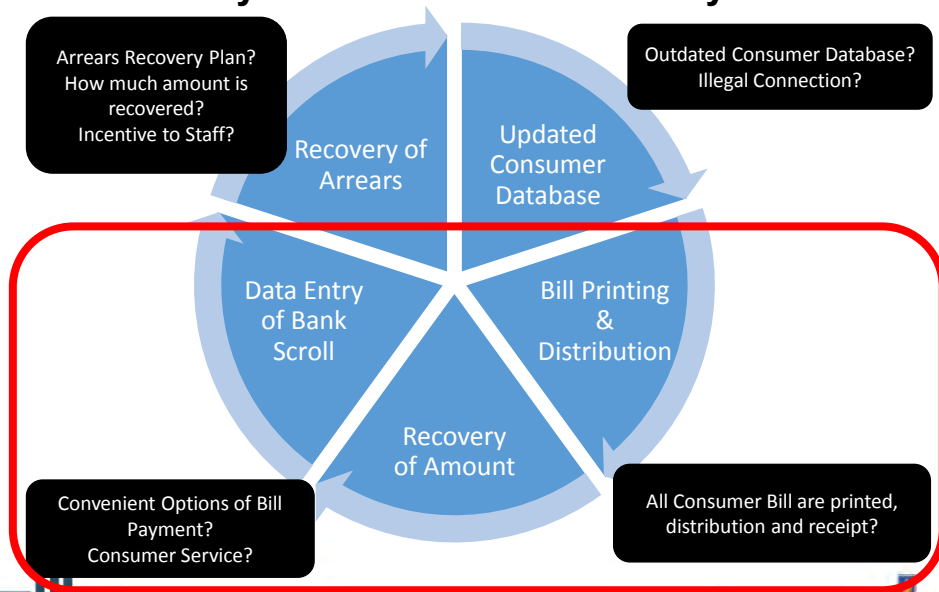
GROUP ACTIVITY: (15 Minutes)

Strategies for Outdated Consumer Database in your WSS?

Sr. No.	Strategy	Responsibility	Start Date	End Date	KPIs
1					
2					
3					
4					
5					

Analysis Revenue Collection Cycle

9



Issue # 2 : Bill Distribution

10

Bills should reach to all customers in time

What are the Bill Distribution and Receipt Issue of your WSS Utility?

Issue # 2 : Bill Distribution

11

Current Method of Bill Distributions

	Faisalabad	Gujranwala	Lahore	Multan	Rawalpindi	Quetta
WASA Staff	X	✓	✓	✓	✓	✓
Third Party	✓	X	X	X	X	X
SMS	X	X	X	X	X	X
Email	X	X	X	X	X	X
Automated Calls	X	X	X	X	X	X
Online Duplicate Bills	✓	X	✓	X	✓	X

Issue # 2 : Bill Distribution

12

Bills should reach to all customers in time

WASA Faisalabad

KWSB

ISSUES

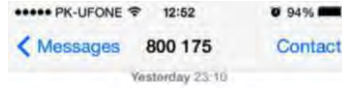
- Bills Distribution to consumers was not 100%

DETAILS

- Bill Distribution Agreement with Pakistan Post Office Department
- Then another agreement with M/S Abdul Rahim & Co

BENEFITS

- Bill Distribution Expense come down from 4.2 Million to 0.8 Million.
- Improved Consumer Database by obtaining CNIC and Mobile No.
- Bill Distribution Walk Plan
- Monthly Recovery raised from Rs 53.94 Million to 58.05 Million

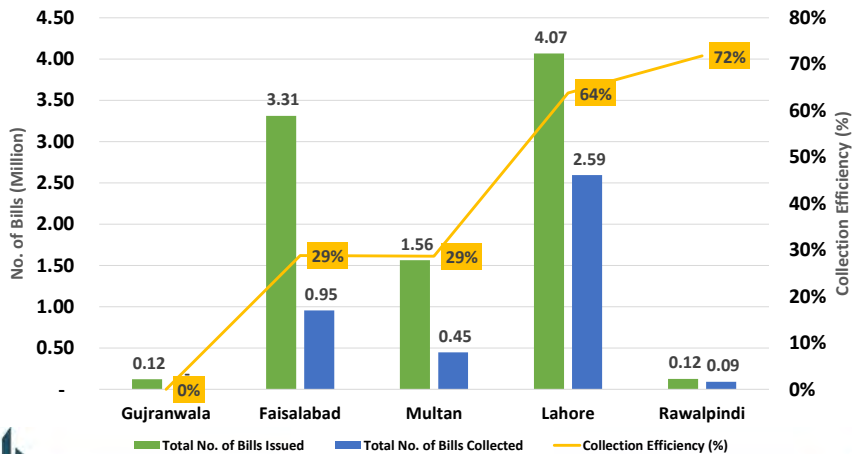


[From KWSB]
Dear Consumer ! Your bill for the month of March has been issued. Kindly pay your bill before 28th March to avoid late payment surcharge. If you have not received the bill then please inform through reply message to get the duplicate bill.
Dy. Managing Director Revenue KW&SB.
(SMSall.pk)

Issue # 2 : Bill Distribution

13

Collection Efficiency in Numbers
Five WASAs 2016-17



Issue # 3 : Bill Receipt

14

Facilitate the Consumers in payment of bills

How many mode of payments your WSS Utility facilitates?

	Faisalabad	Gujranwala	Lahore	Multan	Rawalpindi	Quetta
Financial Institutions	✓	✓	✓	✓	✓	✓
NADRA	✓	✓	✓	✓	✓	✓
Easy Paisa	✗	✓	✗	✗	✓	✗
U Paisa	✗	✗	✗	✗	✓	✓
UBL Omni	✓	✗	✗	✓	✗	✓
Post Office	✓	✓	✗	✓	✓	✓

Issue # 3 : Bill Receipt

15

Facilitate the Consumers in payment of bills

How many banks facilitate the payment of your WSS Utility?

Faisalabad	Rawalpindi	Quetta	Multan
<ol style="list-style-type: none"> Allied Bank Limited Habib Bank Limited Bank of Punjab National Bank of Pakistan Bank Alfalah Limited United Bank Limited Muslim Commercial Bank FINCA Microfinance Bank SME Bank Askari Bank Summit Bank Bank Islami Dubai Islami Burj Bank Mezan Bank Samba Bank NIB Bank Bank of Khayber NRSP Microfinance Bank 	<ol style="list-style-type: none"> Allied Bank Limited Habib Bank Limited National Bank of Pakistan Muslim Commercial Bank United Bank Limited Bank of Punjab Bank Alfalah Limited 	<ol style="list-style-type: none"> Muslim Commercial Bank United Bank Limited Tameer Bank Limited 	<ol style="list-style-type: none"> Habib Bank Limited, Bank Al-Habib, Bank of Punjab, United Bank, MCB
	Lahore	Gujranwala	
	<ol style="list-style-type: none"> Allied Bank Limited United Bank Limited National Bank of Pakistan CitiBank Bank of Punjab Habib Bank Limited JS Bank Bank Alfalah Bank Alhabib Zarai Tarakati Bank Askari Bank Burj Bank Limited Meezan Bank 	<ol style="list-style-type: none"> Bank of Punjab United Bank Limited Allied Bank Limited Habib Bank Limited 	

BACK

Issue # 3 : Bill Receipt

16

Facilitate the Consumers in payment of bills

How many banks facilitate the payment of your WSS Utility?

DETAILS	Banks	
Rawalpindi	07	1 Al Baraka Bank (Pakistan) Limited. 2 Allied Bank Limited. 3 Askari Bank Limited. 4 Bank Alfalah Limited. 5 Bank Al-Habib Limited. 6 BankIslami Pakistan Limited. 7 Citi Bank N.A. 8 Deutsche Bank A.G. 9 Dubai Islamic Bank Pakistan Limited. 10 Faysal Bank Limited. 11 First Women Bank Limited. 12 Habib Bank Limited. 13 Habib Metropolitan Bank Limited. 14 Industrial and Commercial Bank of China 15 Industrial Development Bank of Pakistan. 16 JS Bank Limited. 17 MCB Bank Limited. 18 MCB Islamic Bank Limited. 19 Meezan Bank Limited. 20 National Bank of Pakistan.
Lahore	13	21 S.M.E. Bank Limited. 22 Samba Bank Limited. 23 Silk Bank Limited. 24 Sindh Bank Limited. 25 Soneri Bank Limited. 26 Standard Chartered Bank (Pakistan) Limited. 27 Summit Bank Limited. 28 The Bank of Khyber. 29 The Bank of Punjab. 30 The Bank of Tokyo-Mitsubishi Limited. 31 The Punjab Provincial Cooperative Bank Limited. 32 United Bank Limited. 33 Zarai Taraqiati Bank Limited. 34 NIB Bank Limited
Faisalabad	19	
Quetta	03	
Multan	05	
Gujranwala	04	

34 Scheduled Banks in Pakistan as per SBP – Dec 30, 2016

Issue # 2 & 3 : Bill Distribution and Receipt

17

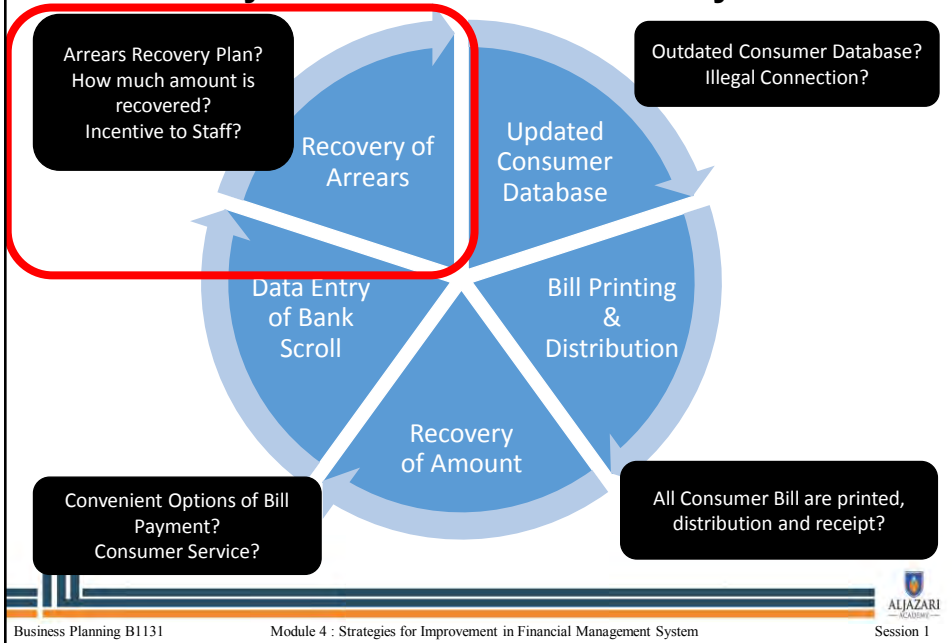
GROUP ACTIVITY: (15 Minutes)

Strategies for Bill Distribution and Receipt in your WSS?

Sr. No.	Issues	Strategy	Responsibility	Start Date	End Date	KPIs
1						
2						
3						
4						
5						

Analysis Revenue Collection Cycle

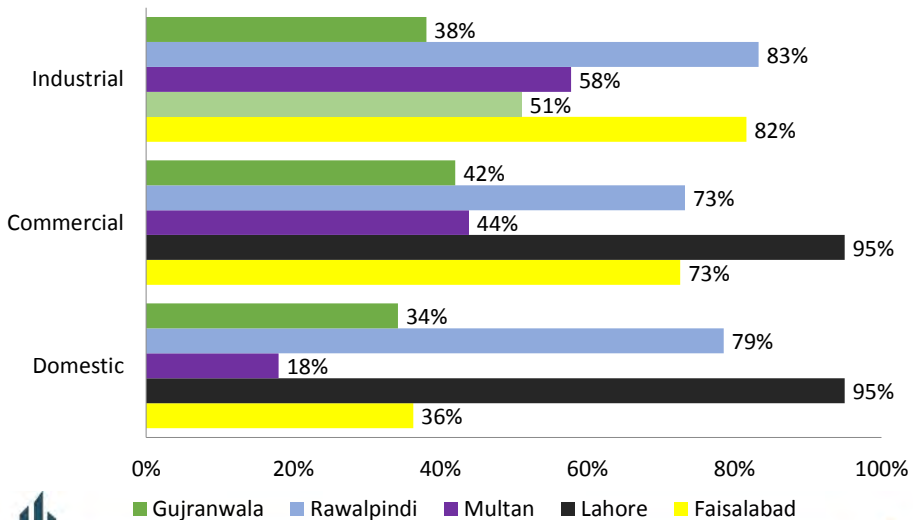
18



COLLECTION EFFICIENCY OF WSS UTILITIES

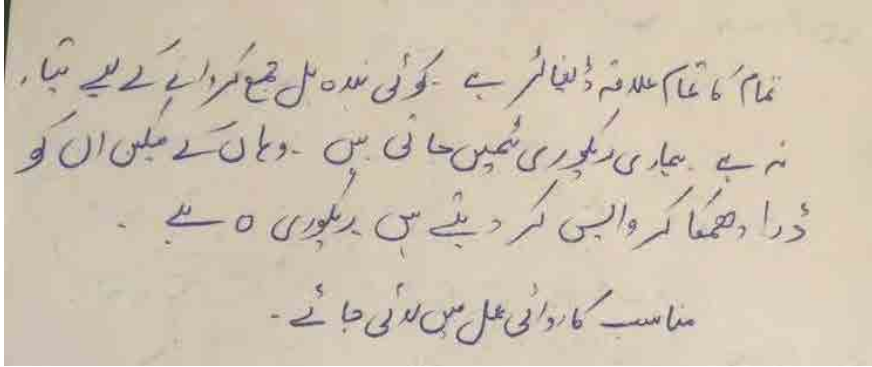
19

Financial Data FY 2015-16



Issue # 4 : Arrear Recovery

20



Issue # 4 : Arrear Recovery

21

What are the Arrears Recovery Issues faced by your WSS Utility?

Issue # 4 : Arrear Recovery

22

Example of "Employee Incentives"
For Recovery of Arrears - 2001



'Never-paid' cases owe Rs 29 crore to Water Board

THE TIMES OF INDIA NEWS SERVICE | Jul 13, 2001, 12:58 AM IST

✉️ 🖨️ A- A+

h yderabad: the hyderabad metropolitan water supply and sewerage board (hmwssb) has failed to persuade the nearly 44,000 consumers who have not paid for water. the amount owed by these defaulters is rs 29.54 crore. officials of the water utility has served notices on these consumers --

Source: <http://timesofindia.indiatimes.com/city/hyderabad/Never-paid-cases-owe-Rs-29-crore-to-Water-Board/articleshow/1397277626.cms>

Issue # 4 : Arrear Recovery

23

Example of "Employee Incentives"
For Recovery of Arrears - 2001



The Meter Readers were provided incentive:

Rs. 1 per bill for arrears.

3% of collected amounts for "Never Paid Consumers".

General Managers monitor Revenue
Collection monitored after 15 days.

The General Manager of "**Best Performing Circle**" is awarded by **Chief Minister** of Andhra Pradesh



Source: "Developing Effective Billing and Collection Practices" by WSP 2008 .

Issue # 4 : Arrear Recovery

24

Example of "Employee Incentives"
For Recovery of Arrears - 2001



Financial Impact after two years.



Source: "Developing Effective Billing and Collection Practices" by WSP 2008 .

Issue # 4 : Arrear Recovery

25

Voluntary Disclosure Scheme (VDS) and
One-Time Settlement Scheme (OTS)- 2014



**Voluntary Disclosure
Scheme (VDS)**

Deals with regularization of
illegal water connections
and avoids police cases

Water Board to Act against Defaulters and Violators

By Express News Service | Published: 02nd April 2014 09:05 AM |
Last Updated: 02nd April 2014 09:05 AM | A+ A A-

**One-Time Settlement
Scheme (OTS)**

Deals with settlement of
dues with complete waiver
of interest

With the Voluntary Disclosure Scheme (VDS) and One-Time Settlement (OTS) scheme for regularisation of illegal water supply connections at nominal penalty and settlement of dues with interest waiver coming to an end on Monday, the Hyderabad Metropolitan Water Supply and Sewerage Board is set to take stringent action against defaulters and violators by disconnecting tap connections and also slapping criminal

Source: <http://www.newindianexpress.com/cities/hyderabad/2014/apr/02/Water-Board-to-Act-against-Defaulters-and-Violators-593512.html>

Issue # 4 : Arrear Recovery

26

Voluntary Disclosure Scheme (VDS) and One-Time Settlement Scheme (OTS)- 2014



Voluntary Disclosure Scheme (VDS)
Deals with regularization of illegal water connections and avoids police cases

15000 Consumers

One-Time Settlement Scheme (OTS)
Deals with settlement of dues with complete waiver of interest

11000 Consumers

CITIES » HYDERABAD

HYDERABAD, April 24, 2014

Updated: April 24, 2014 01:05 IST

11,000 apply for water connection regularisation

YUNUS Y. LASANIA

COMMENT · PRINT · T

Like Share 2 Tweet G+ 0 in Share Share

Nearly 15,000 consumers settled their dues and 11,000 others applied for regularisation of their illegal water connections under the One Time Settlement (OTS) and the Voluntary Disclosure Scheme (VDS) programmes offered by the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) until March 31.

Source: <http://www.thehindu.com/news/cities/Hyderabad/11000-apply-for-water-connection-regularisation/article5941137.ece>

Issue # 4 : Arrear Recovery

27

Example : Yahaba Municipality

YAHABA

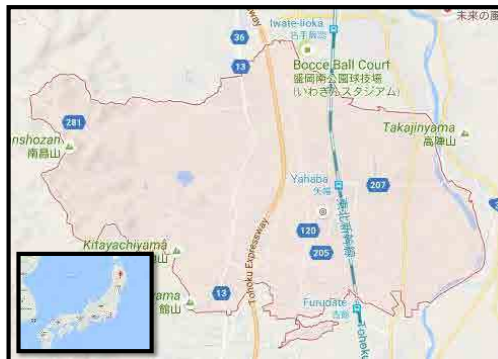
- Town in Iwate Prefecture, Japan
- Population of 27,168 and Total Area (25.89 sq mi)

PROBLEM STATEMENT

- **Management:** Lack of Funds (Waterworks renovations, declining population)
- **Citizens :** Tastier Tap Water and Cheaper Water rates

STRATEGY

- Yahaba worked out a Two-Step PR Strategy



OBJECTIVES

- Help in reduction in Arrears
- Participatory Approach by engaging customers

Issue # 4 : Arrear Recovery

Example : Yahaba Municipality

28

STEP 1

- Publish a **Carton Booklet** to inform the current Water Supply Situation

STEP 2

- Hold a series of workshops in which citizens participated as **Water Supporters**



Issue # 4 : Arrear Recovery

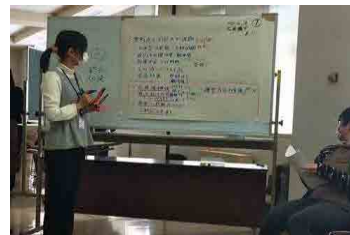
Example : Yahaba Municipality

29

- Started in 2008, Seven people applied first time.
- In 2009, 11 participants attended.
- The workshop has 20 participants capacity
- Group of 10 participants with one facilitators and one record Keepers
- The Facilitators asks questions and the recorder wrote down all the information on a white board
- They watched special Videos & pictures, tasted tap water Vs Mineral Water, conduct site visits.
- "Individual learning" to "Community Learning"

BENEFITS

- The municipality has convinced the citizens that,
- **Regular payment of bills is important**
- **Raise water rates to ensure a secure water supply**



Issue # 4 : Arrear Recovery

34

Customer Un-willing to pay

Political Interference

Out-dated Consumer Database

Customer Service Centre

Employees Motivation

STRATEGY

Know your Consumer

Categorize the Consumers and take appropriate Actions
"AGING OF ARREARS"

"Can't Pay" Category of Consumers

- 1-Installment payments of Arrears
- 2-Regular Follow up on Phone
- 3-Voluntary Disclosure & Discounts
- 4-Incentives to Recovery Employees
- 5-Regularly M&E of Progress

"Won't Pay" Category of Consumers

Legal Actions

Business Planning B1131

Module 4 : Strategies for Improvement in Financial Management System

Session 1

Issue # 4 : Arrear Recovery

35

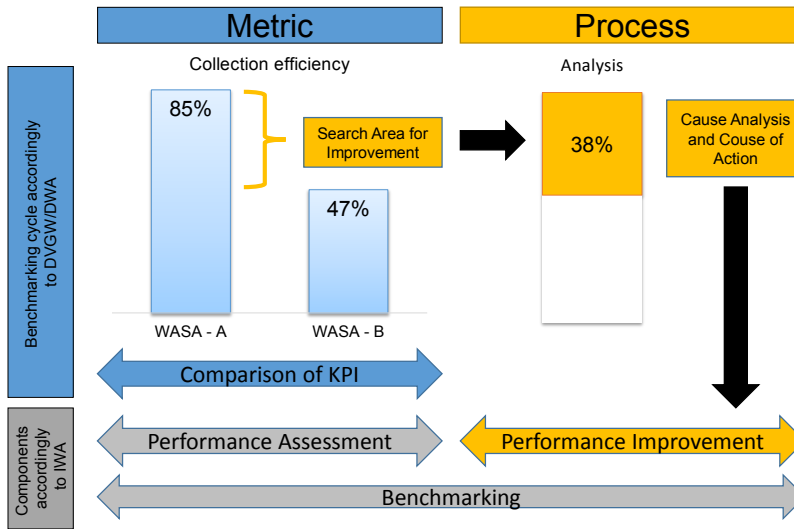
GROUP ACTIVITY: (30 Minutes)

Strategies for Arrear Recovery in your WSS?

Sr. No.	Issues	Strategy	Responsibility	Start Date	End Date	KPIs
1						
2						
3						
4						
5						

TYPES OF BENCHMARKING

33



Source: <http://www.slideshare.net/BorisavMilutinovic/benchmarking-and-performance-indicators-borisav-milutinovic>
Benchmarking cycle according to DVGW and DWA (2008)

SIMULATION EXERCISE ARREARS RECOVERY PLAN

AGING OF ARREARS

1

LEARNING OUTCOMES

Use Of MS EXCEL for Aging of Arrears

The image shows two overlapping Excel spreadsheets. The top spreadsheet is titled 'Aging of Arrears' and displays a table with columns for 'CONSUMER NAME', 'Start of Month', and 'Sum of ARREARS'. The bottom spreadsheet is titled 'Consumer Database' and shows a larger table with columns for 'CONSUMER ID', 'NAME', 'HOUSE', 'STREET', 'ROAD', 'COLONY', 'PROPAREA', 'CATEGORY', 'F SIZE', 'B CODE', 'W-BILL', 'S-BILL', 'ACQUIFER', and 'ARREARS'. An orange arrow points from the 'Consumer Database' table to the 'Aging of Arrears' table. The Aljazari Academy logo is visible in the bottom right corner.

ARREARS RECOVERY PLAN

2

ARREARS AGING REPORT FROM CONSUMER DATABASE USING MS EXCEL

Step1: Understanding the Consumer Database

- A = Unique Consumer Number
- H = Category of Connection
- K = Current Water Bill
- L = Current Sewerage Bill
- M = Current Aquifer Bill
- N = Amount of Arrears

The image shows an Excel spreadsheet with a table titled 'Creating Arrears Aging Report from Consumer Database'. The table has columns labeled A through N, corresponding to the legend above. The data rows include consumer details such as 'CONSUMO', 'NAME', 'HOUSE', 'STREET', 'ROAD', 'COLONY', 'PROPAREA', 'CATEGORY', 'F SIZE', 'B CODE', 'W-BILL', 'S-BILL', 'ACQUIFER', and 'ARREARS'. The Aljazari Academy logo is visible in the bottom right corner.

ARREARS RECOVERY PLAN

3

Step 2: Assigning the Arrears Aging Criteria

Lookup1 **Reporting Categories**

1 1>=months late <=3

3 3.1>=months late <=6

6 6.1>=months late <=9

9 9.1>=months late <=12

12 12.1>=months late <=24

24 24.1>=months late <=1000

ROAD	COLONY	PROPAREA	CATEGORY	F SIZE	BCODE	W-BILL	S-BILL	AQUIFER	ARREARS
MDA CHOWK	REHABAT	100	0			0	112	0	7336
	GOVT EMPLOYEES	SIC	0		B PARLOR	0	175	0	5378
	EMPLOYS	100	0		G HOUSE	0	700	200	1003
	EMPLOYS	SIC	114			200	112		355
	EMPLOYS	100	104			200	112		355
	GOVT EMPLOYEES	SIC	104			120	88		220
	GOVT EMPLOYEES	100	114			200	112		355
	PUNJAB EMPLOYEES	100	104			200	112		355
	M.D.A. CHOWK	100	0			0	112		135
	SHADAB	SIC	0			0	68		83
	SHADAB	SIC	0			0	68		1032
	EMPLOYS	100	0			0	112		4748
	GOVT EMPLOYEES	SIC	114			200	112		8405
	SHADAB	SIC	104			172	42		139
	SHADAB	SIC	114			200	112		22921
	SHADAB	SIC	114			200	112		355
	MDA CHOWK	SIC	104			172	82		158
	SHADAB	100	104			200	112		355

ARREARS RECOVERY PLAN

4

Step 3: Calculating the Arrears in “Months” for each consumer

- i. Create a new column after “Arrears” Column with the name of “Months”.
- ii. Calculate the months by using the formula = [Arrears/(W-Bill+S-Bill+Acquifer)]. The MS Excel Formula is [N11/(K11+L11+M11)]
- iii. Copy the formula to the remaining rows by double clicking the icon

N	
ARREARS	Months
7336	65.5

011 X ✓ +N11/(K11+L11+M11)

WAMT	SAMT	ACQUIFER	ARREARS	Month
0	112		7336	=+N14/(K14+L14+M14)
0	175	0	5378	30 73

A	B	C	D	E	F	G	H	I	J	K	L	M	N	
CONSUM	NAME	HOUSE	STREET	ROAD	COLONY	PROPAREA	CATEGORY	F SIZE	BCODE	W-BILL	S-BILL	AQUIFER	ARREARS	Months
0001	MOHTAZ HUSEAIN				REHABAT	100	0			0	112	0	7336	
0004	FQZHA SHAFIQ YOUS SHAFIQZHA				MDA CHOWK	SIC	0		B PARLOR	0	175	0	5378	
0004	REHABAT				MDA CHOWK	SIC	0		B PARLOR	0	175	0	5378	

ARREARS RECOVERY PLAN

5

Step 4: Assigning Arrears Aging Criteria with each consumer using VLOOKUP formula.

- i. Create a new column with the name of "Reporting Line" along with "Months" Column.
- ii. Assign the VLOOKUP formula in the column next to the "Reporting Line" by:
 =VLOOKUP (lookup_value, table_array, col_index_num, [range_lookup])
 =VLOOKUP (O11,\$E\$2:\$F\$2,\$2)

Month	Reporting Label	Unique Identifier
65.50	=VLOOKUP(O14,\$M\$2:\$N\$7,2)	
30.73	24.1>=months late <=1000	004 /000004

ARREARS	Months	Reporting Label
7336	65.50	24.1>=months late <=1000
5378	30.73	
1003	1.11	
255	4.4	

Lookup1	Reporting Categories
1	1>=months late <=3
3	3.1>=months late <=6
6	6.1>=months late <=9
9	9.1>=months late <=12
12	12.1>=months late <=24
24	24.1>=months late <=1000

STREET	ROAD	COLONY	PROPAREA	CATEGORY	SIZE	BCODE	W-BILL	S-BILL	ACQUIFER	ARREARS	Months	Reporting Label
		REHSAT	10	G	0	B PARLOR	0	112		7336	65.50	=VLOOKUP(O11,\$E\$2:\$F\$2,\$2)
	MIDA CHOWK	GOVT EMPLOYEES	5	C	0	B PARLOR	0	175				
	K SO MALIK HASSAN	EMPLOYS	10	C	0	G HOUSE	0	700				
		EMPLOYS	9	D	114		200	112		355	1.11	
	BHARANAH	EMPLOYS	10	D	114		200	112		356	1.14	

ARREARS RECOVERY PLAN

6

Step 5: Creating PIVOT TABLE

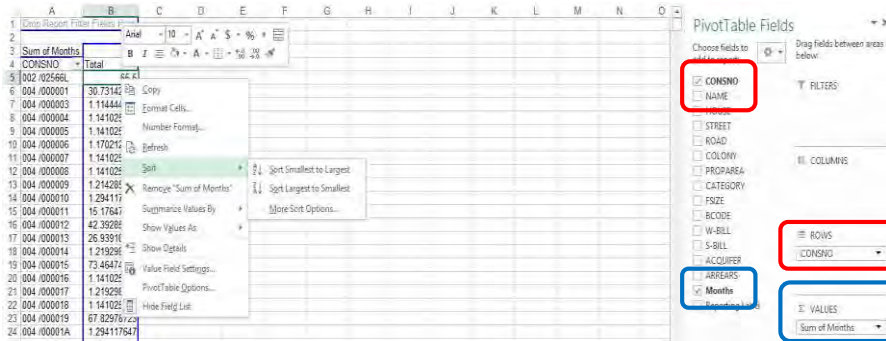
- | First Method | Second Method |
|--|--|
| i. Click "Alt + N + V + Enter" and a new window "Create PivotTable" will open. | i. Click "Ctrl + A" to select all data of the sheet. |
| ii. Click the "Select a table or range" and select the table | ii. Click the "Insert" tab and select "Pivot Table" option |
| iii. Click the "New Worksheet" | iii. A new window "Create PivotTable" will open. |
| iv. Click "Ok" | iv. Click the "Select a table or range" and select the table |
| | v. Click the "New Worksheet" |
| | vi. Click "Ok" |

ARREARS RECOVERY PLAN

7

Step 6: Add values to the PIVOT TABLE

- i. Drag “Consno” and “Name” to the “Rows”
- ii. Drag “Months” to the “Values” and sort it by right clicking the “Months” column and select “Sort Largest to Smallest”

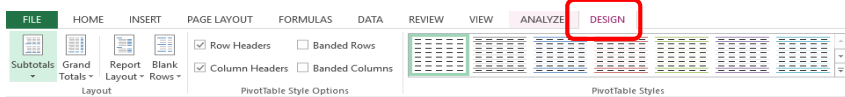


ARREARS RECOVERY PLAN

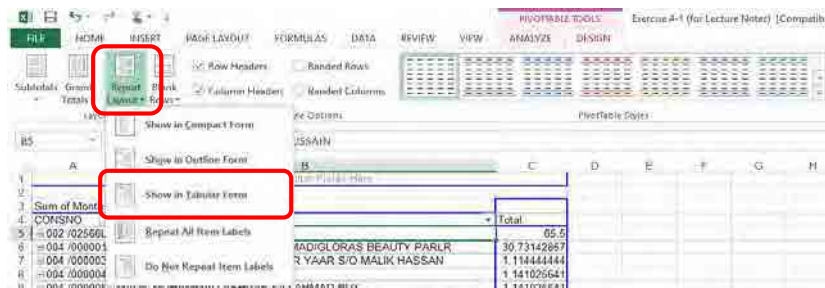
8

Step 6: Add values to the PIVOT TABLE

- iii. Click on “PivotTable Tools” then “Design” tab



- iv. Select “Show in Tabular Form” from the “Report layout”

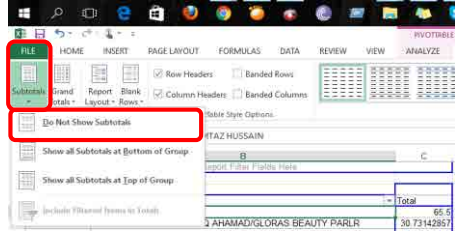


ARREARS RECOVERY PLAN

9

Step 6: Add values to the PIVOT TABLE

- v. Select "Do Not Show Subtotals" from the "Subtotals" tab.



- vi. Drag "Arrears" in the "Values"
- vii. Drag "Report Label" to the "Filter"
- viii. The PivotTable Field will look like as show in the figure



- ix. Rename the Sheet "PT-(1)"

ARREARS RECOVERY PLAN

10

Step 6: Creating "Arrears Aging Reports" using the PIVOT TABLE

- i. Click on the "Analyze" tab in the "PivotTable Tools"
- ii. Select "Show Report Filter Pages" from the "Options"



- iii. Click 'Ok' to the newly opened window "Show Report Filter Pages".
- iv. This will opening separate sheets for "Arrears Aging Report" with the "Pivot Table" as per "Arrears Aging Criteria" defined in Step 2.



(PT)IL DUA S/O M/IN DUA	1	11062100	220
(HAQ NAWAZ S/O M/NAWAZ	2	438696491	278
(M)SHADIE S/O M/SUKH	4	211620054	447
1.>=months late <=3 3.1>=months late <=6 6.1>=months late <=9 9.1>=months late <=12 12.1>=months late <=24 24.1>=months late <=100			

ARREARS - FAISALABAD

Arrears		2013-14	2014-15	2015-16	2016-17
		Rupees in million			
Opening Balance	A	2,727	2,571	2,514	2,401
Arrears for the years	B	84	122	154	175
	C=A+B	2,811	2,694	2,668	2,575
Arrears Collected for the years	D	240	180	267	255
Closing Balance	E=C-D	2,571	2,514	2,401	2,320

ARREARS - LAHORE

Arrears		2013-14	2014-15	2015-16	2016-17
		Rupees in million			
Opening Balance	A	3,189	3,492	3,641	3,990
Arrears for the years	B	813	830	1,041	652
	C=A+B	4,002	4,322	4,682	4,642
Arrears Collected for the years	D	510	682	692	685
Closing Balance	E=C-D	3,492	3,641	3,990	3,956

ARREARS - MULTAN

Arrears		2013-14	2014-15	2015-16	2016-17
		Rupees in million			
Opening Balance	A	789	839	969	967
Arrears for the years	B	257	286	267	
	C=A+B	1,046	1,125	1,236	967
Arrears Collected for the years	D	206	256	270	
Closing Balance	E=C-D	839	869	967	967

ARREARS - RAWALPINDI

Arrears		2013-14	2014-15	2015-16	2016-17
		Rupees in million			
Opening Balance	A	652.70	704.34	773.98	848.97
Arrears for the years	B	128.20	156.79	163.14	141.17
	C=A+B	780.90	861.14	937.12	990.14
Arrears Collected for the years	D	76.56	87.16	88.15	102.00
Closing Balance	E=C-D	704.34	773.98	848.97	888.13

ARREARS - GUJRANWALA

Arrears		2013-14	2014-15	2015-16	2016-17
		Rupees in million			
Opening Balance	A	698	706	729	754
Arrears for the years	B	45	52	56	57
	C=A+B	743	759	785	811
Arrears Collected for the years	D	37	30	31	36
Closing Balance	E=C-D	706	729	754	775

Issue # 5 : Additional Sources of Revenue

In Pakistan, the Sources of Revenue in Water and Sanitation Utilities as mostly:

1. Water Charges (including Arrears)
2. Sewerage Charges (including Arrears)
3. Connection Fee
4. Bank Profit
5. Tender Fee
6. Advertisement

Are there any other sources of revenue available?

Issue # 5 : Additional Sources of Revenue

37

What are the Additional Sources of Revenue of your WSS Utility?

Sr No.	Sources of Revenue
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Issue # 5 : Additional Sources of Revenue

38

Rental of Land

GULGASHT OFFICE WATER WORKS

89.60 Maria

PIZZA HUT

GULGASHT COLONY ROAD

PIZZA HUT

Rental value
Rs. 165,000/pm

M-WSA working on the revaluation of its real estate portfolio

PIZZA HUT GulGashat Avenue, Multan

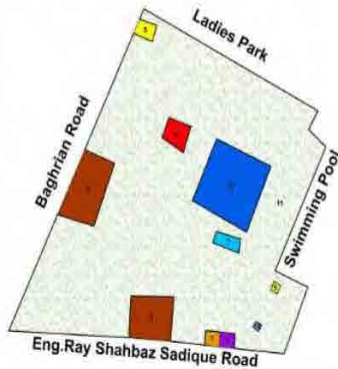
Issue # 5 : Additional Sources of Revenue

39

Rental of Land

Business Opportunities for Lahore WASA Capitalisation of Land Portfolio

Green Town Sub-Division-SDO Office



Legend

- Complaint Center
- Generator
- Masjid
- Open Space
- Residence
- Store
- Tube Well (Closed)
- Wash Room
- Water Tank/Offices

14

Sr.No.	Type	Area (Sq.ft.)	Area (Marta)
1	Wash Room	225.47	1.00
2	Complaint Center	228.82	1.02
3	Residence	1888.43	8.39
4	Residence	2492.77	11.08
5	Store	320.85	1.43
6	Masjid	602.12	2.68
7	Generator	349.97	1.56
8	Water Tank/Offices	4306.10	19.14
9	Store	68.68	0.31
10	Tube Well (Closed)	45.48	0.20
11	Open Space	59831.30	265.92



Issue # 5 : Additional Sources of Revenue

40

Advertisement on Over Head Reservoirs.



Leased to Telco Companies



Leased for Advertisement

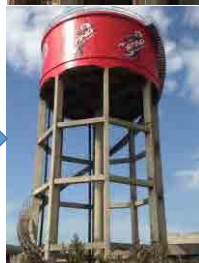
Issue # 5 : Additional Sources of Revenue

40

Advertisement on Over Head Reservoirs.



Leased to Telco
Companies



Leased for
Advertisement

Issue # 5 : Additional Sources of Revenue

40

Over Head Reservoirs (Multan)

Sr.	Name	Capacity	Leased
1	Naqsh Band Colony	100,000 Gallon	
2	Eid Ghah	100,000 Gallon	Pak Cables
3	Gulgasht Colony Pizza Hut	100,000 Gallon	Telecom
4	Mda Chowk	100,000 Gallon	Pak Cables
5	Bagh Lange Khan	100,000 Gallon	
6	Hassan Perwana	200,000 Gallon	Telecom
7	Lohari Gate	400,000 Gallon	
8	Timber Market	100,000 Gallon	
9	Shah Shamas Colony	100,000 Gallon	
10	Qasim Pur Colony	100,000 Gallon	
11	Mumtaz Abad	100,000 Gallon	Pak-Cables
12	Tughlak Town	100,000 Gallon	
13	Ansar Colony	100,000 Gallon	
14	G-Block (Sra)	100,000 Gallon	Pak-Cables
15	D-Block (Sra)	100,000 Gallon	
16	K-Block (Sra)	100,000 Gallon	
17	Gulshan Market (Sra) New Multan	100,000 Gallon	Pak-Cables
18	Aam Khas Bagh	100,000 Gallon	
19	Shamsabad (Abandon)	50,000 Gallon	
20	T.B Road (Abandon)	100,000 Gallon	
21	Gulashst Colony Near Board Office (Abandon)	50,000 Gallon	
22	W-Block (New Multan) (Abandon)	50,000 Gallon	

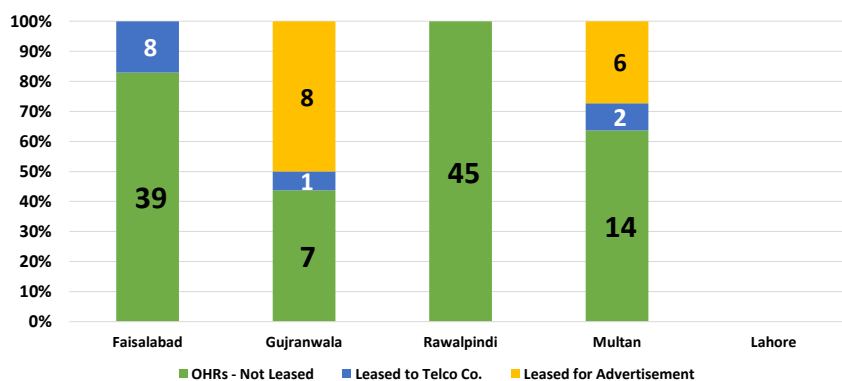
Issue # 5 : Additional Sources of Revenue Over Head Reservoirs (Rawalpindi)

40



Issue # 5 : Additional Sources of Revenue Statistics on Advertisement on Over Head Reservoirs 2016-17

41



Issue # 5 : Additional Sources of Revenue

42

Sale of Waste Water and letting out of Crane & Fort lifter.



Subject: **RENTAL CHARGES OF PARKING YARD MACHINERY**

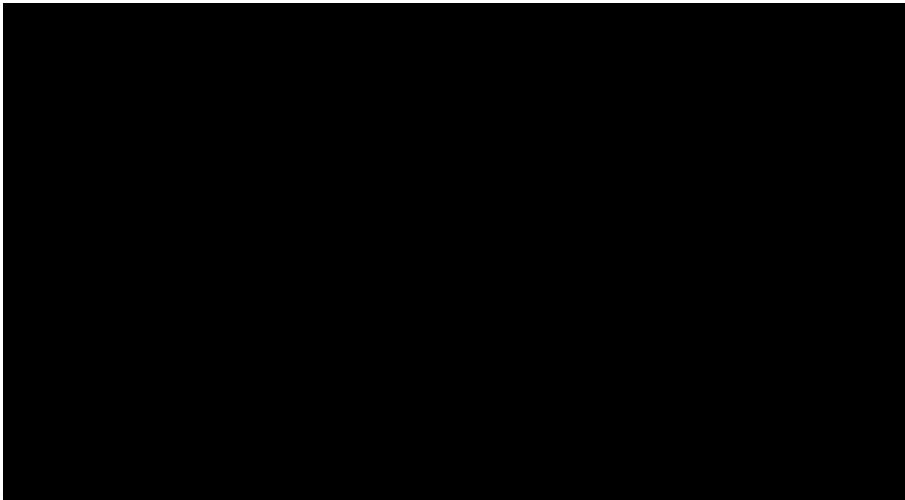
The rental charges of Parking Yard machinery (excluding POU) being implemented at present are as follows:

Sr. No	Type	Current Rates
1	Jetter Machine	2000/hr
2	Sucker Machine	2000/hr
3	Dump Truck	900/trip
4	Crane Cargo Truck	2000/hr
	For Shifting of Dewatering Set/Mini Backhoe	900/trip
5	Wheel Backhoe (Excavator)	2000/hr
6	Mini Backhoe	1500/hr
7	Dewatering Set	2000/day
	Operator Charges	546/day
8	Water Tanker	1500/day

Issue # 5 : Additional Sources of Revenue

43

Sale of Water Bottles – Water Bottling Plant



Issue # 5 : Additional Sources of Revenue

44

GROUP ACTIVITY: (30 Minutes)

Strategies for Additional Sources of Revenue in your WSS?

Sr. No.	Issues	Strategy	Responsibility	Start Date	End Date	KPIs
1						
2						
3						
4						
5						

45

THANKS

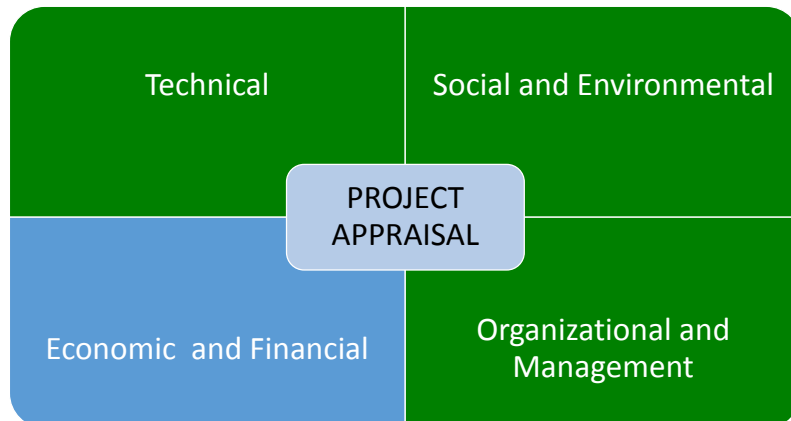


بِسْمِ اللّٰهِ الرَّحْمٰنِ الرَّحِیْمِ
In the name of Allah, the Beneficent, the Merciful

Business Planning

Capital Budgeting, Financial and Economic Appraisal

Asif Iqbal
Financial Management
Specialist



Financial Appraisal:
CBA based on purely financial terms

Economic Appraisal:
CBA includes societal perspective



FINANCIAL APPRAISAL

3

- **Appraisal on purely financial terms**
- **Incremental financial benefits & costs to the project & the IRR or NPV**
- **Methods of financial appraisal (discounted cash flow techniques) – consider time value of money**
 - Net Present Value (NPV)
 - Internal Rate of Return (IRR)
 - Benefit Cost Ratio (BCR)

These differing appraisal techniques may give contradictory conclusion



LEARNING FOCUS

4

- 1) Understanding of Technique
- 2) Calculation Methods
- 3) Interpretation of Results and how to base decisions on Results.



Which Project will you choose?

Table 1: Expected Net After-Tax Cash Flows

Year (t)	Project A	Project B
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

Project A: Net Cash Inflow of \$ 600

Project B: Net Cash Inflow of \$ 800

TIME VALUE OF MONEY

*The value of money decreases as the time passes.
Costs and benefits occur at different point of time.
How to compare benefits with costs ?*

- Compounding $F=P(1+r)^n$ → Future Value
- Discounting $P=F/(1+r)^n$ → Present Value

Net Present Value (NPV)

"The revenues and costs of a project are estimated and then are discounted and compared with the initial investment."

Preferred option - highest positive NPV
Reject projects with negative NPVs

Disadvantages of NPV

Rank projects in order of ascending NPV (smaller project with lower NPV might be more attractive due to higher ratio of discounted benefits to costs)

Example: NPV

Example: NPV analysis

Using the project cash flows presented in Table 1, compute the NPV of each project's cash flows and determine for each project whether it should be accepted or rejected. Assume that the cost of capital is 10%.

Table 1: Expected Net After-Tax Cash Flows

Year (<i>t</i>)	Project A	Project B
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

Example: NPV

Example: NPV analysis

Using the project cash flows presented in Table 1, compute the NPV of each project's cash flows and determine for each project whether it should be accepted or rejected. Assume that the cost of capital is 10%.

Table 1: Expected Net After-Tax Cash Flows

Year (t)	Project A	Project B
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

NPV:

Project A: \$ 157.6

Project B: \$ 98.4

Internal Rate of Return (IRR)

“The IRR is the discount rate that, when applied to cash inflows of a project, sets them equal to the initial investment”

Preferred option - with the IRR most in excess of a specified rate of return

IRR of 10% means that with a discount rate of 10%, the project breaks even

Interest rate used for discounting future cash flows to compute present value of those cash flows.

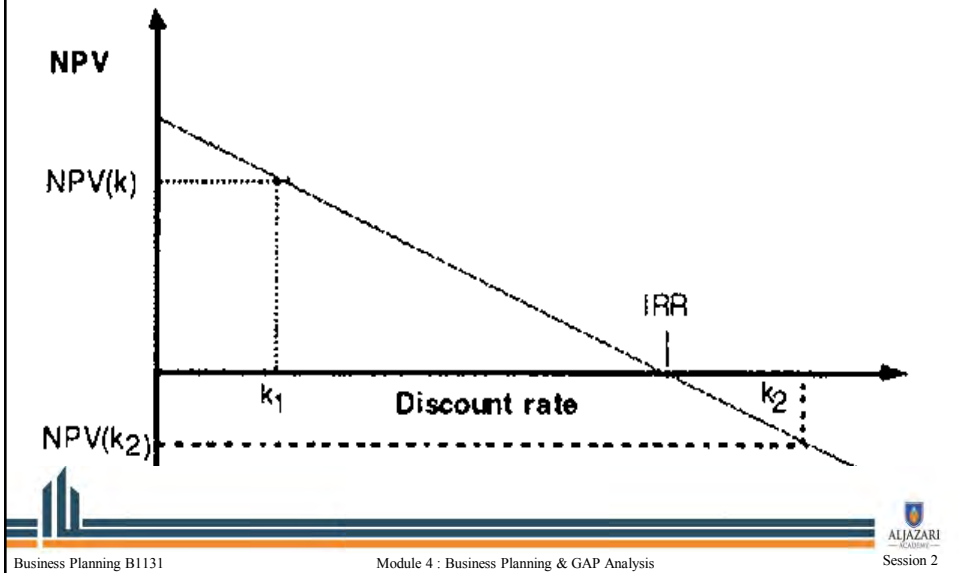
IRR exceeds the hurdle cost of capital - discount rate, the project is accepted

Disadvantage of using IRR method

Not suitable for ranking of competing projects

Two projects may have same IRR but different NPVs when time horizon differs

NPV and Discount Rate



IRR FORMULA

$$IRR = r_a + \frac{NPV_a (r_b - r_a)}{(NPV_a - NPV_b)}$$

r_a = lower discount rate

r_b = higher discount rate

NPV_a = NPV using the lower discount rate

NPV_b = NPV using the higher discount rate

Example: IRR

Table 1: Expected Net After-Tax Cash Flows

<i>Year (t)</i>	<i>Project A</i>	<i>Project B</i>
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

Example: IRR

Table 1: Expected Net After-Tax Cash Flows

<i>Year (t)</i>	<i>Project A</i>	<i>Project B</i>
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

IRR:
Project A: 14.5%
Project B: 11.8%

Benefit Cost Ratio

Benefit Cost Ratio (BCR) or Profitability Index (PI)
“The BCR is the discounted net revenue divided by the initial investment”

Preferred option - ratio most in excess of 1
Project with a BCR of less than 1 should generally not proceed
Advantage is simplicity of the method

Disadvantage of using BCR method
Suboptimal decision as a project with higher BCR will be selected over a project with lower BCR even when the latter project has the capacity to generate much greater economic benefits because it has a higher NPV value and involves greater scale

Example: BCR

Table 1: Expected Net After-Tax Cash Flows

Year (t)	Project A	Project B
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

Example: BCR

Table 1: Expected Net After-Tax Cash Flows

Year (t)	Project A	Project B
0	-\$2,000	-\$2,000
1	1,000	200
2	800	600
3	600	800
4	200	1,200

BCR/PI:
Project A: 1.08
Project B: 1.05



Exercise1: Financial Appraisal of PFI Panel Installation.

	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021
	0	1	2	3	4	5
Investment Expenditure						
Maintenance Expenditure						
Electricity Charge Saving						
Net Cash flows						

Calculate NPV, IRR & BCR?



Exercise1: Financial Appraisal of PFI Panel Installation.

19

	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021
	0	1	2	3	4	5
Investment Expenditure	(2,000,000)					
Maintenance Expenditure			(140,000)		(140,000)	-
Electricity Charge Saving		660,000	660,000	660,000	660,000	660,000
Net Cash flows	(2,000,000)	660,000	520,000	660,000	520,000	660,000

Calculate NPV, IRR & BCR?



Exercise1: Financial Appraisal of PFI Panel Installation.

20

	Year 2016	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021
	0	1	2	3	4	5
Investment Expenditure	(2,000,000)					
Maintenance Expenditure			(140,000)		(140,000)	-
Electricity Charge Saving		660,000	660,000	660,000	660,000	660,000
Net Cash flows	(2,000,000)	660,000	520,000	660,000	520,000	660,000

NPV= 178,573
IRR= 15.56%
BCR= 1.09



Sensitivity Analysis

- Possible to identify those parameters and assumptions to which the outcome of the analysis is most sensitive
- Challenges the robustness of the results to changes in the assumptions made (i.e. discount rate, time horizon, estimated value of costs and benefits, etc.)

Scenario Analysis

- Scenarios are formulated: best case, worst case, etc.
- Potential values assigned for each cost and benefit variable

Case Study- Water Bottling Plan in Faisalabad

1. Please review and rationalize (if any) assumptions for Water Bottling Plant as used by WASA Fsb and mentioned in Case.
2. Determine initial investment, revenues and expenditures based on revised assumptions considering life of the project is 5 years.
3. Perform Financial Appraisal including NPV, IRR and BCR.
4. Perform sensitivity analysis for 10% change in production and 10% change in electricity Cost.

Economic Appraisal

Economic soundness of the project - **Societal Perspective**

Considers non-market impacts

- Externality: Cost or benefit that affects a party that did not choose to incur that cost or benefit.
- Example: Environmental degradation by a dam or improved income by construction of Road

Frequently used analytical techniques:

- Cost Benefit Analysis (CBA): Impacts can be quantified in monetary terms
- Cost Effectiveness Analysis (CEA): Impacts cannot be quantified in monetary terms



Economic Appraisal

1. Identify Benefits and Costs to the Society e-g
 - i. Decrease in Diarrhea.
 - ii. Time and effort savings
2. Quantify these Benefits and Costs.
3. Add them into Financial Cash flows.
4. Calculate ENPV, EIRR & BCR.



THANK YOU!





1

MODULE - 4

Actual water consumption volume and Tariff- Tentative tariff revision CASE STUDY OF SUDAN

Mr. Yasuyuki Kuroda
JICA Expert



No.3-2

Actual water consumption volume and Tariff- Tentative tariff revision

التعريفات المائية والسعرات الحقة في كينيا

October 28, 2014

Mr. Abdalla Ahmed Mohamed
Kassala SWC Financial department

2

1. (Introduction)

- Groundwater of the Gash Basin is the main source of water for Kassala city. It has been reported that groundwater level declined. It is necessary for the residents to conserve water and pay water production costs. The Local Government in Tokyo sets: the more volume they use, higher water tariff rates per M3 they have to pay.

• اجتماع الكليزن - 12 يونيو 2013

• نتتخير لبيك بروفيل حوض القاشل بروفيل هي لامصدر لوجي دلل بروفيل لميون فاس لا وذات كهي م حدوده واش اراتب عضتق اري ر لاي لخصاض سرتوي سطح ل هيل خلف اضرا مل حوظا قنارن قنل سيني رن لم اضية وان في دع سكان ميون فاس لات كالي فن لاج ل هياه وع لبي م تلتش عيل.

• ن نموذج موين طوكيو و لابل اب اية: لنتبترك لذيبي ستخدم كهي تم ي الكثر بل بتر لمك عب ي جب ان فيف عت ع رفة ا لوي ل بوش تترك لذيبي ستخدم كهي هيا اقل



2. Current tariff, customer numbers and monthly revenues

2 الىت عرفة الخ الية و عدد المشركين و لخل الش هري

The current tariff in Kassala City is a flat rate and customers pay a monthly fixed rate no matter how much water they consume. The following table shows: categories, year 2012-3 tariff, customer number and monthly revenues. The monthly revenues present a cash income amount if all the customers pay their tariffs.

التعريف هال حالي هل م مينة س التعريف قشبت خال للش هرب غرض النظر عن كهي هال هياه المبت هالك هف ي حل هف ع كل المشركين زي ع بر هذ لم شبة الير الملش هري. لاج دول ا لتلا يي يوض ح التعريف هال حالي ه و عدد المشركين و لدخل للش هري و درجات المشركين.



Table : current tariff, customer number and monthly revenues

Categories	Class	Inch's/ Type	Year 2012-3 Tariff	Customer Number as of Dec. 2012			Monthly Revenue (SDG) (In case of 100% correcting rate)
				East Office	West Office	Total	
Households							
	Class1	1	40	286	97	383	15,320
	Class2	3/4	35	3,352	250	3,602	126,070
	Class3	1/2	20	16,263	12,428	28,691	573,820
Commercial							
	A	Small Water shops, Factories	280	6	14	20	5,600
	B	Restaurants, Hotels	80	387	349	736	58,880
	C	Small Juice Shops	45	719	518	1,237	55,665
Government							
	A	Government Building School, Hospital, Hall	80-550	180	160	340	27,200
	B	Schools which do not have commercial buildings	45	191	58	249	11,205
Total				21,384	13,874	35,258	873,760

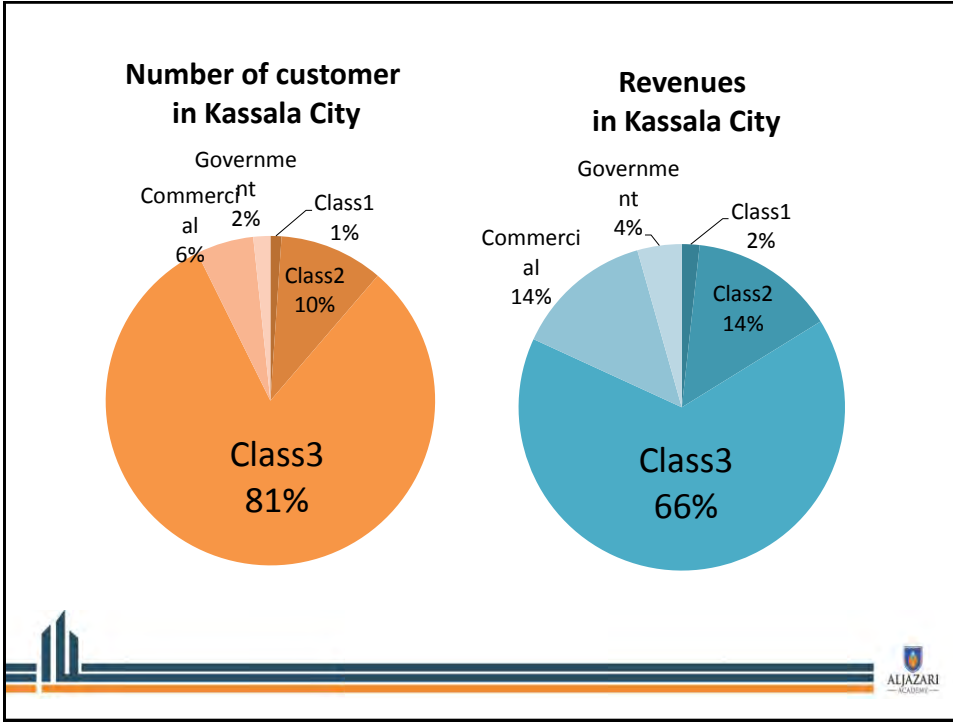
5

In SWC East and West Offices, the Class 3 customers accounted for 81.4% and 65.7% in terms of customer numbers and revenues, respectively, thereby being main customers as of December 2012. Tariff rate increase of the Class 3, 2, Commercial A, B, C, Government A would generate a substantial revenue increase.

الدرجة 3):

فيما يتعلق بعدد المشتركين في فئات القاش وغرب القاش قدرت بـ 81.4% من إجمالي المشتركين وبمذاي عبر أغلب المشتركين من الدرجة 3 (وفيما يتعلق بقطر اداة فئات القاش وغرب القاش عن شهر ديسمبر 2012 قدرت بـ 65.7%.





3. Actual monthly consumption volume average during one year measured by water meters

متوسط استهلاك المياه خلال سنة : المقياس

Every month, SWC staff monitors to keep records of each customer water volume of private houses, offices, hotels, restaurants and others. The following table shows actual average monthly consumption volumes during one year from July 2011, water tariff rates (fixed amounts) and actual unit payment per M3 (tariff rates/ average monthly consumption volumes).

تقوم هيئة المياه بصيانت جميع كفة المياه للمباني وكميات استهلاك المياه في كل من المنازل، المطاعم، الفنادق، الفنادق وغيرها. الجدول التالي يوضح معدل الاستهلاك الشهري خلال سنة واحدة بدءاً من شهر يوليو 2011، معدل كفة المياه الشهرية (معدلات ثابتة). كفة المياه للمباني وكميات استهلاك المياه للمباني المختلفة.



Table : summary of monthly consumption, tariff and actual unit payment per M³

measured by water meters from Jul. 2011 to Jul.2012

لجدول 3: لمخص المبت هلاك الاشهر لى فالتوى فوالتى فده لمتر لمكعب من لمياه بشرق وغربالقاش:

Categories	Class				Actual Unit Payment (SDG/m3)
		Customer No.	Average M3	Year 2012-3 Tariff	
Households	Class1	13	59	40	0.68
	Class2	9	44	35	0.80
	Class3	16	23	20	0.87
Commercial				Ave. Tariff	
	A	5	346	280	0.77
	B	6	165	93	0.56
Government				Ave. Tariff	
	A	6	815	80-550	0.25
	B	0	0	0	
Total		55			

9

(Unfair Tariff rate of the Class 1, Class 2 and class 3)

البيوعرى فالتوى بتسوغى من طقى قوغرى عادلى لدرجات 1 و 2 و 3)

The actual average monthly consumption during one year were 23M3, 44 M3, 59M3 in Class 3(tariff: 20SDG), Class 2(35 SDG) and Class 1(40 SDG), respectively. Actual unit payments per M3 thus decrease: 0.86 SDG (Class 3), 0.80 SDG (Class 2), 0.68 SDG (Class 1).

نوس طكفية لىياه المبت لىكفى لاشهر اللى سنة واحدة :

لدرجة 3(= 23 نهر لمكعب

لدرجة 2(= 44 نهر لمكعب

لدرجة 1(= 59 نهر لمكعب

لدرجة 3(بتسوغى قىبها 20 سىيه.)

لدرجة 2() 35 سىيه.)

لدرجة 1() 40 سىيه. .

مذلى سىي: قىمة لىنهر لىكعب لىواحد ل:

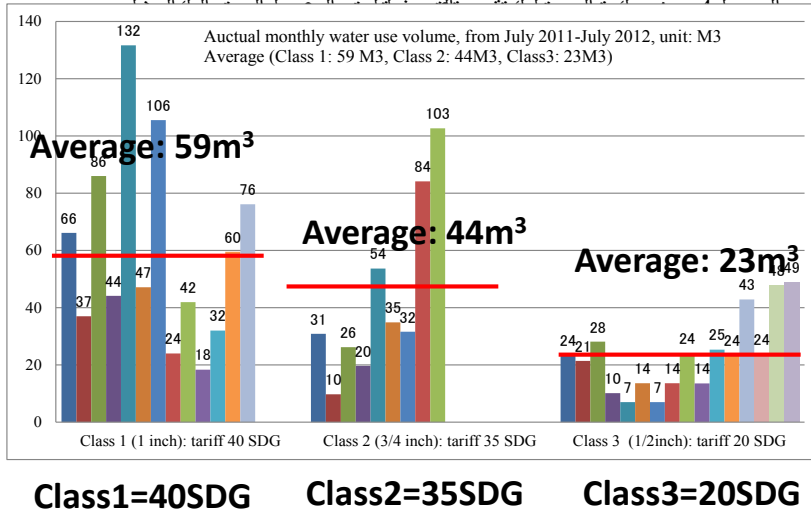
لدرجة 3(=) 0.86 سىيه.)

لدرجة 2(=) 0.80 سىيه.)

لدرجة 1(=) 0.68 سىيه.)

10

Table : Consumption volumes, tariff, actual unit payment per M3 of "Domestic", unit: M³



11

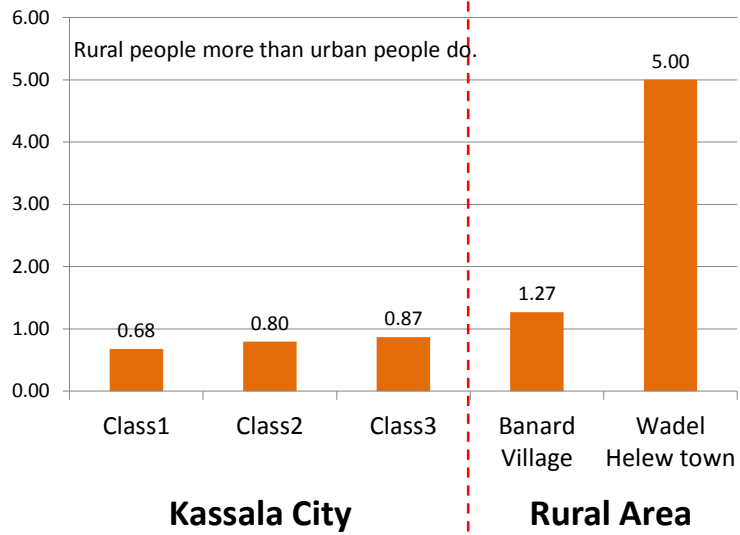
The Year 2012-3 tariff rates are not fair among class 1, 2 and 3 in consideration of the class 3 actual unit payment per M³, 0.86 SDG. The Wad El Helew and Banard people pay 5 SDG and 1.27 SDG per M3, respectively, thereby paying more than urban people do.

تعتبر التعريفات الحالية لدرجات 1 و 2 و 3 غير عادلة مقارنة بمقياس الدفع للمستهلك
لواحد) 0.86 جنيه (سوداني).

في مناطق وادحليو سعر الدفع للمستهلك من اليفيقدر ب: 5 جنيه هانتوفي في مناطق جبلت
1.27 جنيه، وهذا يعني ان سكانريف المنطق اليفيقومون بدفع تعريفة ألجوي من
المدينة، وأن سعر الدفع للمستهلك اليفي لريفمقاروقبالمدينة.



Table: Actual unit payment (SDG) per M³



13

Unfair Tariff rates of the Commercial, Government)

The following table shows actual average monthly water consumption during one year from July 2011 of Commercial A (chicken & cow farmers, small water shops, factories), Commercial B (restaurants, hotels) and Government A (government building).

Actual unit payments per M³ of the Commercial A, B, and Government A were from 0.25 to 0.77SDG. The year 2012-3 tariff rates are not fair, comparing with the class 3 rate.

The following table shows actual average monthly consumption volumes during one year from July 2011, water tariff rates and actual unit payment per M³ (tariff rates/ average monthly use volumes).

تعاريف غير عادلة لقطاع تجاري ولمؤسسات حكومية

الجدول 6: أتي ويوضح معدل الإستهلاك الشهري خلال سنة واحدة لتبدأ من يوليو 2011 لقطاع التجاري (A) (المطاعم والمصانع وغيره) (القطاع B) (الفنادق والمطاعم) (والمؤسسات الحكومية) (A).

قيمه الاستهلاك الشهري لقطاع التجاري (A&B) (والمؤسسات الحكومية) (A) من : 0.25 الى 0.77 جنيه سوداني.

14

Table : Consumption volumes, tariff, actual unit payment per M3 of “Commercial” and “Government”, unit: M³

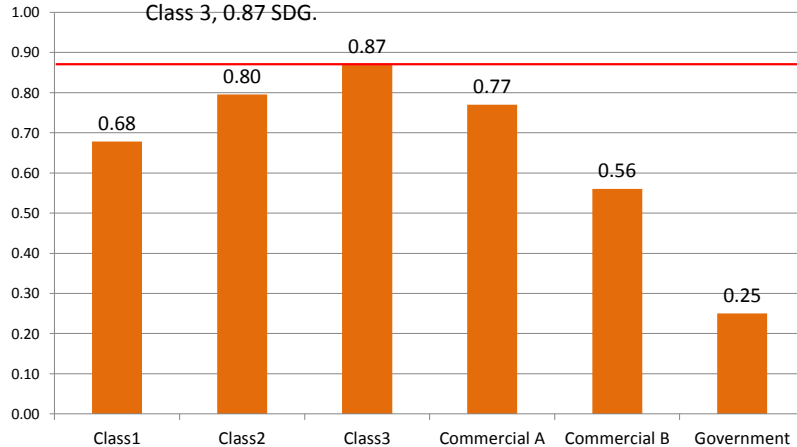
جدول 7. بيوض حاسبت الكى الق طاعالت جاري والو هس س انتل ح ك و ه ية ل م ت ر ل م ك ع ب :

Categories	Class	Actual Monthly M3	Year 2012-3 Tariff	Actual Unit Payment (SDG)
Commercial A	Gas station 1	98	280	2.86
	Hotel 1	125	280	2.24
	Cow famer 1	338	280	0.83
	Foot ball club 1	572	280	0.49
	College 1	596	205	0.34
Commercial B	Small hotel 1	83	80	0.96
	Small hotel 2	104	80	0.77
	Restaurant 1	131	80	0.61
	Small hotel 3	145	80	0.55
	Restaurant 2	341	157	0.46
	Restaurant 3	187	80	0.43
Government A	University 1	301	280	0.93
	Hospital 1	1777	550	0.31
	Office 1	336	80	0.24
	High school 1	393	80	0.20
	Hall 1	1305	160	0.12
	School 2	776	80	0.10

15

Table: Actual unit payment (SDG) per M³ in Kassala City

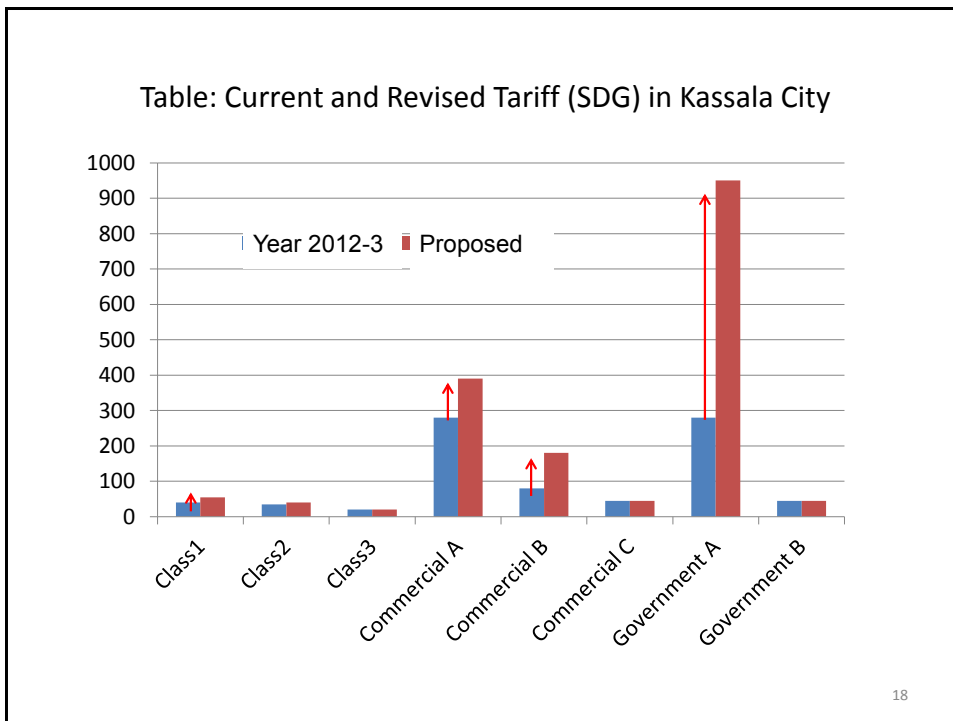
the “Commercial” and “Government” unit payment rates per M3 should be equal or more than that of the Class 3, 0.87 SDG.



16

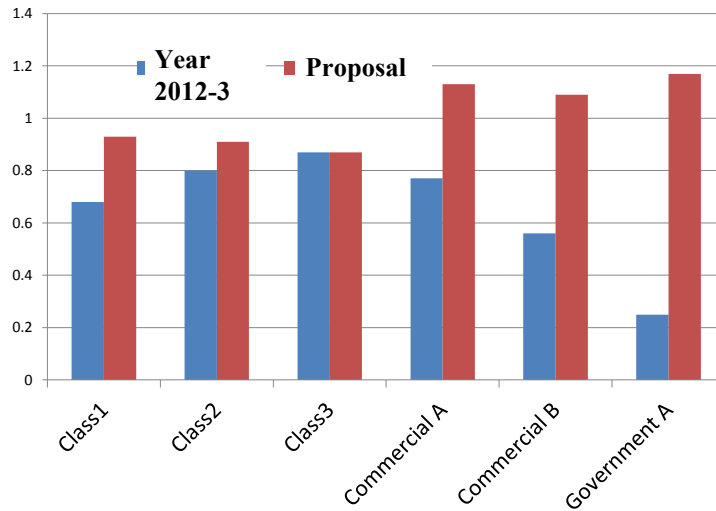
Tariff revision proposal								
الإيرادات لشدة للمنطقة Revenue	القيمة المقترحة Proposed Tariff/m ³	القيمة المقترحة Proposed Tariff	القيمة لشدة Year 2012-3 Tariff/m ³	القيمة لشدة Year 2012-3 Tariff	متوسط الاستهلاك لشدة (م ³) 2011 - يوليو Average Monthly m ³	عدد العملاء او المشتركين شهر 2012 Customer Number as of Dec-2012	بوصة Inch's	الفئات او الصفوف Categories
								للشدة
21,065	0.93	55	0.68	40	59	383	واحد	لدرجة 1
144,080	0.91	40	0.8	35	44	3,602	الثلاثة ارباع	لدرجة 2
573,820	0.87	20	0.87	20	23	28,691	نصف	لدرجة 3
								لدرجة 4
7,800	1.13	390	0.77	280	346	20	مزارع دواجن وابقار، منازل تجارية منازل ومصانع	(أ)
132,480	1.09	180	0.56	80	165	736	مطاعم وفنادق	(ب)
55,665		45		45		1,237	منازل تجارية فنادق ومصانع والشروبات	(ج)
323,000	1.17	950	0.25	80-550	815	340	مباني حكومية	لدرجة 1
11,205		45		45		249	المدارس الابتدائية لديها م تجارية	(ب)
1,269,115						35,258		لدرجة 1

17



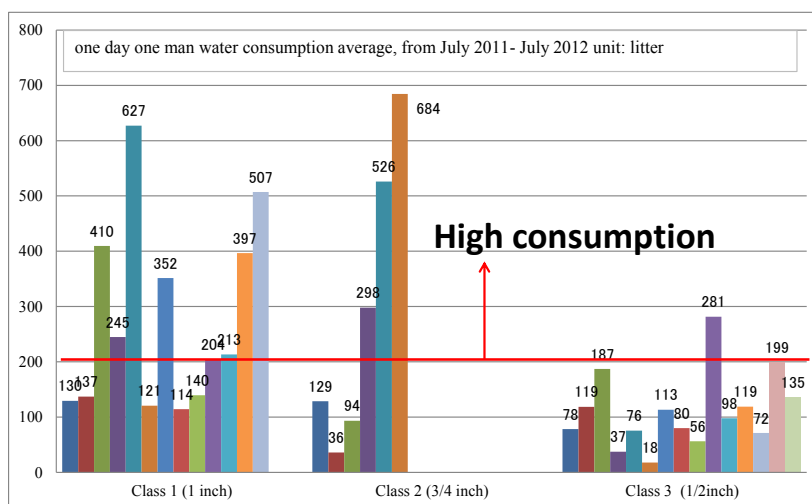
18

Table: Year 2012-3 and Proposed unit payment (SDG) per M³ in Kassala City



19

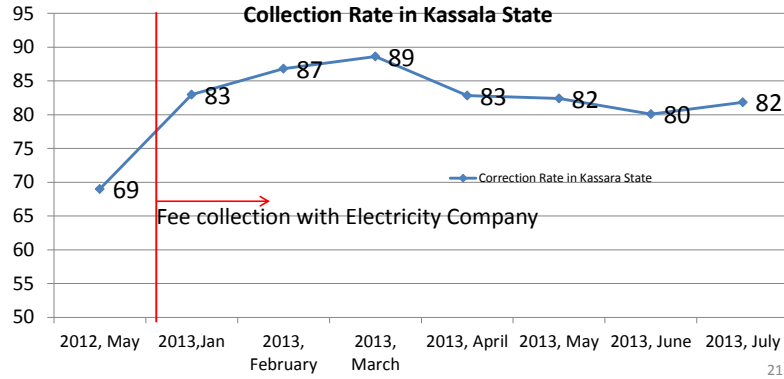
Table 5: one day one man water consumption average of "Domestic", unit: litter



20

Customers using both electricity and water would pay water fees to the Electricity Corporation from Jan., 2013. The SWC would collect water charges by themselves from their customers who do not use electricity.

The collection rate , including SWC East/ West/ New Halfa/ Girba/ Aroma offices, in May 2011, were 69%. Those in March 2013 were 89%. The collection rate has increased by twenty (20) percent with collection by the Electricity Corporation.



3. Recommendation

3- إقتراحات فوي قوال خجاء ليا بلي :

Recommends:

- 1) It is necessary to revise the year 2012-3 tariff, by setting higher rates for the large volume consumers, including "Household Class 2 and 3", "Commercial" and "Government".
- 2) Next year, the Japan's donation projects will start to supply more water to Kassala city. The year 2014 is thus a good timing to revise the current tariff.

1- من الضروري إعادة للظرفي فوي فة ال حالية، لم يت خدمي لاي بشركل اغير ميا فوي لك ال درجة ال فزيية
 برافني (2 و 3 لمتجاري و ال خفومي.
 2 فوي ال اطلاق ادم، مش ايجع ال فوج ال هيل لوي سيفر ال جديد من ال امل مهينة س ال. و بيلتلاي عام 2014 هو للتوقيت
 اللازم سب ال إعادة للظرفي فوي فة ال حالية.

3) Higher rates would enable the large volume consumers to pay fair prices as well as give them an **incentive to conserve water**.

3-التعريف عالي التكلفة يمكن مستخدمي المياه لمشاكل توفير المياه بأسعار عادلة فضلاً عن إقدامهم بالحفاظ على المياه.

Water conservation

Some households consume more than 200 liters in per day per person. Others use more than 600 liters. It is very necessary for the SWC to increase awareness of water conservation, especially in summer.

لمحافظة على المياه:

بعض المنزلات تستهلك 200 لتر في اليوم للفرد الواحد، وبعض المنزلات تستهلك 600 لتر في اليوم للفرد، ومن الضرورة والاهمية أن تقوم هيئة المياه بربح عملتوعوي للحفاظ على



- 4) After the tariff revision, it will be necessary to install **water meters for the large volume consumers**, to begin with the "Government". Because there is much difference in monthly water consumption among the consumers of "Government".
- 5) Revenue increase with the tariff revision will be used **to purchase the water meters**.

4- وبعدها سيتم تجهيل قنوي فستويكون من الضروري تركيب عدادات المياه بمستخدمي المياه لمشاكل توفير المياه، لتبدأ مع القطاع "الحكومي" لأن في الفرق القيرفي بين خدمات المياه من حيث خدمتها في القطاع الحكومي.

5- زيادة الإيرادات من تجهيل قنوي فستويستخدمها شراء عدادات المياه.





In the name of Allah, the Beneficent, the Merciful بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

MODULE - 5

Session 2-3

BUSINESS PLAN FORMULATION and IMPLEMENTATION



Layout of Session 3

1

- **Session 3– Module 1**
 - Vision & Mission
 - SWOT Analysis
 - GAP Analysis & Target Setting
- **Session 3– Module 2**
 - **3 Years** Performance Improvement Plan
 - Water Supply
 - Sewerage & Drainage
 - Energy Management
 - **3 Years** Communication Plan



Layout of Session 2-3

1

- **Session 3 (02:00~03:00) – Module 3**
 - 3 Years Training Plan with Budget
- **Session 3 (03:00~04:00) – Module 3**
 - 3 Years Performance Improvement Plan of Revenue Management System

45

THANKS

Annex 4.20
Training Schedule for O&M of Tube Well and Pump Facility
in Spring 2018



Operation and Maintenance (O&M) of Tube Well and Pump Facility Course
Training Schedule (March 19 to March 22 , 2018)
Course Code: W1221

Sr.No	Day and Date	Themes	Session 1		Tea 11:00-11:15 am	Session 2		Lunch 1:15-2:00pm	Session 3		
			1st Lecture 9:00-10:00am	2nd Lecture 10:00-11:00am		3rd Lecture 11:15am-12:15 pm	4th Lecture 12:15-1:15pm		Assignment 2:00-4:00pm		
1	Monday (March 19, 2018)	<ul style="list-style-type: none"> • Key Issues in Water Distribution System • Operation & Maintenance of Water Supply Pipelines & Valves 	<ul style="list-style-type: none"> • Introduction of Course Participants • Training Expectations 	<ul style="list-style-type: none"> • Key Issues in Water Distribution System 	<ul style="list-style-type: none"> • Key Issues in Water Distribution System • Components of Water Supply Facility 	<ul style="list-style-type: none"> • Components of Water Supply Facility • Arrangement of Water Distribution System 	<ul style="list-style-type: none"> • Pipe Material • Appurtenances 		<ul style="list-style-type: none"> • Critical Report on Major Issues of Five WASA's (Group Assignment) • Reflection and Review 		
2	Tuesday (March 20 2018)	<ul style="list-style-type: none"> • Operation & Maintenance of Water Supply Pipelines • Water Safety Plan (WSP) 	<ul style="list-style-type: none"> Review of Previous Lecture 	<ul style="list-style-type: none"> • Water Distribution Operational Plan • Water Distribution Maintenance Plan 		<ul style="list-style-type: none"> • Water Distribution Maintenance Plan • Water Distribution System Mapping • Overhead Reservoirs 	<ul style="list-style-type: none"> • Water Safety Plan Linked with Distribution Pipelines and Reservoirs 		<ul style="list-style-type: none"> • Group Assignment (Preparation of WSP Plan) • Reflection and Review 		
3	Wednesday (March 21, 2018)	<ul style="list-style-type: none"> EPANET Analysis for Water Distribution System 	<ul style="list-style-type: none"> Review of Previous Lecture 	Pipeline Network Analysis Exercise of Supply Area of One Tube Well							
5	Thursday (March 22, 2018)	<ul style="list-style-type: none"> Operation and Maintenance of Water Distribution System 	<ul style="list-style-type: none"> Review of previous Lecture 	OJT at Green Town WASA Sub Division , Lahore <ul style="list-style-type: none"> • Checking of Valves, Hydrants and pipeline crossing river as per Drawing • Checking of Pressure and Residual Chlorine 			<ul style="list-style-type: none"> • Individual Assignment on Preparation of Operational and Maintenance Action Plan 		<ul style="list-style-type: none"> • Individual Assignment on Preparation of Operational and Maintenance Action Plan • Course Evaluation • Training Closure Evaluation 		

Annex 4.21
Training Schedule for Leakage Detection in Spring 2018



Leakage Detection and Repair

Course Code - W 7231

Training Schedule (April 16 to April 19, 2018)

Sr. No.	Day & Date	Themes	Session 1		Tea 11:00am - 11:15am	Session 2		Lunch 1:15pm-2:00pm	Session 3
			1st Lecture 9:00am - 10:00am	2nd Lecture 10:00am - 11:00am		3rd Lecture 11:15am - 12:15pm	4th Lecture 12:15pm - 1:15pm		2:00pm-4:00pm
1	Monday (April 16, 2018)	<ul style="list-style-type: none"> Basic Knowledge of Leakage Detection Repairing of Leakage and Burst Pipelines 	<ul style="list-style-type: none"> Introduction of Course Participants & Trainers Training Expectations from Participants Current Scenario of Leakage Detection at WASAs 	<ul style="list-style-type: none"> Countermeasures for Leakage 		<ul style="list-style-type: none"> Countermeasures for Leakage Leakage Survey Equipment 	<ul style="list-style-type: none"> Leakage Survey Equipment Repairing of Leakage and Burst Pipeline Illegal Connections 		Group presentation <ul style="list-style-type: none"> Current practices for leakage prevention and pipe repairing from each Water Utility Case Study Q&As
2	Tuesday (April 17, 2018)	<ul style="list-style-type: none"> On Site Leakage Detection 	<ul style="list-style-type: none"> Review of Previous Lectures Visit Briefing Sharing of OJT Plan & Checksheets 	<u>OJT at Green Town Sub Division, Lahore</u> <ul style="list-style-type: none"> Leak Detection by Leak Detector and Acoustic bar Leakage Repairing Site Installation and Operation of Non-Metal Pipe Locator 					<ul style="list-style-type: none"> Discussion on Site Visit Site Visit Reflection
3	Wednesday (April 18, 2018)	<ul style="list-style-type: none"> On Site Installation and Operation of Leakage Detection Equipment 	<ul style="list-style-type: none"> Review of Previous Site Visit Visit Briefing 	<u>OJT at Green Town Sub Division, Lahore</u> <ul style="list-style-type: none"> Installation and Operation of Metal Pipe Locator Flow Measurement and Pressure Recording by Ultrasonic Flowmeter and Pressure Recorder 					<ul style="list-style-type: none"> Discussion on Site Visit Site Visit Reflection
4	Thursday (April 19, 2018)	<ul style="list-style-type: none"> Leakage Prevention Action Plan 	<ul style="list-style-type: none"> Review of Previous Lecture & Site Visit Briefing on Leakage Prevention Action Plan 	<ul style="list-style-type: none"> Preparation of Action Plan of Leakage Prevention by Training Participants 		<ul style="list-style-type: none"> Preparation of Action Plan for Leakage Prevention by Training Participants Group Presentation Training Evaluation Training Closure 			



Annex 4.22
Training Schedule for O&M of Sewer
and Storm Water Drainage in Spring 2018



**Operation & Maintenance (O&M) of Sewerage and Storm Water Drainage System including Safety Precautions
Training Schedule (19 ~ 23 February, 2018)**

Sr. No.	Day and Date	Module Name	Session-1			Tea 11:00 am-11:15 am	Session-2			Lunch 1:15 pm-2:00 pm	Session-3		
			1 st Lecture 9:00 am-10:00 am		2 nd Lecture 10:00 am-11:00 am		3 rd Lecture 11:15 am - 12:15 pm		4 th Lecture 12:15 am - 1:15 pm		5 th Lecture 2:00 pm - 3:00 pm		6 th Lecture 3:00 pm -4:00 pm
			09:00 am-9:15 am	9:15 am-10:00 am			11:15 am-11:45 am	11:45 am-12:15 pm					
1	Monday February 19, 2018	Module 01 Safety Control and Measures for Sewerage and Drainage Works	<ul style="list-style-type: none"> Welcoming Remarks Participant Introduction Course Overview Training Expectations 	<ul style="list-style-type: none"> Hazards & Risks Control Measures Current Safety Practices in WASA 	<ul style="list-style-type: none"> Introduction to PPE Working in Confined Space First Aid in Emergency Situations 	Tea Break	Traffic Control Practices during O&M Works	Class Room Demonstration - Personal Protective Equipment (PPE)	Class Room Demonstration - Cardiopulmonary Resuscitation (CPR)	Lunch & Prayer Break	Field Exercise - Traffic Routing during O&M Works	<ul style="list-style-type: none"> Quick Win Measures (QWMs) Conclusion on Day's Activities 	
2	Tuesday February 20, 2018	Module 02 O&M of Storm Water Drainage System	<ul style="list-style-type: none"> Module Overview Expected Learning Outcomes 	<ul style="list-style-type: none"> Need for O&M of Drains Drain Dredging Equipment 	<ul style="list-style-type: none"> Estimation of Sludge in Drains (Class Exercise) Sludge Disposal Techniques Lecture by Guest Speaker (WASA-Lahore) 		Field Exercises 1. Observation of Drain Dredging Equipment WASA - Drainage Division - (South) 2. Observation of Storm Water Drain Management Model WASA - Drainage Directorate - (Central)				Field Exercise -Estimation of Sludge Volume in Sattu-Katla Drain	<ul style="list-style-type: none"> QWMs Conclusion on Day's Activities 	
3	Wednesday February 21, 2018	Module 03 O&M of Sewerage System	<ul style="list-style-type: none"> Module Overview Expected Learning Outcomes 	<ul style="list-style-type: none"> Identification of a Lost Manhole Tests for Hazardous Gases Inspection of Manholes & Sewers 	<ul style="list-style-type: none"> Testing Techniques Machinery & Equipment Cleaning Techniques 		Field Exercises around Academy 1. Use of Metal Locator 2. Manhole / Sewer Line Inspection				Field Exercises around Academy 1. Use of Gas Monitor 2. Use of Air Blower / Sucker Machine	<ul style="list-style-type: none"> QWMs Conclusion on Day's Activities 	
4	Thursday February 22, 2018		<ul style="list-style-type: none"> Recap of Previous Day Activities 	<ul style="list-style-type: none"> Introduction to Emergency Response Measures taken by WASAs during Monsoon 	<ul style="list-style-type: none"> Disposal Station -Introduction -O&M 		Field Visits & Exercise <ul style="list-style-type: none"> Observation of O&M Works & Facility Assessment at... <ol style="list-style-type: none"> Disposal Station - Sattu Katla, Abu Bakar Road, Township Disposal Station - Gulshan-e-Ravi 				Lunch & Prayer Break	<ul style="list-style-type: none"> QWMs Conclusion on Day's Activities 	
5	Friday February 23, 2018	Action Plan	Development of QWMs & Action Plan					Development of QWMs & Action Plan			Lunch & Prayer Break	Conclusion & Closing Remarks	



Annex 4.23
Training Schedule for O&M of Electrical Equipment
in Spring 2018

**Operations and Maintenance (O&M) of Electrical Equipment
Training Schedule (March 26th - March 30th 2018)
Course Code: WSD 5231**

Module-1, 2 Electrical Control Panels & Generators

Sr. No.	Day and Date	Themes	Session 1		Tea 11:00- 11:15am	Session 2		Lunch 1:15-2:00pm	Session 3	
			1st Lecture 9:00-10:00am	2nd Lecture 10:00-11:00am		3rd Lecture 11:15am-12:15 pm	4th Lecture 12:15-1:15pm		5th Lecture 2:00-3:00pm	6th Lecture 3:00-4:00pm
1	Monday (March 26,2018)	Electrical Control Panel •Usage of electrical control panel •Control panel assembly	• Introduction of course participants and module expectations •Benefit and purpose of electrical control panels •Electrical units and components	• Introduction to main electrical units, design and its components Exercise P1: Wiring diagram of different components of MCU		• Motor Starters • Introduction to Motors (Working Principle of motor) • Power factor correction Exercise P2: Troubleshooting of MCU (Motor Control Unit)	• Record Keeping • SOP Exercise P3: SOP check on demo panel, Modification of Operation Record		Exercise P4: Device Inspection on demo panel, Continuity check by Clamp multi-meter •Day's wrap-up and Review •Discussion and Queries	
2	Tuesday (March 27,2018)	Electrical Control Panel • Energy efficiency analysis • Standard operating procedures (SOP) •Problem solving techniques •Preventive maintenance	•Equipment testing and energy efficiency analysis • Preventative Maintenance •Introduction to testing equipment	<u>Demonstration at WASA tube well at Green Town (10:00-12:30)</u> •Energy efficiency analysis •SOP Checklist • Record Keeping •Device Inspection •Demonstration of Preventive maintenance (•Practice on Insulation resistance tester) Review of results in filled templates at Academy					•5S Implementation Exercise P5: 5S activity in house •Label all essential equipment on control panel •Post standard fault reporting or maintenance request procedure •Post emergency contact list (including site operations and maintenance team contacts)	
3	Wednesday (March 28, 2018)	Generator •Generator assembly •Standard operating procedures (SOP) •Preventive maintenance •Applicable PPE	• Introduction to Diesel Generator	• Assembly parts of a generators Exercise G1: Label exploded diagram of a diesel generator		•SOP •Daily operation and maintenance Record •Preventive Maintenance	<u>Demonstration on Generator at Academy</u> •Queries about components and their flow •Daily operation and maintenance record		<u>Demonstration on Generator at Academy</u> Demonstration of Preventative Maintenance •Day's wrap-up and Review •Discussion and Queries	
4	Thursday (March 29, 2018)	Generator and HSE •Preventive Maintenance Plan •Troubleshooting with the manufacturer's manual	• Importance of the Manufacturer's Manual	Exercise G2: Develop preventive maintenance plan		<u>Demonstration Exercise G3:</u> Refer to operations manual and perform troubleshooting on generator	Health Safety and Environment Introduction to HSE with respect to Electrical Equipment		Health Safety and Environment Deomstration HSE related to electrical equipment operations	
5	Friday (March 30,2018)	•Output Challenge • Action plan • Course evaluation	Exercise A1: •Output Challenge of Electrical Panel and Generator	•Action plan -List up possible actions -Develop OJT implmentation procedure		•Presentation of gained knowledge and action plan (Each WASA) •Course and trainer evaluation				

Annex 4.24
Training Schedule for O&M of Mechanical Equipment
in Spring 2018

**Operations and Maintenance (O&M) of Mechanical Equipment
Training Schedule (Apr 9th - Apr 13th, 2018)
Course Code: WSD 5231**

Module-1 Pumps and Valves; Module-2 Filtration and Chlorination Systems

Sr. No.	Day and Date	Themes	Session 1		Tea 11:00-11:15am	Session 2		Lunch 1:15-2:00pm	Session 3	
			1st Lecture 9:00-10:00am	2nd Lecture 10:00-11:00am		3rd Lecture 11:15am-12:15 pm	4th Lecture 12:15-1:15pm		5th Lecture 2:00-3:00pm	6th Lecture 3:00-4:00pm
1	Monday (Apr 9, 2018)	<ul style="list-style-type: none"> •Pumps •Valves 	<ul style="list-style-type: none"> •Introduction of course participants •Training expectations •Introduction to pumps and valves 	<ul style="list-style-type: none"> •Assembly components of pumps and valves •Selection criteria for pumps •Preventive maintenance plan 		Exercise 1: <ul style="list-style-type: none"> •Pump selection criteria •Calculate total head for pumps (Model pumping station and system head model demonstration) 	Exercise 2A: Find and identify appropriate manual section and develop a monthly maintenance plan Exercise 2B: Identify various valve types and relevant valve function		Demonstration visit to Green Town tube well: Observe standard operating procedure of centrifugal pumps <ul style="list-style-type: none"> • SOP of Pump start/Off (especially lubrication of shaft bearings before start) •Pressure checks •Leakage inspection •Valve functions •Gland seal replacement procedure •Pump lubrication before start •Ultra Filtration plant process review 	
2	Tuesday (Apr 10, 2018)	<ul style="list-style-type: none"> •Preventive maintenance •Common faults and trouble shooting •Chlorination and Filtration Systems (Start of module 2) 	<ul style="list-style-type: none"> •Record keeping for operations and maintenance •SOPs 	Pumps and Valves: <ul style="list-style-type: none"> •Major faults and root causes •Current maintenance issues at WASAs 		<ul style="list-style-type: none"> •WHO water safety guidelines • Introduction to filtration system at WASA tube well filtration plants 	<ul style="list-style-type: none"> • Introduction to filtration system at WASA tube well filtration plants 		Exercise 1: Filtration system components and specific function identification	
3	Wednesday (Apr 11, 2018)	<ul style="list-style-type: none"> •Chlorinators (Start of module 3) •Introduction to heavy machines (Suction, Jetting and Backhoe) 	<ul style="list-style-type: none"> •Chlorinator pump operating principle •Chlorinator pump parts and maintenance 	<ul style="list-style-type: none"> •Adjustment of chlorinator (pump) for required treatment levels •Use of MS Excel tool to calculate the correct knob setting for the chlorinator pump 		Exercise 2 : <ul style="list-style-type: none"> •Identify various parts and features of the chlorinator pump 	<ul style="list-style-type: none"> •Importance of heavy machines in WASA capacity enhancement (operational efficiency) •Assembly components and operations of Suction and Jetting Machines 		<ul style="list-style-type: none"> •Assembly components and operations of Backhoes 	



**Operations and Maintenance (O&M) of Mechanical Equipment
Training Schedule (Apr 9th - Apr 13th, 2018)
Course Code: WSD 5231**

Module-3 Heavy Machines, HSE & 5S; Module-4 Water Meters

Sr. No.	Day and Date	Themes	Session 1		Tea 11:00-11:15am	Session 2		Lunch 1:15-2:00pm	Session 3	
			1st Lecture 9:00-10:00am	2nd Lecture 10:00-11:00am		3rd Lecture 11:15am-12:15 pm	4th Lecture 12:15-1:15pm		5th Lecture 2:00-3:00pm	6th Lecture 3:00-4:00pm
1	Thursday (Apr 12, 2018)	<ul style="list-style-type: none"> •SOPs •Preventive maintenance for heavy machines •HSE •Work place standardization and process optimization (5S) 	<ul style="list-style-type: none"> •SOP of Jetting unit •SOP of Suction unit •SOP of Backhoe •Preventive maintenance for heavy machines •Videos of demonstration of suction, jetting and backhoe machine operations 	<p>Exercise 1: Jetting and Suction machine components and machine purpose</p> <p>Exercise 2: Truck Severe Condition Maintenance Plan Items</p>		<ul style="list-style-type: none"> • Facility and Process Standardization and Optimization (5S) •HSE related to mechanical equipment and facility 	<ul style="list-style-type: none"> •Demonstration of HSE and 5S implementation 		<ul style="list-style-type: none"> •Demonstration of suction, jetting and backhoe machine operations •HSE aspects of heavy machine operations (Hazard Hunt and marking the working area safe zone) 	
2	Friday (Jan 13, 2018)	<ul style="list-style-type: none"> •Water meters •Participant reflections and site action plan •Module evaluations 	<ul style="list-style-type: none"> •Importance of water meters •Water meter types •Common maintenance issues •Water meter accuracy check demonstration 	<p>Exercise 1: water and flow meter types and functions</p> <p>Water meter installation (team demonstration)</p>		<ul style="list-style-type: none"> •Participant reflections and site action plan 	<ul style="list-style-type: none"> •Module evaluations 			

Annex 4.25
Training Schedule for Asset Management in Spring 2018



Asset Management Course

Training Schedule (January 15, 2018 to January 20, 2018)

Sr.No	Day and Date	Themes	Session 1		Tea 11:00-11:15am	Session 2		Lunch 1:15-2:00pm	Session 3	
			9:00-10:00am	10:00-11:00am		11:15am-12:15 pm	12:15-1:15pm		2:00-3:00pm	3:00-4:00pm
1	Monday (January 15, 2018)	Introduction to Asset Management Asset Inventory & Asset Management Information System	Registration of Participants and Ice breaking session	Definition of Assets Assets of WASAs Phenom Penn Video		Introduction of Asset Management Information System (AMIS) Registration of Users Addition of Assets into AMIS Searching and Editing of Assets			Assignment 1- Practical exercise on AMIS (Asset Management Information System) in WASAs with respect your organization/sub-division and prepare a brief report of 300 words. Output: Participant Specific Asset Inventory. (5 Marks)	
			AM Team	Asif Iqbal		Asif Iqbal & Waseem Hussain			Waseem Hussain	
2	Tuesday (January 16, 2018)	Asset Condition Assessment and Visit Field	Asset Condition Assessment & scale to determine Asset conditions. Three different Exercises to identify assets and asset components			Field Visit to a tubewell to conduct condition assessment (with Faculty)			Assignment 2- Group Activity to conduct Asset Condition Assessment of Tubewell. Output: Asset Condition Assessment Forms of Two Tubewells. (10 Marks)	
			Ali Qumain			Ali Qumain			Ali Qumain	
3	Wednesday (January 17, 2018)	Definition of Risk Risk Management of Assets of WASAs	Risk Types of Risks Business Risk of WASAs	Risk Management Strategies for WASAs.		Introduction to Integrated Development and Asset Management Plan (IDAMP) Asset Management Plan based on Risk Categorization			Assignment 3- Asset Condition & Risk Assessment & asset management plan of assets extracted in assignment 1. Output: Asset Management Plan (15 Marks)	
			Asif Iqbal			Asif Iqbal & Ali Qumain			Asif & Ali Qumain	
4	Thursday (January 18, 2018)	GIS	Introduction to ArcGIS software Asset data browsing classification Editing the asset data			GIS based Pipe Replacement Palnning: Applying query functions Making Water and sewerage project Map of subdivision/zone of WASA.			Assignment 4 - Prepare and present Project Map of Subdivision. Output: Project map of actual subdivision (10 Marks)	
			Aneeqa Azeem & Nizam			Aneeqa Azeem & Nizam			Aneeqa Azeem & Nizam	
5	Friday (January 19, 2018)	Asset database Analysis & Asset Replacement Planning	Data Description Definition & application of pivot table. Asset Condition Analysis. Cost calculation and prioritization for replacement planning. Demonstration. Practical exercises on analysis and observation.			1) Pipeline replacement plan: formulating pipeline replacement plan in a WASA, short, medium, and long-term plan, with its cost 2) Replacement with its cost (assignment 3): Exercises of imputing a cost table to calculate the short, medium, and long-term plan.			Assignment 5- Conduct Asset Data Analysis and prepare Pivot Tables showing condition analysis. Output: Asset Replacement Plan with Cost. (10 Marks)	
			Aneeqa Azeem & Asif			Mr. Kuroda & Asif			Aneeqa, Kuroda & Asif	
6	Saturday (January 20, 2018)	Preparation and presentation of Asset Mangement Plan	Preparation and Presentation of Asset Management Plan and Asset Replacement Plan. (25 Marks)							
			Asif, Kuroda, Aneeqa and Ali Qumain							

Annex 4.26
Training Schedule for Business Planning in Spring 2018

Training Plan

B1131 - Business Planning Course

DAY & DATE	MODULE	Session 1		Tea 11:00-11:15	Session 2		Lunch & Prayer 1:15:2:00	Session 3	
		9:00-10:00	10:00-11:00		11:15-12:30	12:30-1:15		2:00pm-3:00pm	3:15pm-4:00pm
Thursday, January 25, 2018	Module 1: Business Planning and GAP Analysis	Registration of the participants. Introduction of the Course. Introduction of the participants and faculty	LECTURE & GROUP ACTIVITY Course Introduction, Benchmarking * SWOT Analysis		GROUP ACTIVITY Integrated Development and Asset Management Plan & Role Play Project Prioritization and Approval			LECTURE & GROUP ACTIVITY Business Planning Practise - International (Sudan)	LECTURE & GROUP ACTIVITY Introduction of PIP and Gap Analysis
		Mr M Kashif	Mr M Kashif		Mr. Asif Iqbal			Mr Kuroda	Ali Qumain & Aneeqa
Friday, January 26, 2018	Module 2: Strategies for Service Delivery Improvements	LECTURE & GROUP ACTIVITY Energy Audit, Energy Management Plan and PIP of Above Ground Assets.			LECTURE & GROUP ACTIVITY Performance Improvement Plan (PIP) Operational Business Plan (OBP) - Water Supply System			LECTURE & GROUP ACTIVITY Performance Improvement Plan (PIP) Operational Business Plan (OBP) - Sewerage and drainage system	
		Mr Ali Qumain & Mr. Mohsin			Ms Aneeqa and Mr Ali Qumain			Ms Aneeqa and Mr Ali Qumain	
Saturday, January 27, 2018	Module 3: Strategies for Human Resource Development	LECTURE Human Resource Development INDIVIDUAL ACTIVITY Job Role Analysis	LECTURE AND INDIVIDUAL ACTIVITY Knowledge Skill Attitude (KSA) Training Prioritization		LECTURE Workforce Database Analysis			GROUP Activity Training Plan	
		Mr. Saleem Ahmad			Mr. Rehan Khalid			Rehan Khalid and Kashif Ali Zia	
Monday, January 29, 2018		LECTURE & GROUP ACTIVITY Communication Strategy Communication Plan of Next Three Years			LECTURE & GROUP ACTIVITY GAP Analysis and Target Setting Financial Management			GROUP ACTIVITY Preparation of Business Plan including SWOT Analysis, PIPs, Energy Management Plan, HR Management Plan.	
		Ms Memoona and Ms Madiha			Mr Asif Iqbal			Business Planning Team	

Training Plan

B1131 - Business Planning Course

DAY & DATE	MODULE	Session 1		Tea 11:00-11:15	Session 2		Lunch & Prayer 1:15:2:00	Session 3	
		9:00-10:00	10:00-11:00		11:15-12:30	12:30-1:15		2:00pm-3:00pm	3:15pm-4:00pm
Tuesday, January 30, 2018	Module 4: Strategies for Financial Management System	LECTURE AND GROUP ACTIVITY Strategies for Improvement in Financial Management System (Cosumer Database)			LECTURE AND GROUP ACTIVITY Strategies for Improvement in Financial Management System (Bill Distribution and Receipt)			LECTURE AND GROUP ACTIVITY Strategies for Improvement in Financial Management System (Additional Sources of Revenue)	
		Mr. Muhammad Kashif / Mr. Asif			Mr. Muhammad Kashif / Mr. Asif			Mr. Muhammad Kashif / Mr. Asif	
Wednesday, January 31, 2018		GROUP ACTIVITY Due Collection Improvement Plan (Arrear Recovery Strategies)			LECTURE Tariff Revision Practise in Sudan	LECTURE AND GROUP EXERCISE Investment Appraisal		LECTURE AND GROUP EXERCISE Investment Appraisal (exercises including a case of bottling company)	
		Mr. Kuroda / Mr. Bilal and Mr. Qasim			Mr Kuroda	Mr Asif Iqbal		Mr Asif Iqbal	
Thursday, February 1, 2018		GROUP ACTIVITY (Development of Arrears Recovery Strategy) Use of GIS			GROUP ACTIVITY (Development of Arrears Recovery Strategy) Use of GIS			GROUP ACTIVITY Preparation of Business Plan including SWOT Analysis, PIPs, Communication Plan, Energy Management Plan, HR Management Plan, Financial Management Plan	
		Ms. Aneeqa			Ms. Aneeqa			Business Planning Team	
Friday, February 2, 2018	Module 5: Business plan formulation and implementation	GROUP PRESENTATION 3 Year Sub-division-wise Business Plan		Group Photo	GROUP PRESENTATION 3 Year Sub-division-wise Business Plan				
		Business Planning Team				Business Planning Team			

Annex 4.27
Training Material for O&M of Tube Well and Pump Facility
in Spring 2018



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module1)

Key Issues in Water Distribution System

Zia Mustafa (Water Specialist)

Ramisha Taseer (Research Associate)

March 2018

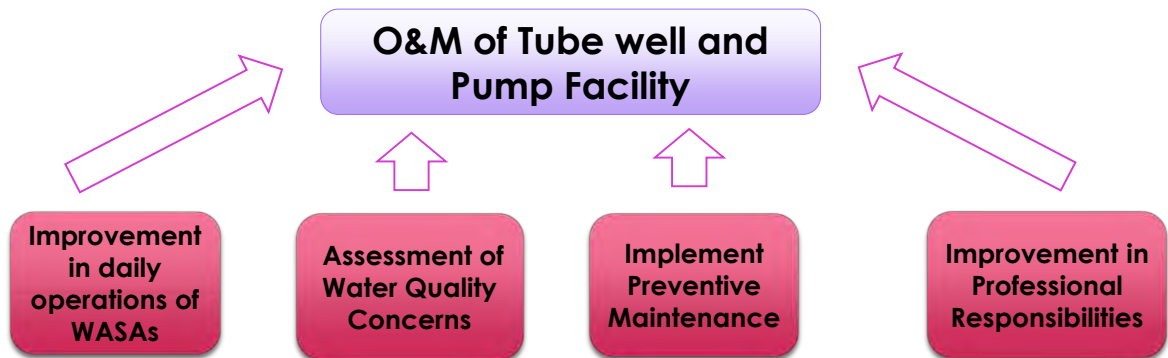
Outline of the Presentation

- ▶ Trainee's Expectations
- ▶ Learning Outcomes
- ▶ Existing Water Distribution System in Five WASA`s
- ▶ Key Issues in Water Distribution System

What are Your
Training
Expectations??



Course Outcomes



Existing Water Distribution System in Five WASA`s

WASA Lahore

7

- Water source Groundwater
- Direct Pumping System
- No. of Tube well 528
(Supply hours 14-18hr/day)
- Total length of water distribution pipelines 5,444km
- No Overhead Reservoir in operational state Except Lange Mandi OHR (Capacity 1MG)

Lecture 1: Key Issues in Water Distribution System

WASA Faisalabad

8

- 60% of population provided with piped water supply
- Water source Combination of ground water and surface water
- 15MGD of water being augmented in system by French Project
- Present Water Demand 145MGD
- Supplied Water to Consumers 93.5 MGD

Lecture 1: Key Issues in Water Distribution System

WASA Multan

9

- 65% of population provided with piped water supply
- Water source Ground water
- Depth of WT 70-80ft
- No. of Tube wells 102
- No. of Reservoirs 18 Nos.
- Water supplied to consumers 221MGD
- Water supply pipelines 3" to 24"
 - Main lines 231 km
 - Distribution lines 1,049km
- No. of Filtration Plants (Cap. 1000 gallons/hr. Each) 32

Lecture 1: Key Issues in Water Distribution System

WASA Rawalpindi

10

- 90% of population provided with water supply facility
- Two Surface water sources with treatment plants
 - Rawal Water Treatment Plant 23MGD
 - Sanjani Water Treatment Plant 6MGD
- No. of Tube wells (0.25 cusecs capacity each) 362
(39 MGD water supplying to consumers)
- Transmission and Distribution pipelines length 1,250km
(3"to 54")

Lecture 1: Key Issues in Water Distribution System

WASA Gujranwala

11

- 40% of population provided with piped water supply
- 10 reservoirs (8 operational & 2 abandoned)
- 67 Tube wells supplying 39MGD of water
- Intermittent supply 10-12 hours in a day
- Distribution length (3" to 24" inches with length of 481km)

Lecture 1: Key Issues in Water Distribution System

Salient Features of Water Supply System in Five WASAs (Year 2014-15)

12

Sr. No.	Water Supply Parameters	WASA Lahore	WASA Faisalabad	WASA Multan	WASA Rawalpindi	WASA Gujranwala
1	Water Source	Ground water	Combination of Ground and Surface Water	Ground water	Combination of Ground and Surface Water	Ground water
2	Total Population (Millions)	9.2	7.19	4.22	4.57	4.66
3	Population Served (Millions)	5.89	1.9	1.43	1.65	0.21
4	WASA served water supply area (km ²)	350	225	365.3	276	25.2

Lecture 1: Key Issues in Water Distribution System

Salient Features of Water Supply System in Five WASAs (Year 2014-15)

13

Sr. No.	Water Supply Parameters	WASA Lahore	WASA Faisalabad	WASA Multan	WASA Rawalpindi	WASA Gujranwala
5	Number of Tube wells	528	77	102	362	67
6	Water Coverage (%)	90	60	65	90	40
7	Average amount of water supplied (MGD)	450	93.5	221	68	39
8	Average per capita water supplied GPCD	80	25	50	40	50
9	Supply Hours	14-18	6-7	6	2-4	10-12
10	NRW (% age)	38.4	32.9	22	43	39

Lecture 1: Key Issues in Water Distribution System

Salient Features of Water Supply System in Five WASAs (Year 2014-15)

14

Sr. No.	Water Supply Parameters	WASA Lahore	WASA Faisalabad	WASA Multan	WASA Rawalpindi	WASA Gujranwala
11	Metering Ratio (%)	5	1	-	-	-
12	Reservoirs (No. and Capacity) Million Gallons	52, 3.16	37, 2.2	18, 2.35	27, 2.77	10, 1.58
13	Total length of Distribution System (km)	5,444	1,218	1,280	1,200	481
14	Total Annual O&M Cost (Rs. Million)	7,354	1,652	1,075	700	643
15	Total water supply connections	636,338	270,451	66,900	114,655	26,091

Lecture 1: Key Issues in Water Distribution System

Key Issues in Water Distribution System

15



Lecture 1: Key Issues in Water Distribution System

Non Revenue Water (NRW)

16

“NRW is the difference in water put into the supply and the amount of water to be billed to consumption”

- NRW Comprises of three components:
 1. Unbilled authorized consumption (Water used for Public buildings, parks etc.)
 2. Physical losses (leakages from transmission and distribution pipelines)
 3. Commercial losses (illegal connections, inaccuracies in meters)

Lecture 1: Key Issues in Water Distribution System

Non Revenue Water (NRW)

17

- Major factors contributing towards NRW include:
 - Old aged pipe Infrastructure
 - illegal Connections
 - Inadequate metering System
 - Invisible leaks

Lecture 1: Key Issues in Water Distribution System

Present Status of Revenue and Non-Revenue Water across Five WASAs (Year 2014-15)

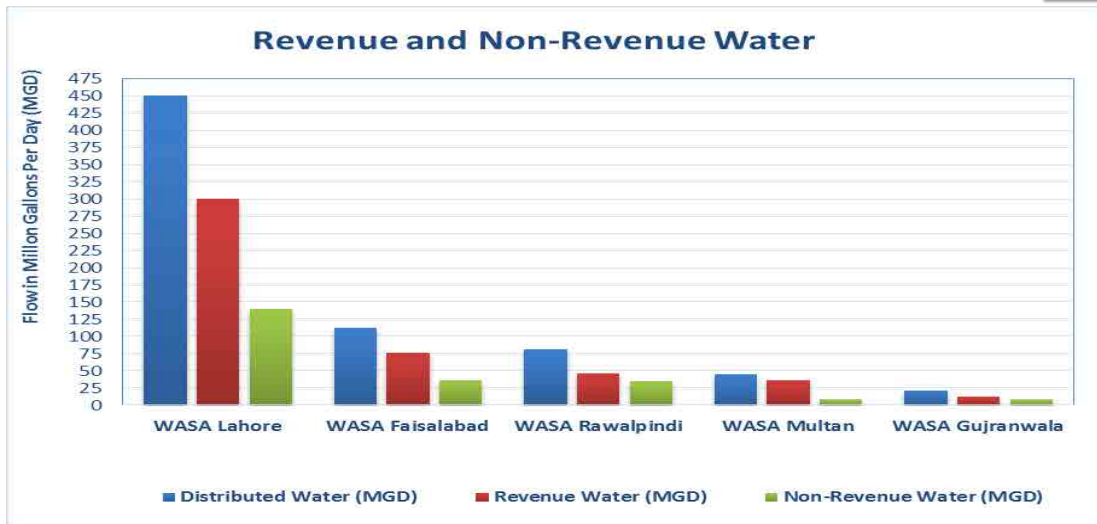
18

Sr. No.	Name of WASA	Distributed Water (MGD)	Revenue Water (MGD)	NRW Water (MGD)
1	WASA Lahore	450	300	150
2	WASA Faisalabad	112	76	36
3	WASA Rawalpindi	81	46	35
4	WASA Multan	45	36	9
5	WASA Gujranwala	21	13	8

Lecture 1: Key Issues in Water Distribution System

NRW Scenario in Five WASAs

19



Lecture 1: Key Issues in Water Distribution System

Metering

20

Metering Ratio in Five WASA`s

Sr. No.	Name of WASA	Metering Ratio
1	WASA Lahore	5 %
2	WASA Faisalabad	1 %
3	WASA Gujranwala	-
4	WASA Multan	-
5	WASA Rawalpindi	-

Lecture 1: Key Issues in Water Distribution System

Metering

21

- Absence of Metering System except LHR & FSD
- Bill collection on flat rate basis
- Installation of meters at domestic & non domestic connections to ensure actual consumption used by consumers



Lecture 1: Key Issues in Water Distribution System

Tariff

22

- Present tariff is based on plot sizes (varying from 5 Marla to more than 20 Marla)
- A gradual increase in Tariff is required to improve the financial position of five WASA`s
- The tariff increase needs to address at affordable cost to consumers

Lecture 1: Key Issues in Water Distribution System

Water Supply Tariff (Rs./Month) in 5 WASAs

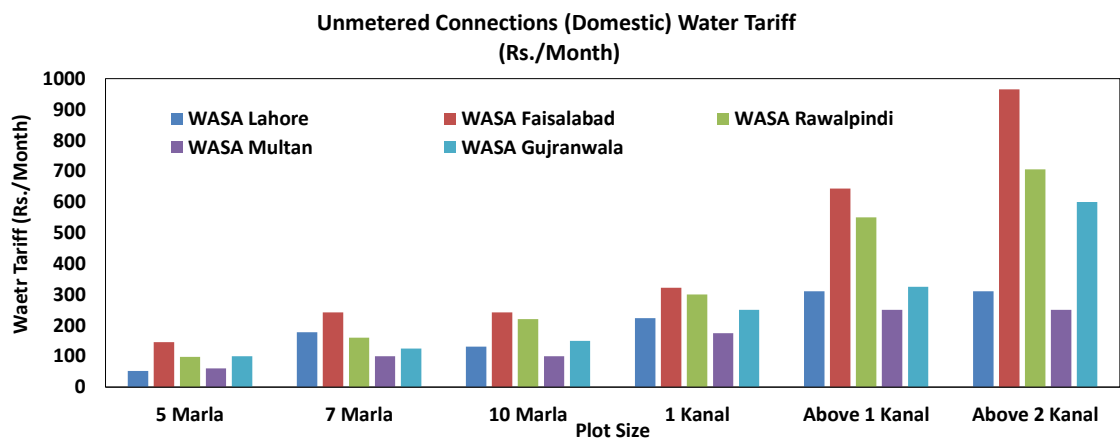
23

Sr. No.	Connections	Plot Size	WASA LHR	WASA FSD	WASA RWP	WASA MUL	WASA GRW
1	Unmetered Connections (Domestic)	5 Marla	52	145	98	60	100
		7 Marla	78	242	160	100	125
		10 Marla	131	242	220	100	150
		1 Kanal	223	322	300	175	250
		Above 1 Kanal	311	644	500	250	325
		Above 2 Kanal	311	966	706	250	600

Lecture 1: Key Issues in Water Distribution System

Domestic Tariff on Un Metered Connections

24



Lecture 1: Key Issues in Water Distribution System

Intermittent Water Supply

25

- Intermittent supply system in all WASA`s varying from 2-18 hours
- WASA Lahore 14-18 hours/ day (maximum duration)
- WASA Rawalpindi 2-4 hours / day (minimum duration)
- Supplying water on intermittent basis is major cause of negative pressure which causes contamination of water supply lines

Lecture 1: Key Issues in Water Distribution System

Cross Connections

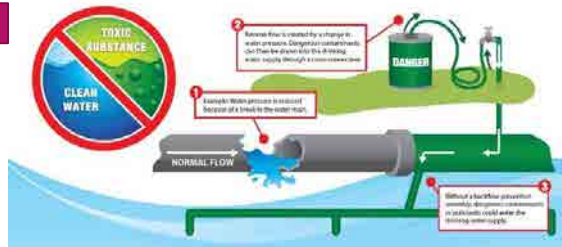
26

- Any connection between a potable water system and any source of contamination through which contaminated water could enter the potable water system
- **Backflow** : the flow of any water, foreign liquids, gases, or other substances back into a potable water system
- **Backpressure** : the foreign substance is forced into a water system under a higher pressure than the system pressure
- **Backsiphonage** : the water system pressure is less than atmospheric , and the foreign substance is essentially sucked into the potable water system

Lecture 1: Key Issues in Water Distribution System

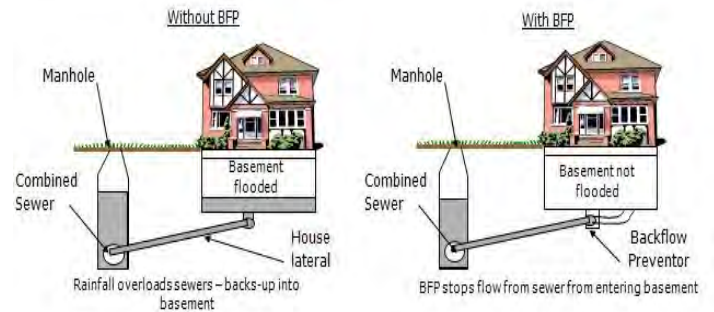
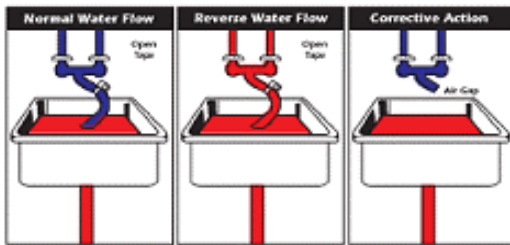
Example of Cross Connections

Backsiphonage



Backsiphonage

Backpressure



Lecture 1: Key Issues in Water Distribution System

Low Pressure

- Low pressure frequently encountered in areas distant from Tube wells

Lecture 1: Key Issues in Water Distribution System

Pipe Network

29

- Water Supply Pipes used by Five WASAs include:
 - Asbestos Cement (AC)
 - Ductile Iron (DI)
 - Galvanized Iron (GI)
 - Polyvinyl Chloride (PVC)
 - High Density Polyethylene (HDPE)
 - Cast Iron (CI)
 - Mild Steel (MS)

Lecture 1: Key Issues in Water Distribution System

Pipe Network...Contd

30

- AC pipes are laid more than 90% in all WASA's
- Corrosion of pipelines and leakages
- Reduction in carrying capacity and inability to sustain high pressures
- Low pressure at user end due to leakages

Lecture 1: Key Issues in Water Distribution System

Network Aging

31

Sr. No.	Pipe Material	Age
1	Ductile Iron (DI)	70 Years
2	Mild Steel (MS)	60 Years
3	Cast Iron (CI)	50 Years
4	Galvanized Iron (GI)	50 Years
5	Poly Vinyl Chloride (PVC)	40 Years
6	Asbestos Cement Pipes	40 Years

Lecture 1: Key Issues in Water Distribution System

Water Quality

32

- Water quality is main issue confronting all WASA's
- Sources of water in Multan Gujranwala and Rawalpindi are low in viruses and bacteria
- Presence of High levels of Arsenic in water sources of WASA Lahore and Faisalabad
- Water of Faisalabad not fit for drinking due to presence of salts in water



Arsenic Diseases in Children

Lecture 1: Key Issues in Water Distribution System

Water Quality Analysis Results of Five WASAs (Year 2016-17)

33

Sr. No.	Water Quality Parameter	WHO Permissible Guideline Value	Water Quality Analysis Results				
			WASA LHR	WASA FSD	WASA GRW	WASA RWP	WASA MUL
1	Appearance	Clear	Clear	Clear	Clear	Clear	Clear
2	Temperature	-	-	-	25 °C	18	NA
3	Turbidity	5 NTU	0.76	0	0.51	2.5	Unobjectionable

Lecture 1: Key Issues in Water Distribution System

Water Quality Analysis Results of Five WASAs (Year 2016-17)

34

Sr. No.	Water Quality Parameter	WHO Permissible Guideline Value	Water Quality Analysis Results				
			LHR	FSD	GRW	RWP	MUL
4	pH	6.5-8.5	8.1	7.55	7.1	7.15	6.52
5	Alkalinity (mg/l)	500	160		50	200	110
6	Hardness asCaCO ₃ (mg/l)	500	136	182	50	175	140

Lecture 1: Key Issues in Water Distribution System

Water Quality Analysis Results of Five WASAs (Year 2016-17)

35

Sr. No.	Water Quality Parameter	WHO Permissible Guideline Value	Water Quality Analysis Results				
			LHR	FSD	GRW	RWP	MUL
7	Electrical Conductivity (uS/cm)	2000	453	432	204	865	710
8	Calcium (mg/l)	200	37.6	32	32	61	45
9	Total Dissolved Solids (TDS) (mg/l)	1000	285.3	250	143	604	345

Lecture 1: Key Issues in Water Distribution System

Water Quality Analysis Results of Five WASAs (Year 2016-17)

36

Sr. No	Water Quality Parameter	WHO Permissible Guideline Value	Water Quality Analysis Results				
			LHR	FSD	GRW	RWP	MUL
10	Chlorides (mg/l)	200	37	10	52	10	130
11	Fluoride (mg/l)	< 1.5	NA	NA	0.06	NA	NA
12	Arsenic (mg/l)	0.01	49.2	6.34	0.01	-	Nil
13	Fecal Coliform	Nil/100 ml	Nil	Nil	Nil	Nil	Nil

Lecture 1: Key Issues in Water Distribution System

Lack of Records

37

- Almost all WASA`s field offices lack in record keeping related to operational and maintenance data , Updation of Distribution Maps
- Good record keeping is vital to operate the system efficiently

Lecture 1: Key Issues in Water Distribution System

Inadequate Operation and Maintenance

38

- Adequate O&M is necessary to run the system efficiently
- Need of Routine as well as Preventive maintenance are tools for successful O&M
- Training of WASA staff
- Need of best O&M practices

Lecture 1: Key Issues in Water Distribution System

Financial Constraints

39

- Financial Constraints being faced by all WASA's
 - Expenditures are more than the collected revenue per annum
 - More spendings on power cost (about 70% in all WASAs) due to pumping of water through tube wells
 - Increase in tariff is required as per actual consumption, however, on an affordability cost of consumers

Lecture 1: Key Issues in Water Distribution System

Contact

39

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Components of Water Supply System

Zia Mustafa (Water Specialist)

Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Introduction
- Components of Water Distribution System

Introduction

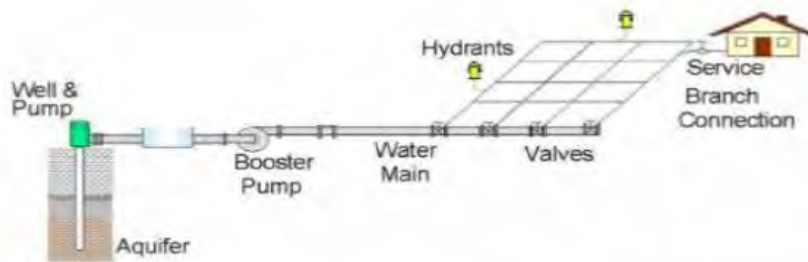
“Water supply system is used to supply water from source to the consumers through different components.”

Purpose

- To deliver water to consumers with adequate quantity and quality

Introduction...contd.

Water Supply System Using a Ground Water Source (Direct Pumping)

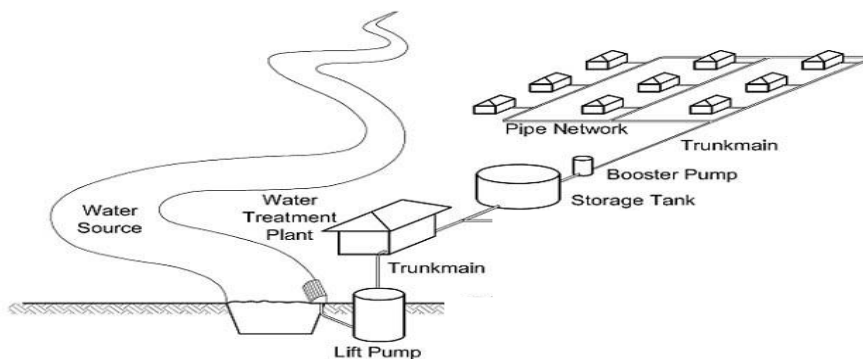


Lecture 2: Components of Water Supply System

5

Introduction...contd.

Water Supply System Using a Surface Water Source

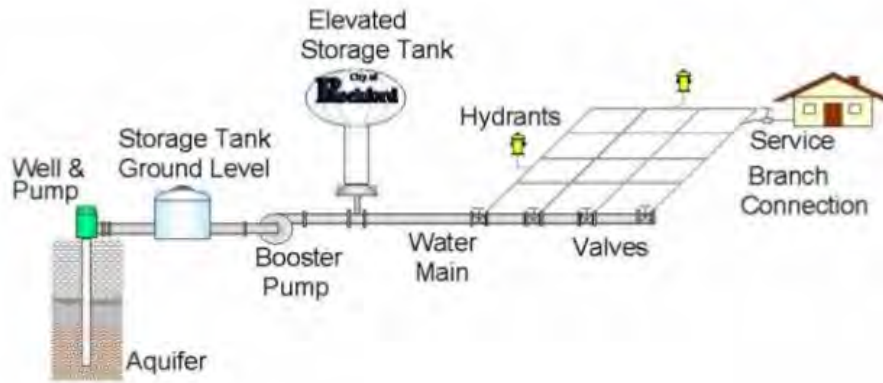


Lecture 2: Components of Water Supply System

6

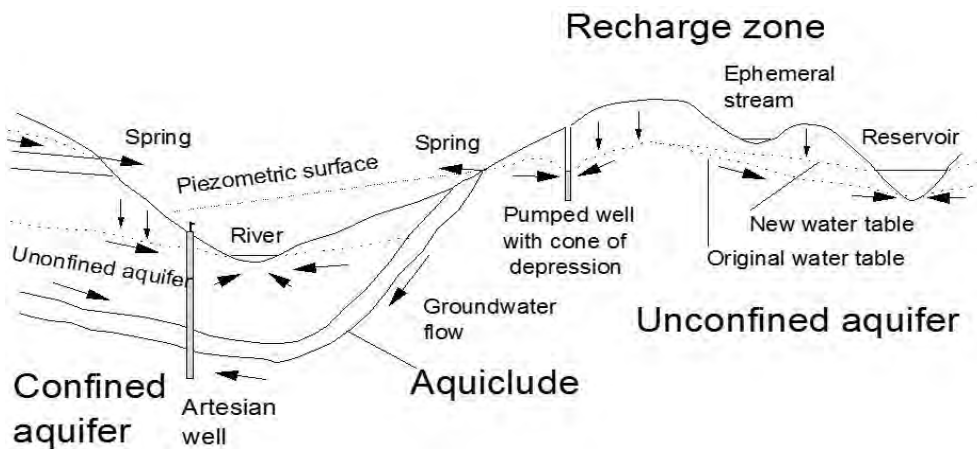
Introduction...contd.

Water Supply System Using a Ground Water Source and Over Head Reservoir



Lecture 2: Components of Water Supply System

Groundwater Movement



Lecture 2: Components of Water Supply System

Components of Water Supply System

Major components of Water Supply System are as under:

- Water Source (River/ Tube wells)
- **Intake Facilities**
- **Water Purification Plant**
- Water Supply Pipelines
- Control Valves (Gate/Sluice valves, Air valves, Drain valves etc)
- Over Head Reservoirs
- Fire Hydrants



Lecture 2: Components of Water Supply System

9

Water Sources

Surface Water

- Streams
- Lakes
- Rivers
- Impoundments

Ground Water

- Tube wells



Lecture 2: Components of Water Supply System

10

Tube Well

A water well used to draw groundwater to supply onward to consumers

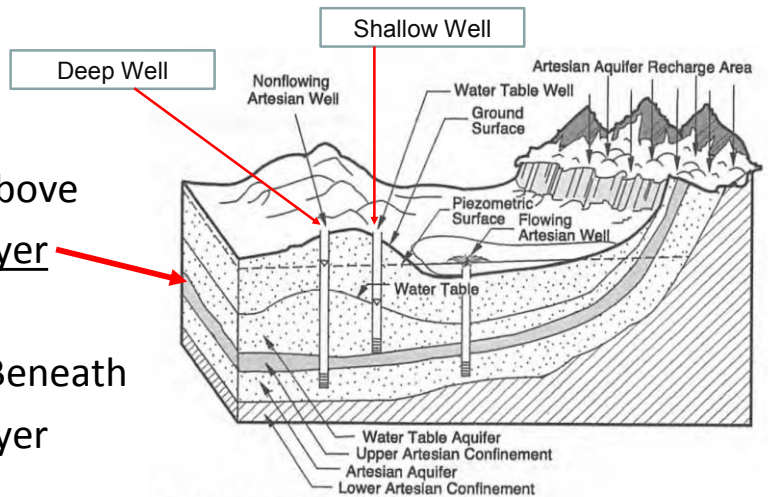
Types of Well

- **Shallow Well**

Pumping up water above the Impermeable Layer

- **Deep Well**

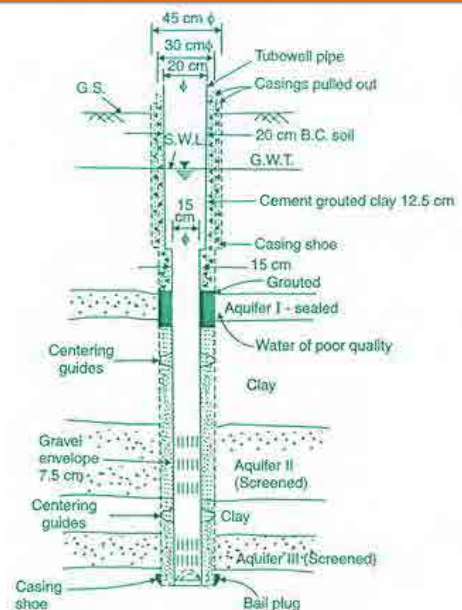
Pumping up water Beneath the Impermeable Layer



Tube Well...Contd.

Components of Tube well include:

- Housing Pipe/Casing Pipe
- Strainer/Screen Pipe
- Blind Pipe
- Bail Plug
- Vertical Turbine Pump



Tube Well....Contd.

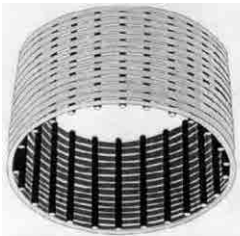
Housing Pipe

Housing Pipe is used to maintain an open access in the earth and to prevent any entrance of surrounding formations

Strainer/Screen Pipe

Strainer is used to keep sand and gravel out of well while allowing groundwater and water from formations to enter into the well

Strainer / Screen Pipe



Well Screens



Tube Well....Contd.

Blind Pipe

Blind pipe is a Plain pipe with no slots which is fixed against an impervious strata

Bail Plug

Bail Plug is provided at the bottom of pipe and strainer assembly

Tube Well....Contd.

Gravel Pack

Gravel is placed around the outside of the screen to prevent sand from entering into the well and to stabilize the well assembly

Vertical Turbine Pump

Vertical turbine pump comprises a shaft rotated by a motor on the surface. The shaft turns the impellers within the pump housing while the water moves up the column

Water Supply Pipelines

Transmission mains

- convey water from the source after treatment to the storage reservoir for onward transmission to distribution system
- larger in diameters

Distribution mains

- deliver water to individual consumer service lines and provide water for fire protection through fire hydrants, if applicable

Water Supply Pipelines

- Pipes used in Water Supply
 - Asbestos Cement (AC)
 - Ductile Iron (DI)
 - Cast Iron (CI)
 - Galvanized Iron (GI)
 - Polyvinyl Chloride (PVC)
 - Unplasticized Poly Vinyl Chloride (UPVC)
 - High Density Poly Ethylene (HDPE)

Water Supply Pipelines

- **Selection Criteria**

Soil type , Roughness coefficient, Ability to resist corrosion, Installation & maintenance cost, Ability to withstand desired pressure etc.)

- **Pipe Maintenance** (repairing leaks and breaks, flushing, disinfecting and relining)

Valves

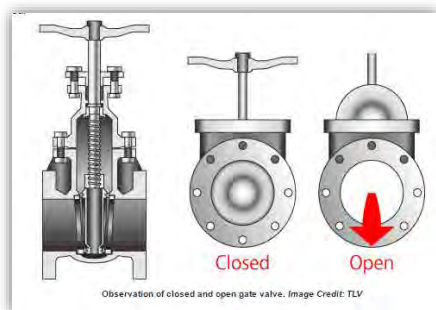
Valves are used to:

- ✓ To shut off or turn on water supply
- ✓ To regulate the flow & pressure
- ✓ To prevent backflow
- ✓ To provide air relief
- ✓ To drain out the sediments accumulated from mains

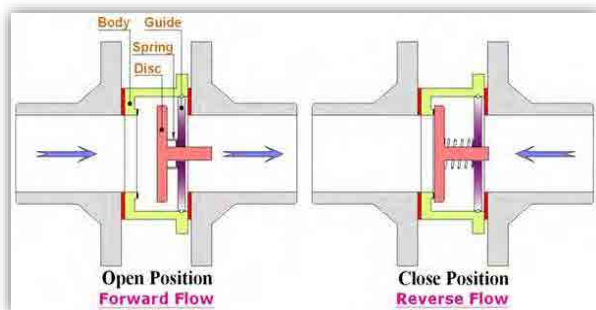
Valves

- **Type of Valves** (Gate/slucice Valves, Air relief valves, butterfly Valves, shut off valves , altitude valves, Non Return Valve etc.)
- **Valve Maintenance** (Inspecting valves stem and nut, checking valve condition)

Valves

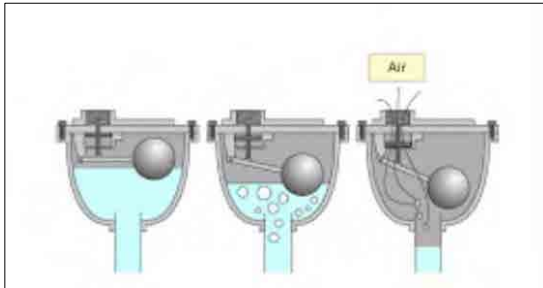


Gate Valve

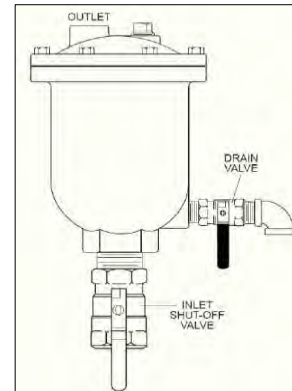


Non Return Valve

Valves



Air Release Valve



Drain/ Scour Valve

Fire Hydrants

Fire Hydrants are used for fire fighting purpose and are provided on distribution main or sub main to tap water for its use during fire

Types Of Fire Hydrants

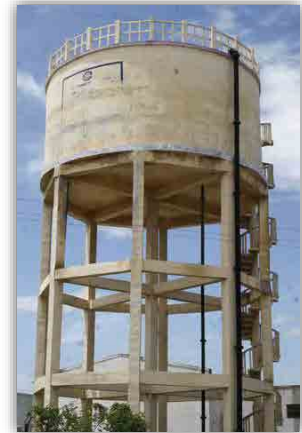
- Post Type Fire Hydrants
- Flush Fire Hydrants



Overhead Reservoirs

Overhead reservoirs are used for the following purposes:

- To balance supply and demand
- To supply water during emergencies (such as during fires)
- to help in absorbing the hourly fluctuations in the normal water demand



Overhead Reservoirs

Components of Overhead Reservoirs include:

- Inlet pipe (for entry of water in the reservoir)
- Outlet pipe (connected to the distribution mains)
- Overflow Pipes (discharging extra water into drain gutters)
- Air Vents (for fresh air circulation)
- Manholes (for providing entry into the overhead tank for inspection purposes)
- Ladder (to reach bottom of the reservoir)

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Arrangement of Water Distribution System

Zia Mustafa (Water Specialist)

Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Types of Water Supply Facilities Arrangement
- Surface Water Treatment Alternative
- Types of Distribution Networks
- Valves and Fire hydrants
- Water Pressure Requirement

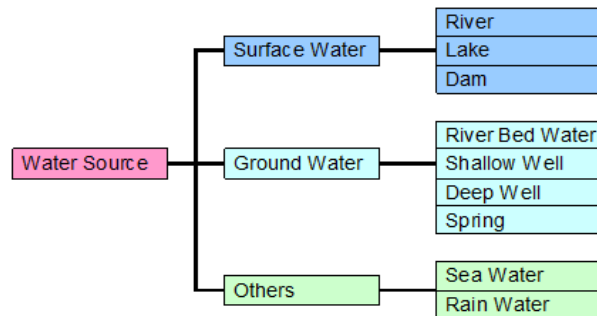
Types of Water Supply Facilities Arrangement

Planning and Design of a water supply system depends on the following:

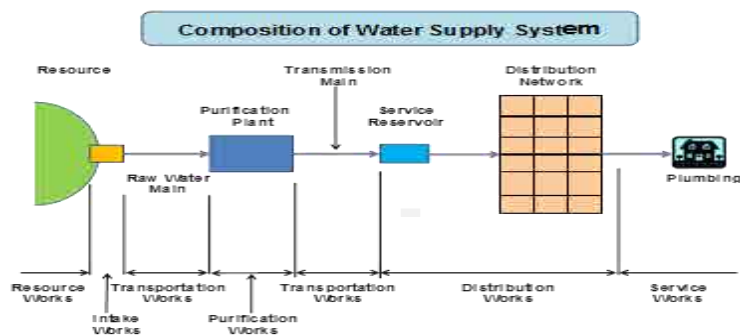
- Source of water
- Transmission of water to overhead Reservoir
- Distribution through distribution pipelines

Types of Water Supply Facilities ArrangementContd.

- Detail of sources of water are as under:



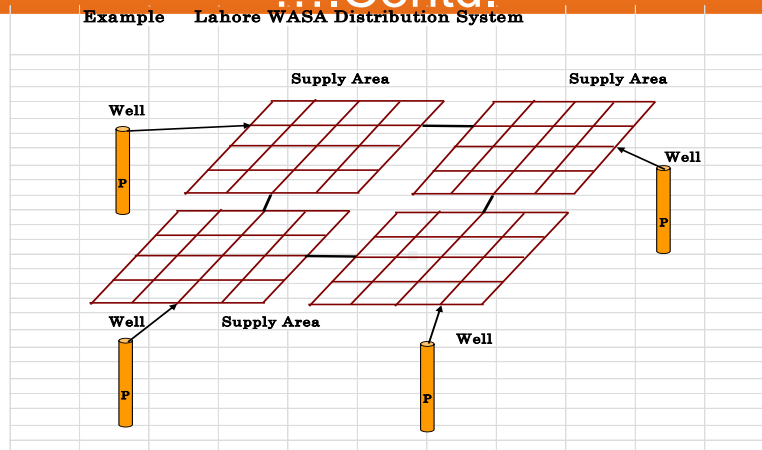
Types of Water Supply Facilities ArrangementContd.



(Layout of Water Distribution System based on Surface Water Source)

Types of Water Supply Facilities Arrangement

Contd.



(Layout of Water Distribution System based on Groundwater)

Lecture 2: Arrangement of Water Distribution System

7

Surface Water Treatment Alternative

- Decline of Ground Water on increased levels across all Five WASAs to meet future demand of population
- More water quality concerns in Five WASAs leading to surface water treatment alternative
- Improvement in service delivery by utility service providers

Lecture 2: Arrangement of Water Distribution System

8

Types of Distribution Network

“Networks are a system of pipes and valves providing the appropriate quality and quantity of water to a community.”

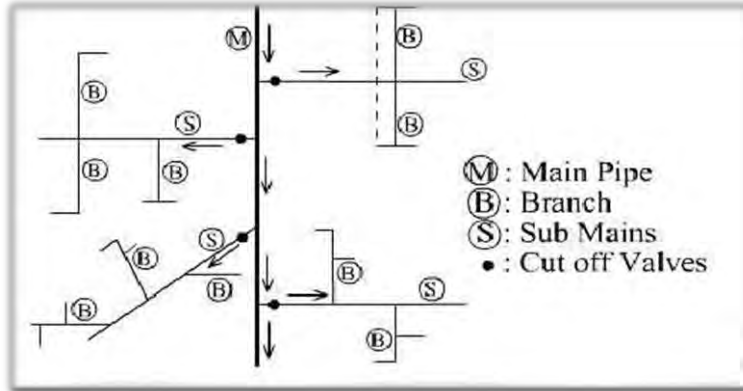
Three ways in which distribution systems are laid include:

- Dead End or Tree System
- Grid System
- Radial System

Selection Criteria for a Distribution Network

- Water quality should be maintained throughout the network
- System capability to supply water to all intended places with sufficient pressure head
- No consumer should be without water supply, during the repair of any section of the system
- Watertight to keep losses to a minimum (e.g. due to leakages)

Dead End or Tree System



one main pipeline runs through the center of the populated area and sub-mains branch off from both sides

Lecture 2: Arrangement of Water Distribution System

11

Dead End or Tree System

Advantages:

- ✓ Simple pipe laying
- ✓ Less cut off valves are required
- ✓ Low O&M cost

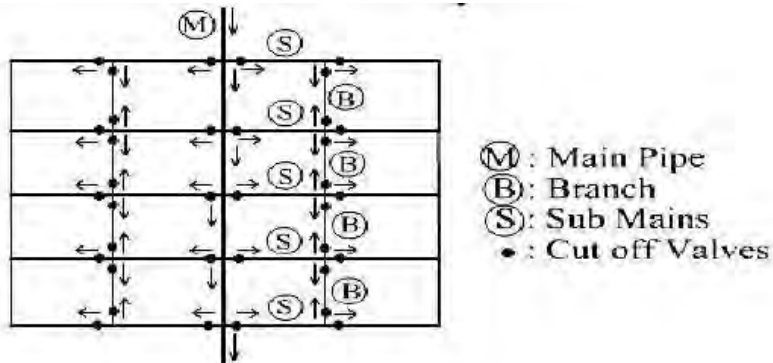
Disadvantages:

- ✓ Low pressure in remote points
- ✓ Interruption of supply in case of main failure
- ✓ Sedimentation and bacterial growth at dead ends
- ✓ Scour valves required at dead ends

Lecture 2: Arrangement of Water Distribution System

12

Grid Iron System



Main supply line runs through the center of the area and sub mains branch off in perpendicular directions
All of the pipes are interconnected and there are no dead ends

Grid Iron System

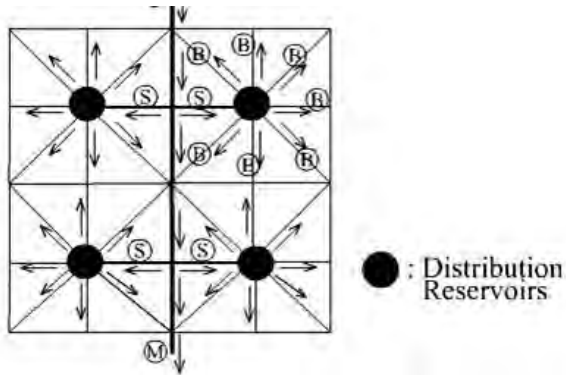
Advantages:

- ✓ Minimal chance of stagnation
- ✓ No sedimentation
- ✓ Repairs require small area to be interrupted

Disadvantages:

- ✓ Greater cost of pipe laying
- ✓ Large number of cutoff valves required
- ✓ Longer pipe lengths with larger diameter

Radial System



Area is divided into distribution districts
Each District has a centrally located distribution *reservoir* (elevated)

Valves and Hydrants

- Provision of shut off valves at frequent intervals in water distribution system
- Provision of Fire Hydrant at frequent intervals to meet emergencies due to fire

Water Pressure Requirement

- Minimum Residual Pressure required in Water Distribution System 14m
- Development of pressure zones in areas with varying elevations

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Pipe Materials

Zia Mustafa (Water Specialist)

Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Selection Criteria for Pipes
- Types of Pipes used in Water Supply System
- Factors affecting installation cost

Selection Criteria for Pipes

1. Corrosion Resistance

- External & internal Corrosion

2. Roughness Coefficient

- Smoothness of internal pipe surface

3. Soil Condition

- Loss of support (bedding)

4. Overall Cost

- Capital Cost
- O&M cost



Types of Pipes Used in Water Supply

- Cast Iron (CI) Pipes
- Ductile Iron (DI) Pipes
- Asbestos Cement (AC) Pipes
- Steel Pipes
- Galvanized Iron (GI) Pipes
- Reinforced Cement Concrete (RCC) Pipes
- PVC (Polyvinyl Chloride) Pipes
- UPVC (Unplasticized Polyvinyl Chloride) Pipes
- HDPE (High Density Polyethylene) Pipes

Lecture 2: Pipe Materials

5

Cast Iron Pipes

Advantages

- Withstand high pressures
- Inexpensive
- Durable
- Leak detection straightforward
- Easy to install

Disadvantages

- Heavy & brittle
- Difficult to transport
- Corrodes in soft water
- Metallic taste due to iron leaching



Lecture 2: Pipe Materials

6

Ductile Iron Pipes

Advantages

- High strength for supporting earth loads
- Lighter than Cast iron
- Less Brittle than CI
- Easy jointing

Disadvantages

- May require wrapping or cathodic protection in corrosive soils or water
- Thrust blocks needed



Asbestos Cement Pipes

Advantages

- Rigid
- High tensile strength
- Easily tapped, cut
- Low friction to water flow
- Corrosion resistant to most soils and water

Disadvantages

- Can release asbestos fibers under corrosive conditions
- Easy breakage when bent
- Difficult to locate



Steel Pipes

Advantages

- High strength for supporting earth loads
- High in cost
- Easy handling & transport

Disadvantages

- Poor corrosion resistance



Lecture 2: Pipe Materials

9

Galvanized Iron Pipes

Advantages

- Low initial cost
- Toughness
- Long life
- Easy inspection
- Fast assembly

Disadvantages

- Contain lead and Corrode easily
- Deposits buildup causing blockages



Lecture 2: Pipe Materials

10

Reinforced Concrete Pipes

Advantages

- Durable
- Easy installation

Disadvantages

- Gravity flow pipe



Lecture 2: Pipe Materials

11

Polyvinyl Chloride (PVC) Pipes

Advantages

- Inert and Resists corrosion
- Doesn't support combustion
- Cheap
- Easy to install
- Smooth interior surface
- Very low frictional losses

Disadvantages

- Very brittle (break or crack easily)
- Less flame resistant
- At higher temperature their strength reduces



Lecture 2: Pipe Materials

12

Unplasticized Polyvinyl Chloride (UPVC) Pipes

Advantages

- Good corrosion resistance
- Light weight
- Ease of jointing
- Low cost
- Smooth internal surface

Disadvantages

- Susceptible to impact damage
- Degradation by certain organic compounds
- Susceptible to poor installation practice



Lecture 2: Pipe Materials

13

HDPE Pipes

Advantages

- Flexible
- Easily transported because can be rolled
- Used in trenchless installations
- Lightweight
- Resistant to cracking

Disadvantages

- Fusion jointing require skilled installer & special equipment
- Not suitable for large diameters



Lecture 2: Pipe Materials

14

Factors Affecting Installation Costs

- ✓ **Weight of the pipe:**

A pipe that is lightweight can be handled easier and faster

- ✓ **Ease of assembling:**

Push-on joints can be assembled much faster than bolted joints

- ✓ **Pipe strength:**

If one type of pipe requires special bedding to withstand external pressures while another pipe does not, the choice can impact installation costs significantly

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Valves in Water Supply System

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Valves in Water Supply System
- Types of Valves
- Maintenance of Valves

Valves in Water Supply System

Valves are used to:

- ✓ To isolate flow
- ✓ To regulate the flow & pressure
- ✓ To prevent backflow
- ✓ To drain out the sediments accumulated from mains

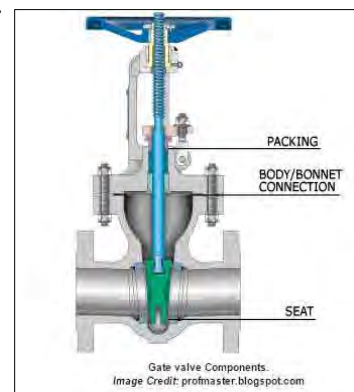


Types of Valves

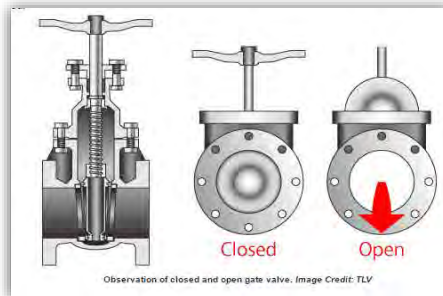
- Gate Valve/Butterfly Valve
- Air Release Valves
- Drain Valve/ Wash Outs
- Altitude Valves
- Pressure Relief Valves
- Check Valves/ Non return valve

Gate Valve /Butterfly Valve

- Gate valves are used to isolate sections of the distribution system to permit emergency repairs without interrupting service to large numbers of customers
- Components of gate valves include:
 - Body
 - Bonnet
 - Trim



Gate Valve/Butterfly Valve



- A sliding flat metal disc is moved at right angles to the direction of flow by a screw operated stem
- Provides very little resistance to flow when it is opened

Lecture 2: Valves

7

Butterfly Valves

- Mainly installed in lines 300mm and above in diameter
- Used for isolating the water supply lines for repair purpose

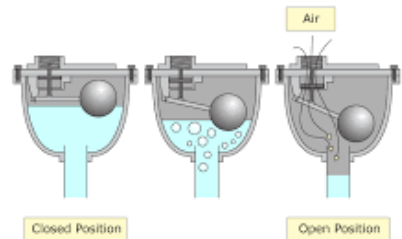


Lecture 2: Valves

8

Air Release Valves

- Air valves are used to remove air accumulated in pipe
- Provided at summit points
- Float drops off and air is released

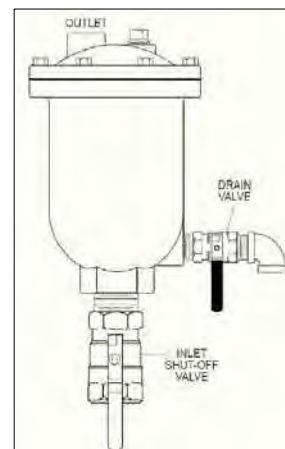


Lecture 2: Valves

9

Drain Valves/ Washouts

- Allow sediment to be flushed out and to enable the pipeline to be drained for maintenance and repair work

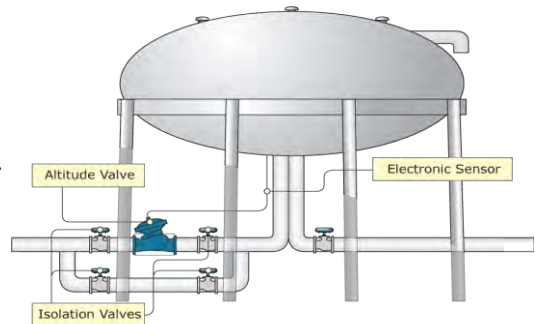


Lecture 2: Valves

10

Altitude Valves

- Normally installed at rising mains
- To prevent overflow of overhead reservoirs
- closes at a preset maximum water level to prevent overflow of reservoir and opens to refill when the water level in the tank or reservoir lowers

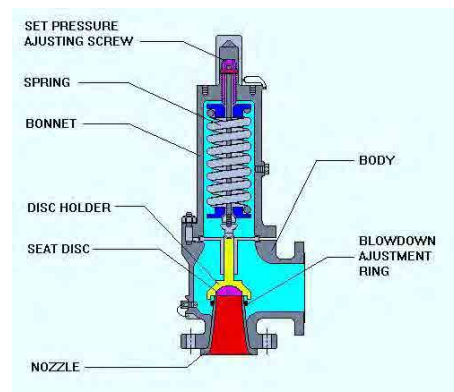


Lecture 2: Valves

11

Pressure Relief Valve

- Also known as safety valves
- Used to release high pressures in system to prevent damage

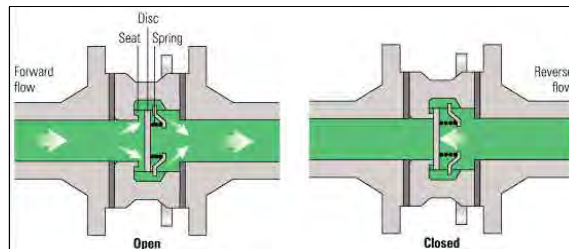


Lecture 2: Valves

12

Check Valve/ Non-return valve

- Used for unidirectional flow



Lecture 2: Valves

13

Maintenance of Valves

Components of a Valve Maintenance Program:

- ✓ An updated system map
- ✓ Documentation for each valve
- ✓ Record of maintenance work
- ✓ Sample Valve Operation Worksheet
- ✓ A schedule for routine maintenance



Lecture 2: Valves

14

Maintenance of Valves

Components of a Routine Valve Inspection:

- Verify accuracy of location of valve boxes on map
- Updation of map when necessary
- Remove valve box cover
- Inspect stem and nut for damage or obvious leakage
- Close the valve fully

Maintenance of Valves

- Record condition of valve (any maintenance required)
- Replace a valve if it does not completely open or close
- Clean the valve box cover seat
- Place the valve in its operating position (open or closed) when inspection is complete.

Valve Exercising

Valve exercising must be done for flushing dead end lines at least quarterly

Following information must be collected:

1	Unique Valve identification number
2	Visibility and proper elevation
3	Accessibility
4	Location and GPS coordinates
5	Manufacturer
6.	Size and Style of Valve
7.	Number or turns and direction for opening
8.	Check for leakage with detection equipment
9.	Condition of valve
10	Age of valve in system

Lecture 2: Valves

17

Valve Operation Worksheet

Date	Valve No.	Location	Size	# of Turns	Direction of Closing	Remarks/ Maintenance/ Deficiencies

Lecture 2: Valves

18

Contact

**Zia Mustafa
Water Specialist**



Assignment 1

Critical Report on Major Issues of Five WASA`s

Guidelines for Preparing Assignment



- List down main issues faced by the water utility (Respective WASA).
- Prioritize the issues
- What are the factors that are contributing towards these issues
- How to rectify or improve the current WASA`s Situation in your opinion



O&M of Tube Well and Pump Facility (W1221)
O&M of Water Distribution System (Module 1)
Operational Action Plan for Water Supply System

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Operation of Water Supply System
- Why Operational Action Plan Needed?
- Features of Water Supply Operational Action Plan
- Operational Action Plan for Water Supply System

Operation of Water Supply System

Operation of Water Supply System refers to daily operations of various components of Water Supply System such as Pipelines, Valves, Overhead Reservoirs, Fire Hydrants, Equipment etc. to deliver reliable and safe Supply of Water to Consumers with adequate Pressure

Why Operational Action Plan Needed?

- To deliver adequate Supply of Water to Consumers without interruption
- To ensure Safe Water requirement without any contamination to Consumers
- To know about System Component Failure (Pumps, Chlorinators, Valves, Meters etc.)
- To find causes of main breaks in Water Distribution System

Features of a Water Supply Operational Plan

Generally, Water Supply Operational Action Plan Comprises of the following:

- Prevailing operational issues in the system
- Possible causes
- Control measures in the form of Checklists
- Key Responsibilities

Operational Action Plan for Water Supply System

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
1	Non availability of updated Water Supply Maps	<ul style="list-style-type: none"> Lack of GIS Mapping 	<ul style="list-style-type: none"> Update water supply Maps with <ul style="list-style-type: none"> - Clear description of pipe diameter - Location of valves Ensure availability of updated Maps at respective WASA sub division offices 	Sub Divisional Officer (SDO), Supervisor
2	Taste and Odor in water	<ul style="list-style-type: none"> High Chlorine Residual Presence of salts in water 	<ul style="list-style-type: none"> Lower Chlorine Dose Apply routine flushing of supply lines or appropriate treatment method 	Sub Divisional Officer (SDO), Supervisor and Operator

Lecture 2: Operational Action Plan

7

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
3	Turbidity	<ul style="list-style-type: none"> Due to presence of Silt or Clay in water (suspended solids) 	<ul style="list-style-type: none"> Apply flushing of pipelines and appropriate treatment Method 	Sub Divisional Officer (SDO), Supervisor
4	Presence of Coliforms or Bacteria	<ul style="list-style-type: none"> Water contaminated due to inadequate chlorine Ingress of contamination transmitted from sewer line in vicinity of water supply line due to cross connections 	<ul style="list-style-type: none"> Increase chlorine dose as per requirement of WHO Guidelines 	Sub Divisional Officer (SDO), Supervisor and Operator

Lecture 2: Operational Action Plan

8

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
5	Loss of Residual Chlorine	<ul style="list-style-type: none"> Inadequate quantity of Chlorine Solution (Sodium Hypochlorite) injected Some operational problems linked with chlorine feed pump to supply chlorine in main line at tube well 	<ul style="list-style-type: none"> Inspect Chlorine solution tanks on regular basis at tube well Check condition of chlorine feed pump to deliver required amount of chlorine solution tank 	Supervisor and Operator
6	Cross Connection	<ul style="list-style-type: none"> Ingress of contamination from sewer line to water supply lines due to cracks in pipelines during periods of no supply 	<ul style="list-style-type: none"> Proper horizontal and Vertical Clearance between water supply and sewer/drain pipe need to be provided 	Sub Divisional Officer (SDO), Supervisor and Operator

Lecture 2: Operational Action Plan

9

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
7	Pipeline Leakages	<ul style="list-style-type: none"> Corrosion, old aged pipes Absence of leak detection equipment for buried pipe line leakages 	<ul style="list-style-type: none"> Repair Pipelines leakages Ensure Gradual replacement of old aged pipes in the network Conduct Water Audit on regular basis 	Supervisor and Operator
8	Leakages from Valves	<ul style="list-style-type: none"> Corrosion of Valves Worn packing material Improper closure of valves 	<ul style="list-style-type: none"> Ensure Periodic Inspection of valve chambers Lubricate gland bolts Replace cover/bonnet gasket after certain duration Ensure periodic cleaning of Valve Chambers 	Supervisor and Operator

Lecture 2: Operational Action Plan

10

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
9	Leakages through Reservoirs	<ul style="list-style-type: none"> Leakage from cracks in reservoirs Internal corrosion of connected piping (inlet, outlet, overflow, bypass pipe) Improper closure of valves 	<ul style="list-style-type: none"> Inspect the reservoir on regular intervals from inside and outside Inspection of connecting pipes and valves on regular basis Monitor water levels in Reservoirs on regular basis 	Supervisor and Operator
10	House Connection Leakages	<ul style="list-style-type: none"> Corroded and sub standard material used for plumbing Poor plumbing practices 	<ul style="list-style-type: none"> Ensure Polyethylene Pipe for House Connection Ensure provision of meters at consumer end Ensure standard pipe material for House connection 	Supervisor and Operator

Lecture 2: Operational Action Plan

11

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
			<ul style="list-style-type: none"> Replace Mild Steel Clamps in the Consumer Connections by Polyethylene or PPR saddles and use S/S bolts instead of ordinary MS bolts 	
11	Water loss	<ul style="list-style-type: none"> Old and deteriorating pipe network Illegal connections 	<ul style="list-style-type: none"> All connections (domestic and commercial) need to be metered 	SDO, Supervisor and Operator
12	Defective Meters	<ul style="list-style-type: none"> Repair Problems Rotation of meters due to pressurized air and starting of supply on intermittent basis 	<ul style="list-style-type: none"> Replace defective meters with new meters 	SDO, Supervisor and Operator

Lecture 2: Operational Action Plan

12

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
13	Improper Metering	<ul style="list-style-type: none"> Majority connections are unmetered Faulty Meters 	<ul style="list-style-type: none"> Ensure metering system at consumers end Ensure routine repair of meters 	Executive Engineer, SDO, Supervisor and Operator
14	Low Pressure	<ul style="list-style-type: none"> Under Capacity pipes present in the system, distant from tube well Corrosion of pipelines 	<ul style="list-style-type: none"> Control buried pipeline leakages Replace under capacity pipes with increased sizes as per water demand of the area 	SDO, Supervisor and Operator

Lecture 2: Operational Action Plan

13

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
		<ul style="list-style-type: none"> leakages in supply lines Valve in system partially closed 	<ul style="list-style-type: none"> Replace gradually old aged pipes in the network Inspect the valve chamber condition in service areas to identify leakages 	
15	Lack of recording Water abstraction at source and consumption by community	<ul style="list-style-type: none"> Absence or presence of faulty bulk flow meters at source (tube well) Absence of consumer meters 	<ul style="list-style-type: none"> Provide Bulk Flow meters at sources for recording the flow Ensure hundred percent consumers metering in the system 	SDO, Supervisor and Operator

Lecture 2: Operational Action Plan

14

Operational Action Plan for Water Supply System ...Contd.

Sr. No	Problem	Possible Cause	Mitigation Measure	Key Responsibility
16	Lack of Monitoring of Pressure at source and in distribution system	<ul style="list-style-type: none">Absence of pressure gauges at various tube wellsFaulty Pressure gauges	<ul style="list-style-type: none">Ensure presence of pressure gauges at all WASA tube wellsMake repair of faulty pressure gauges on priority basis	SDO, Supervisor and Operator

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)
O&M of Water Distribution System (Module 1)
Maintenance Action Plan for Water Supply System

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Introduction
- Types of Maintenance
- Requirements for Preventive Maintenance
- Required Preventive Maintenance Activities in Five WASA`s
- Repair Action Plan For Water Supply System
- Availability of tools

Introduction

“Maintenance refers to contain all the system components (supply pipes, valves, equipment etc.) in a good optimum working order by repair and maintenance”

Types of Maintenance

- Routine Maintenance
- Preventive Maintenance



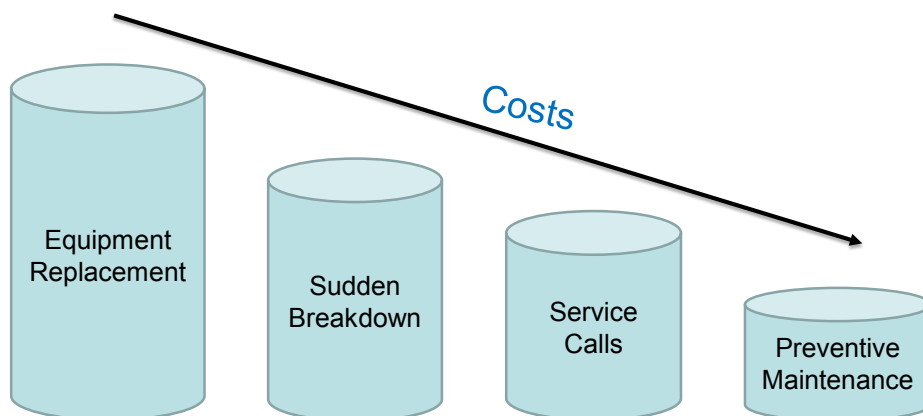
Routine Maintenance

- Routine Maintenance refers to accomplish repair and replacement of parts of the system (Pipes, Valves, Fittings etc.) when damaged or leakages becomes evident from them
- Required to run the system efficiently

Preventive Maintenance

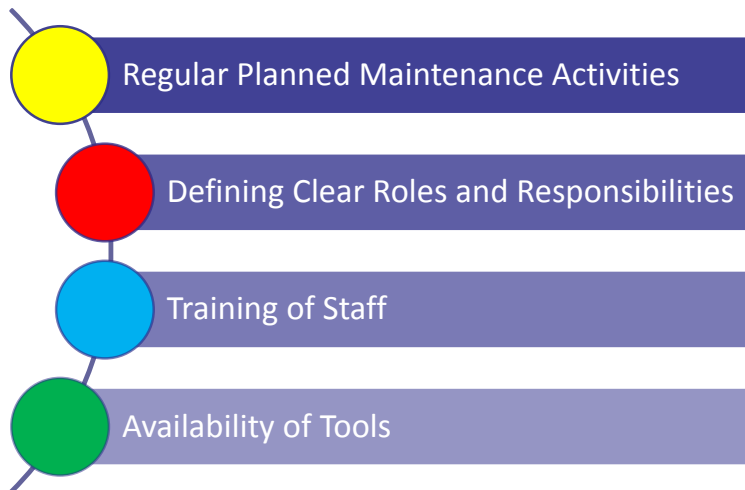
Preventive Maintenance Includes planned activities for maintenance of the system (Pumps, Valves, Flushing of Pipelines etc.) to Prevent their failure at much earlier stage of their design life

Preventive Maintenance



The best way to deal with a Problem is to Prevent it !!

Requirements of Preventive Maintenance Plan



Lecture 2: Maintenance Action Plan for Water Supply System

9

Required Preventive Maintenance Activities in Five WASAs

Sr. No.	Activity	Frequency of Duration	Key Responsibility
1	Flushing of Pipe Lines	Fortnightly	Supervisor and Operator
2	Patrolling of Water Supply Network (To over view Leakages)	Every Month	Supervisor and Operator
3	Water Quality Analysis	Fortnightly	Laboratory Incharge and WASA Sub Division Staff
4	Checking of Pressure in Supply Lines	Daily	Supervisor and Operator
5	Inspection of Bulk Flow Meters	Every Month	Supervisor and Operator
6	Inspection of Consumer Meters	Every Month	Supervisor and Operator
7	Reservoir Cleaning	After every 6 Months	Operators
8	Inspection of Valve Chamber	Every Month	Supervisor and Operator

Lecture 2: Maintenance Action Plan for Water Supply System

10

Repair Action Plan

Sr. No.	Problem	Possible Causes	Mitigation Measures	Key Personnel Responsibility
1	Corrosion of Pipe Line	<ul style="list-style-type: none"> • Due to completion of service life of pipe • Excess dosage of chlorine in pipeline adversely affecting material of pipe 	<ul style="list-style-type: none"> • Ensure replacement of corroded pipe portion with new pipe • Painting of pipelines if present on ground (especially walled city) • Ensure chlorine dosage as per requirement 	Supervisor and Operator

Lecture 2: Maintenance Action Plan for Water Supply System

11

Repair Action Plan

Sr. No.	Problem	Possible Causes	Mitigation Measures	Key Personnel Responsibility
2	Leakages through Pipelines	<ul style="list-style-type: none"> • External or Internal Pipe Metal Loss due to developed cracks • Faulty and corroded Joints • Aging Pipe Network 	<ul style="list-style-type: none"> • Ensure Replacement of damaged pipe portion with new one • Undertake Regular maintenance audit in service areas 	Supervisor and Operator

Lecture 2: Maintenance Action Plan for Water Supply System

12

Repair Action Plan

Sr. No.	Problem	Possible Causes	Mitigation Measures	Key Personnel Responsibility
3	Leakages of Valves (at seat, at cover/ bonnet, at gland packing)	<ul style="list-style-type: none"> Corrosion of seat Settling of Gasket as a result of temperature variations Worn packing material Poor maintenance 	<ul style="list-style-type: none"> Ensure reseating of valve disc Retighten the bolts at bonnet Retight the gland packing at nuts Check opening and closing of valve Ensure periodic inspection of valve chambers 	Supervisor and Operator

Lecture 2: Maintenance Action Plan for Water Supply System

13

Repair Action Plan

Sr. No.	Problem	Possible Causes	Mitigation Measures	Key Personnel Responsibility
4	Valves hard to operate	<ul style="list-style-type: none"> Damaged Seat Valve not fully lubricated 	<ul style="list-style-type: none"> Provide valves with proper lubrication 	Supervisor and Operator
5	Ineffective inventory control system for spare parts and supplies	<ul style="list-style-type: none"> Poor Inventory System, based on recording listing of spare parts in registers 	<ul style="list-style-type: none"> Ensure computerized system at stock yards Provide adequate inventory of maintenance items 	Supervisor and Operator

Lecture 2: Maintenance Action Plan for Water Supply System

14

Availability of Tools

A list of spares required for maintenance shall be prepared and the spares shall be procured and kept for use.

- ✓ Spare check nuts, spindle rods and bolts
- ✓ Nuts and washers for the flanged joints
- ✓ Gaskets for flanged joints for all sizes of sluice valves installed in the transmission system
- ✓ Spare manhole covers
- ✓ Consumables like the gland rope, grease, cotton waste

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Updation of Water Supply Maps

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Introduction
- Importance of Mapping
- Features of updated Water Supply Map
- Example of updated Map
- Procedure for Preparation and Updating of Maps

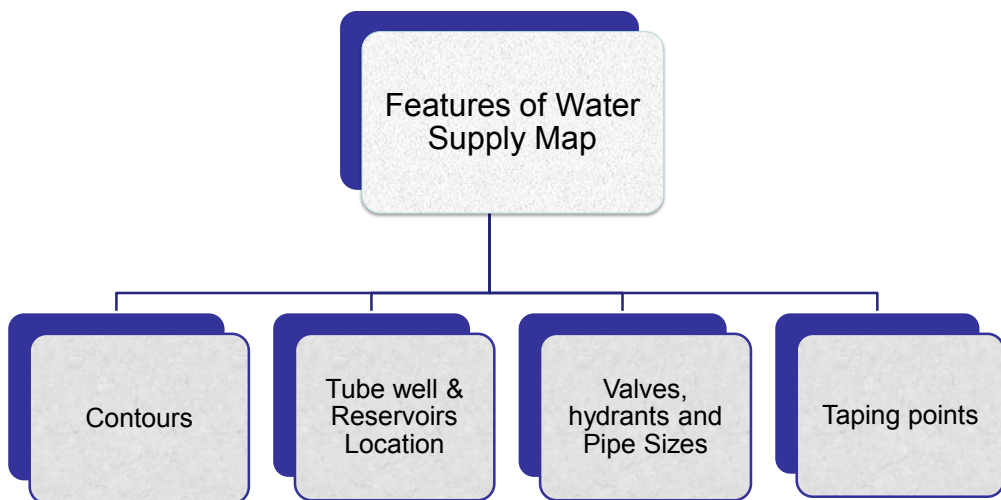
Introduction

- Updated Distribution Maps is pivotal factor for improved operations of utility service providers
- Required to contain updated water distribution system information

Importance of Mapping

- ✓ Provides a comprehensive knowledge about water distribution network
- ✓ To identify location of buried mains for repair purposes (pipe leakages, bursts)
- ✓ To locate position of valves and hydrants
- ✓ Existing maps can be used to identify areas where future installation can be made

Features of Updated Water Supply Map



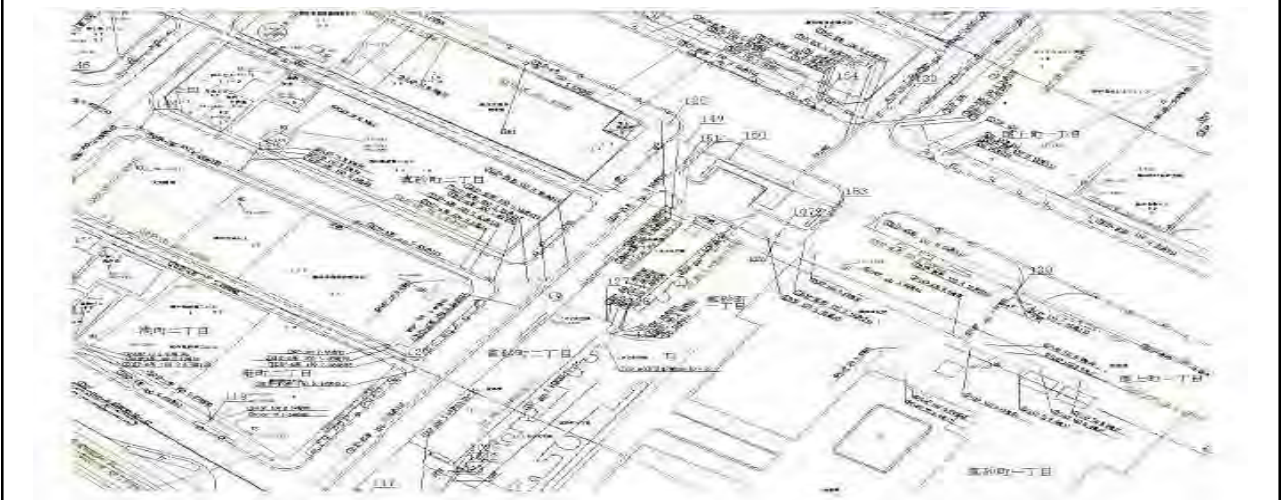
Example of Updated Map



Lecture 2: Updation of Water Supply System

7

Example of Updated Map



Lecture 2: Updation of Water Supply System

8

Procedure for Preparation and Updation of Maps

GIS Maps

Geographic Information System (GIS) is a computer program that combines mapping with detailed information on physical structures with geographic area

Procedure for Preparation and Updation of Maps

GIS Mapping

Compatible with AutoCAD Design Systems

Layers of information on a single map such as water Lines, Sewers, power Cables etc.

Number of valve chambers/manholes, pipe lengths , diameters, reservoir locations, pumping stations are indicated in the form of attributes

Helps the maintenance crew to locate place of work

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Overhead Reservoirs

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Introduction
- Present Situation of Five WASA`s in Context of Overhead Reservoir
- Shapes of Overhead Reservoirs
- Components of Overhead Reservoir
- Maintenance of Overhead Reservoir
- O&M Plan of Overhead Reservoir

Lecture 2: Overhead Reservoirs

3

Introduction

Purpose of Overhead Reservoir:

- To equalize the demand during peak hours
- To equalize operating pressure
- To provide storage for emergencies
(In case of source failure)
- Maintain desired pressure



Lecture 2: Overhead Reservoirs

4

Introduction

Equalizing Supply and Demand

- Designed for 4-6 hour supply at average demand
- During periods of low demand, OHR are refilled

Lecture 2: Overhead Reservoirs

5

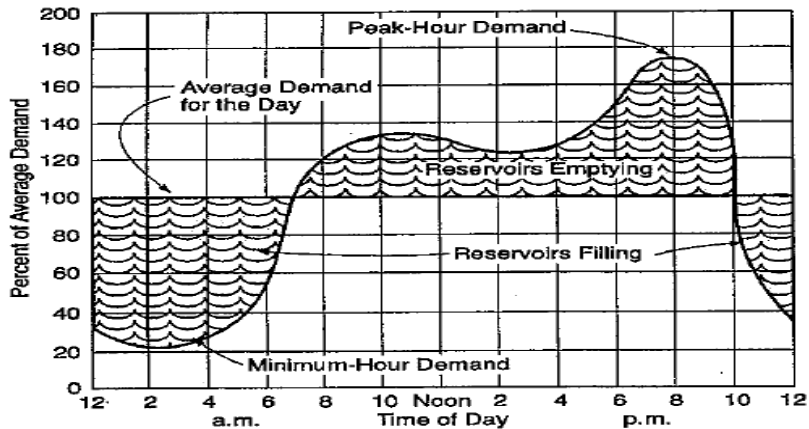
Advantages of Overhead Reservoirs

- Absorb the hourly variations in demand
- Maintain constant pressure in the distribution mains
- Water stored can be supplied during emergencies
- To facilitate carrying out repairs without interruption to the supply of water

Lecture 2: Overhead Reservoirs

6

Demand Fluctuation in a Day



(Function of distribution reservoirs with respect to demand fluctuations)

Lecture 2: Overhead Reservoirs

7

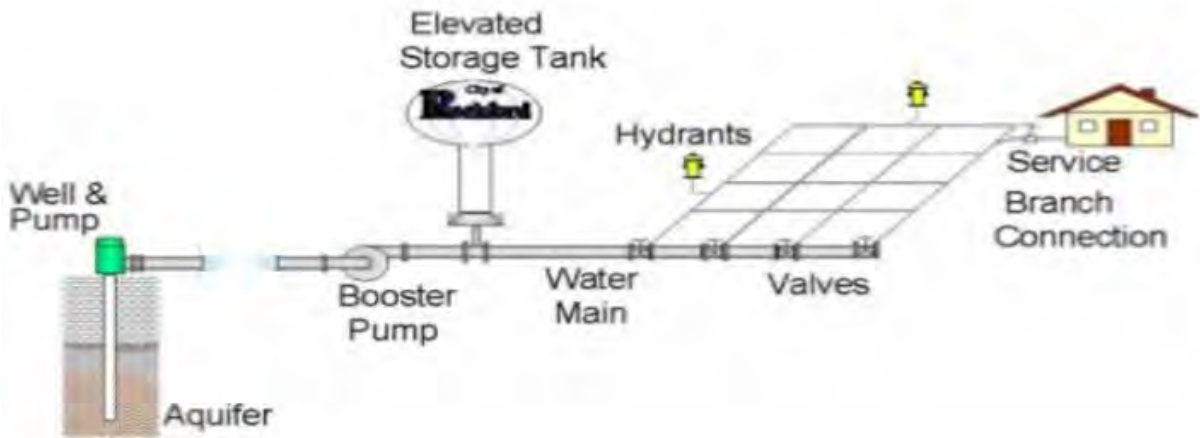
Present Situation of Five WASA's in Context of Overhead Reservoir

Sr. No	Water Supply Parameter	WASA LHR	WASA FSD	WASA MUL	WASA RWP	WASA GRW
1	Total Reservoirs	52	37	18	27	10
2	Total Capacity MG	3.16	2.2	2.35	2.77	1.58
3	In Use	1	17	-	25	8
4	Abandoned	51	20	18	2	2

Lecture 2: Overhead Reservoirs

8

Overhead Reservoir and Gravity Storage System



Lecture 2: Overhead Reservoirs

9

Shapes of Overhead Reservoirs



Intze Type



Circular Type



Rectangular Type



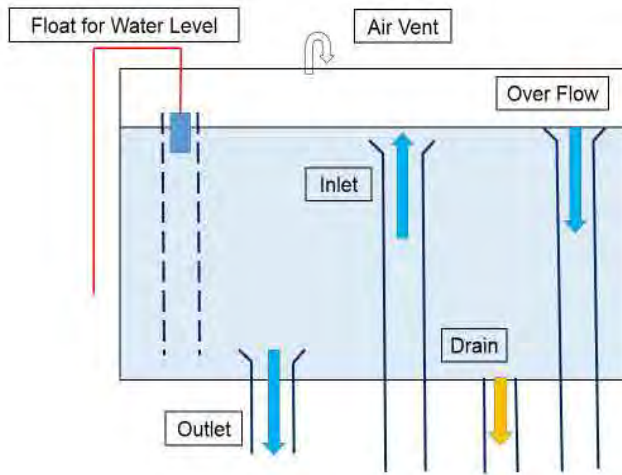
Spherical Type

Lecture 2: Overhead Reservoirs

10

Components of Overhead Reservoir

- Inlet pipe
- Outlet pipe
- Overflow Pipes
- Float for Water Level
- Air Vents
- Manhole for entry
- Ladder
- Valves



Lecture 2: Overhead Reservoirs

11

Components of Overhead Reservoir



Ladder or Stairs



Bottom of Reservoir

Inlet Pipe



Float Gauge for water level

Lecture 2: Overhead Reservoirs

12

Maintenance of Overhead Reservoirs

Following are the main maintenance activities:

- Repairing of cracks & leaks
- Proper Screening of air vents & overflow pipes
- Inspection of manhole covers
- Cleaning & inspection of internal structure
- Preventing littoral growth
- Painting of internal surface
- Replacing corroded pipes
- Inspection of valves

Lecture 2: Overhead Reservoirs

13

Cleaning of Overhead Reservoirs

- Empty the Tank
- Clean the tank with Detergent using steel wire brush
- Fill the Reservoir with water and drain the water
- Fill again the Reservoir for supplying water to consumers
- Add chlorine doze as per requirement in the Reservoir
- Reservoir Cleaning After every 6 Month

Lecture 2: Overhead Reservoirs

14

Maintenance of Reservoirs

Safety Precautions while cleaning of OHR

- Use of PPE (Gum boots, Hand Gloves, Respirators)
- Proper ventilation by opening air vents
- Guard rails provided at the top roof and around ladder
- Trained personnel



Lecture 2: Overhead Reservoirs

15

O&M Plan of Overhead Reservoir

Sr. No.	Problem	Cause	Control Measure
1	Structural failure	<ul style="list-style-type: none"> • Poor engineering design • Poor maintenance • Use of poor quality material 	<ul style="list-style-type: none"> • Improved engineering design • Apply preventive maintenance measures
2	Leakages	<ul style="list-style-type: none"> • Structural Cracks in reservoir 	<ul style="list-style-type: none"> • Monitoring of Water Level and pressure of water in storage reservoir • Relining • Inspection of Pressure gauges, flow meters and flow level indicator

Lecture 2: Overhead Reservoirs

16

O&M Plan of Overhead Reservoir...Contd.

Sr. No	Problem	Cause	Control Measure
		<ul style="list-style-type: none"> Poor lining material used for water proofing 	<ul style="list-style-type: none"> Storage tank internal cleaning and lining
		<ul style="list-style-type: none"> Aging of piping material 	<ul style="list-style-type: none"> Replacing older pipe materials
		<ul style="list-style-type: none"> Internal corrosion of connected piping (inlet, outlet, overflow, bypass pipe) 	<ul style="list-style-type: none"> Replacing older pipe materials
		<ul style="list-style-type: none"> Improper closure of valves 	<ul style="list-style-type: none"> Lubrication of valves

Lecture 2: Overhead Reservoirs

17

O&M Plan of Overhead Reservoir...Contd.

Sr. No	Problem	Cause	Control Measure
		<ul style="list-style-type: none"> Corroded entry cover in the reservoir 	<ul style="list-style-type: none"> Inspection of vents and hatches Replacing corroded covers
3	Taste and odor complaints	<ul style="list-style-type: none"> Long detention time Contaminant entry 	<ul style="list-style-type: none"> Proper opening/closing of outlet valve Check seals on hatches and screens on vents Install bird wires and fences if necessary
		<ul style="list-style-type: none"> Leaching from Internal coatings or new concrete tank 	<ul style="list-style-type: none"> Check chlorine level Improve influent water quality Flush distribution system Clean and disinfect storage tank

Lecture 2: Overhead Reservoirs

18

O&M Plan of Overhead Reservoir...Contd.

Sr. No	Problem	Cause	Control Measure
		<ul style="list-style-type: none">• Long detention time	<ul style="list-style-type: none">• Proper opening/closing of outlet valve
		<ul style="list-style-type: none">• Contaminant entry	<ul style="list-style-type: none">• Check seals on hatches and screens on vents• Install bird wires and fences if necessary
		<ul style="list-style-type: none">• Leaching from Internal coatings or new concrete tank	<ul style="list-style-type: none">• Check chlorine level• Improve influent water quality• Flush distribution system• Clean and disinfect storage tank

Lecture 2: Overhead Reservoirs

19

Contact

Zia Mustafa
Water Specialist



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

Water Safety Plan linked with Distribution Pipelines & Reservoir

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Introduction
- Developing Water Safety Plan
- Water Safety Plan for Water Distribution System

Introduction

“Water Safety Plan is a tool to address the water quality concerns from source to tap in distribution system incorporating possible expected hazards, their possible associated risk setting (risk levels) and finally control measures to address those hazards”

Introduction.....Contd.

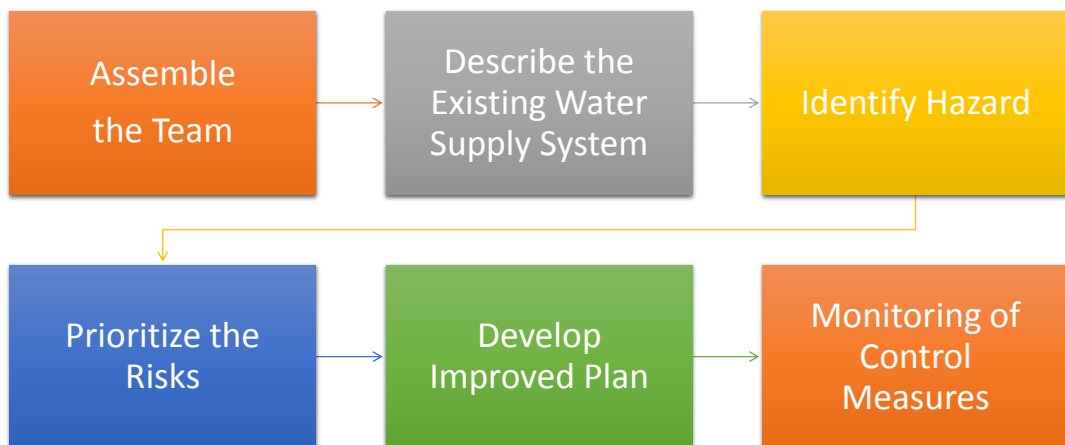


Health Impacts of Poor Water Quality

Lecture 3 : Water Safety Plan

5

Developing Water Safety Plan



Lecture 3 : Water Safety Plan

6

Assembling the Team

- ✓ Assemble of team with adequate operational experience
- ✓ Major role of team is to identify possible hazards linked with poor water quality in water distribution system and apply control measures in turn



Lecture 3 : Water Safety Plan

7

System Assessment

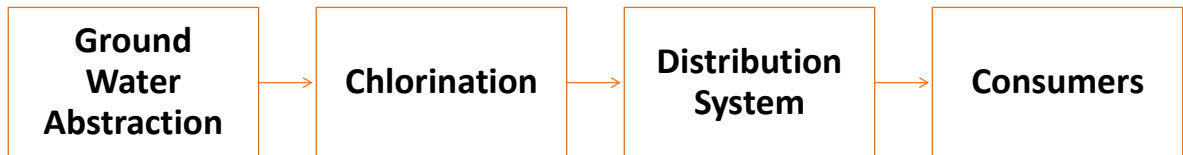
- ✓ Assessment of existing water supply system
- ✓ Developing system flow diagrams from source up to consumers



Lecture 3 : Water Safety Plan

8

System Assessment...contd.

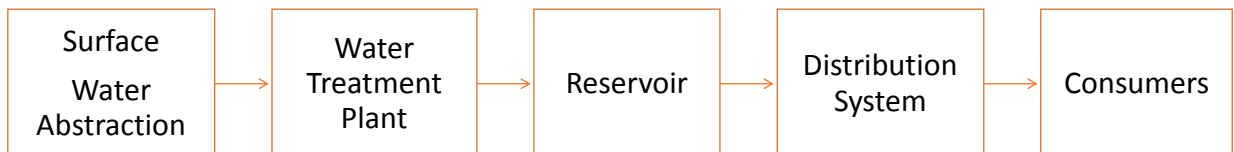


System Flow Diagram based on Groundwater Source

Lecture 3 : Water Safety Plan

9

System Assessment...contd.



System Flow Diagram based on Surface Water Source

Lecture 3 : Water Safety Plan

10

Hazard Identification and Setting Risk Level



- ✓ Identification of possible potential hazards
- ✓ Prioritizing risks associated with hazards
- ✓ Risk level determining



$$\text{Risk Level} = \text{Frequency} \times \text{Severity}$$

Hazard Analysis and Setting Setting Risk Level

Hazard Analysis

Risk level matrix

			Severity of damage					
			Almost no	Requires consideration	Slightly significant	Important	Worst	
			No effects observed	unsatisfactory, but not serious enough for people to turn to other drinking water	Serious enough to turn to other drinking water	May affect health	May result in fatalities	
			1	2	3	4	5	
Frequency of hazard	Frequently	Every month	5	5	10	15	20	25
	Often	Once every few months	4	4	8	12	16	20
	Occasionally	Once every 1 to 3 years	3	3	6	9	12	15
	Rarely	Once every 3 to 10 years	2	2	4	6	8	10
	Almost never	Once every 10 years or less frequently	1	1	2	3	4	5

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
Water Source				
1	Microbial and chemical Hazards	<ul style="list-style-type: none"> Deterioration of water quality 	<ul style="list-style-type: none"> Good practices of source protection through installation of filtration plant Implementation of Industrial Effluent Standards and Volume Controls 	SDO, Supervisor, Operator

Lecture 3 : Water Safety Plan

13

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
Transmission Mains				
1	Microbial Hazard	<ul style="list-style-type: none"> Poor water quality due to source contamination Deposits of sediments Disinfection failure due to high loads of organic contents in water from source 	<ul style="list-style-type: none"> Stop the flow of water by closing valves of problem area Provide a temporary bypass or alternative supply line, if possible Water sampling and its testing 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

14

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
2	Structural Hazard	<ul style="list-style-type: none"> Contamination due to poor jointing Deterioration of pipe materials Ingress of contaminated water from leaking valves 	<ul style="list-style-type: none"> Apply periodic inspection of supply lines Gradual replacement of old aged pipe infrastructure Exercising of valves 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

15

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
Reservoir				
1	Microbial hazard	<ul style="list-style-type: none"> Poor water quality due to inadequate disinfection method 	<ul style="list-style-type: none"> Minimizing ingress of contamination to system Fitting alarms triggered by low disinfectant level Ensure inspection covers and ventilator covers remain in place 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

16

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
2	Structural failure hazard	<ul style="list-style-type: none"> leakage through reservoir leakage from partially open valves taste in water due to internal corrosion of pipelines deterioration of internal lining 	<ul style="list-style-type: none"> Regular reservoir inspections Proper opening/closing of valves Proper pipe material as per specifications should be used Relining/painting of internal surface Routine inspection to see any failure in piping and lining 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

17

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
Distribution Supply lines				
1	Microbial and Chemical Hazards	<ul style="list-style-type: none"> Low chlorine residual in distribution system Ingress of contamination due to pressure fluctuations 	<ul style="list-style-type: none"> Maintain chlorine residual in the system as per requirement Pressure Management Apply flushing of pipelines 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

18

Water Safety Plan(WSP) For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
		<ul style="list-style-type: none"> Contamination during water main repair due to debris, soil or groundwater remaining in the main after repairs 	<ul style="list-style-type: none"> Disinfection prior to commissioning of water main Follow design specifications for water supply system 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

19

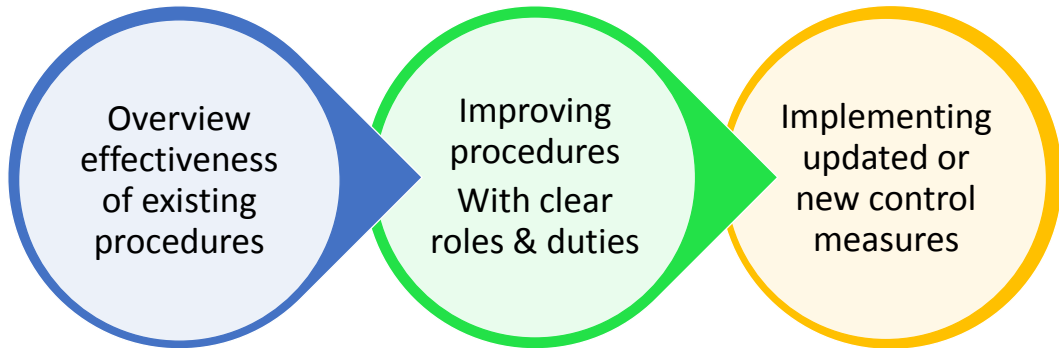
Water Safety Plan For Water Distribution System

Sr. No.	Hazard Type	Problems with associated hazard	Control Measures	Key Responsibility
		<ul style="list-style-type: none"> Cross connection between water system and another system carrying non-potable water 		
2	Structural failure hazard	<ul style="list-style-type: none"> Ingress of contamination due to main burst Ingress of contamination due to cracks in pipelines Ingress of contamination due to improper closure of valves 	<ul style="list-style-type: none"> Maintenance of pipelines and valves Use of approved pipeline types 	SDO, Supervisor, Sub Engineer

Lecture 3 : Water Safety Plan

20

Developing, Implementing & Maintaining an Improved/Upgrade Plan



Lecture 3 : Water Safety Plan

21

Monitoring of Control Measures

- ✓ Important for reviewing effectiveness of water safety plan
- ✓ Measuring residual chlorine, pH, turbidity, pressure changes in service area and periodic inspection of infrastructure



Lecture 3 : Water Safety Plan

22

Contact

Zia Mustafa
Water Specialist



Assignment 2

Preparation of Water Safety Plan (WSP)

Guidelines for Preparing Assignment



- What are major hazard in water distribution system
- Identify problems associated to these hazard
- Control measures
- Responsible persons to apply the control measures



O&M of Tube Well and Pump Facility (W1221)

O&M of Water Distribution System (Module 1)

EPA Net Analysis Exercise

Zia Mustafa (Water Specialist)

Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Introduction
- Purpose of Exercise
- Target Area for Exercise
- Steps in Using EPANET
- Simple Example Network Analysis
- Exercise at Supply Area in Green Town

3

Introduction of EPANET

- A network analysis computer program developed by the U.S. Environmental Protection Agency that analyzes Water Distribution Network
- A tool to determine pressure, velocity in different pipes in a Network

4

Purpose of Exercise

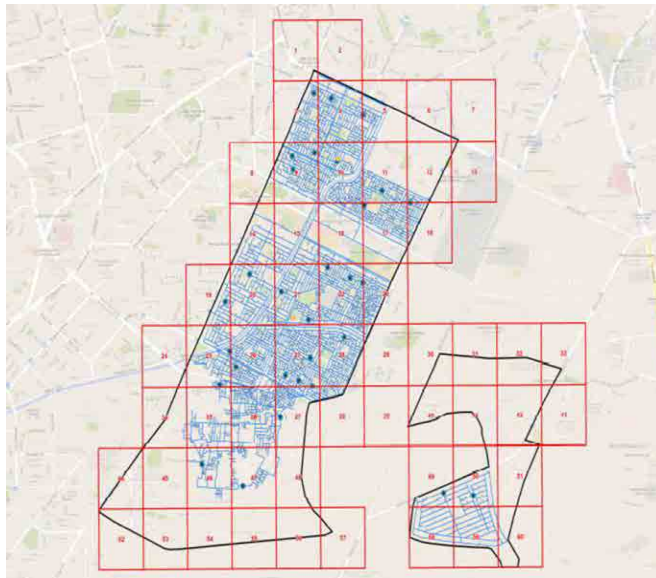
For checking and confirming that sufficient water is supplied to customers within supply area with appropriate pressure or not

- How water pressure within the supply area is changing
- Diameter of pipe is appropriate or not
- Capacity of pump is appropriate or not
- Possibilities of improving

5

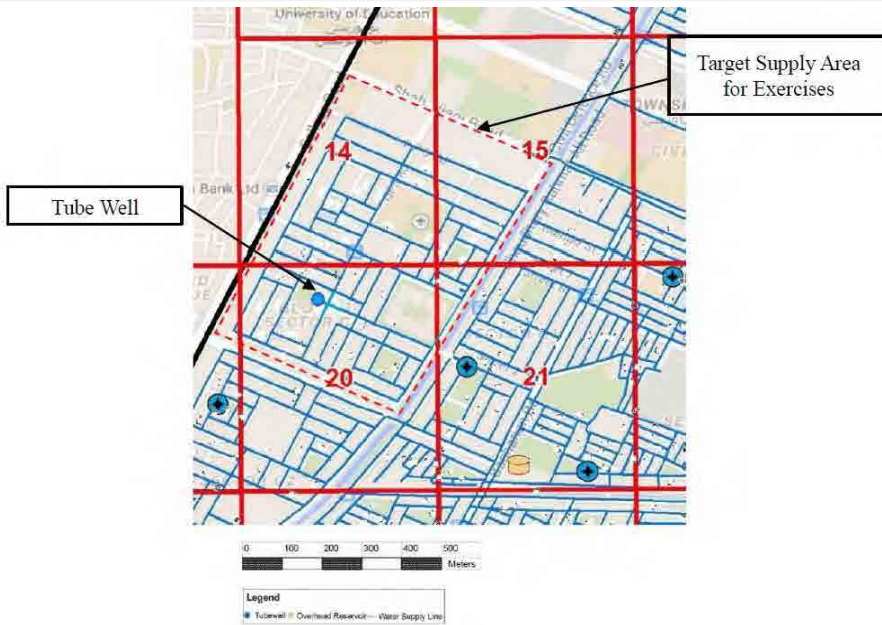
Target Area for the Exercise

Grid Map of Green Town



6

Target Area for the Exercise



Steps in Using EPANET

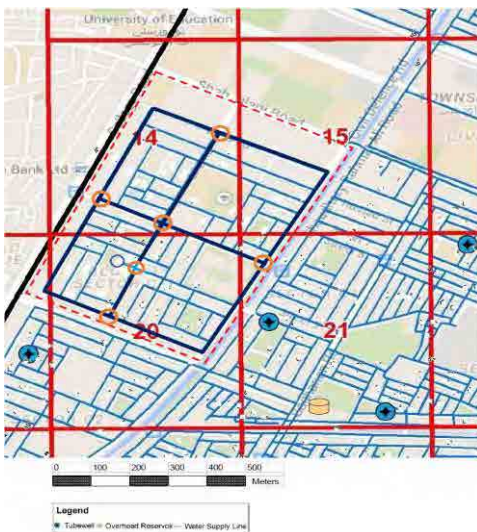
Steps to model a Water Distribution System using EPANET:

1. Draw a network representation of your distribution system or import a basic description of the network placed in a text file
2. Edit the properties of the objects that make up the system
3. Describe how the system is operated
4. Select a set of analysis options
5. Run a hydraulic analysis
6. View the results of the analysis

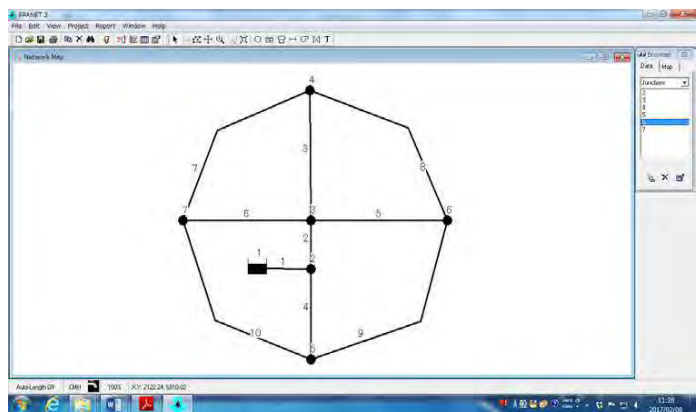
8

Simple Example Network Analysis

Simple Example Network Analysis



Main Distribution Network Example for Analysis



Network Model on the EPANET

Node Properties

Network Node Properties

Node	Elevation(m)	Demand(m ³ /H)
1	GL+30	(406.8)
2	GL	68.0
3	GL	68.0
4	GL	68.0
5	GL	68.0
6	GL	68.0
7	GL	66.8

11

Pipe Properties

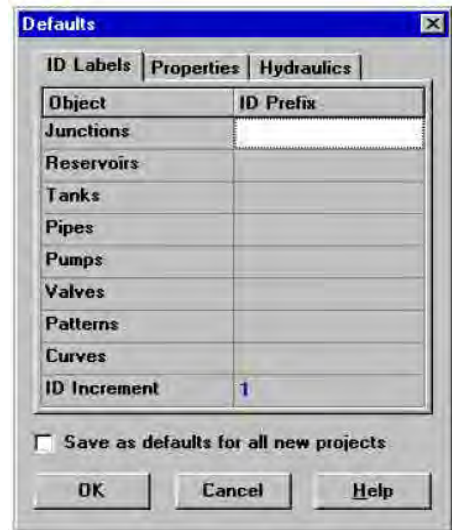
Pipe	Start Node	End Node	Length(m)	Diameter(mm)	C-Factor
1	1	2	100	200	100
2	2	3	100	200	100
3	3	4	300	100	100
4	2	5	200	200	100
5	3	6	300	100	100
6	3	7	200	100	100
7	7	4	500	100	100
8	6	4	600	100	100
9	5	6	600	100	100
10	5	7	500	100	100

12

Project Setup

Project Setup

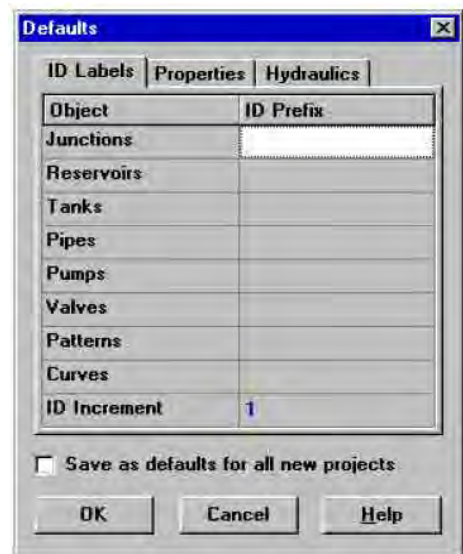
- Launch EPANET
- Create a new project
- Select **Project >> Defaults** to open the dialog form shown in Figure



13

Selecting Flow Unit

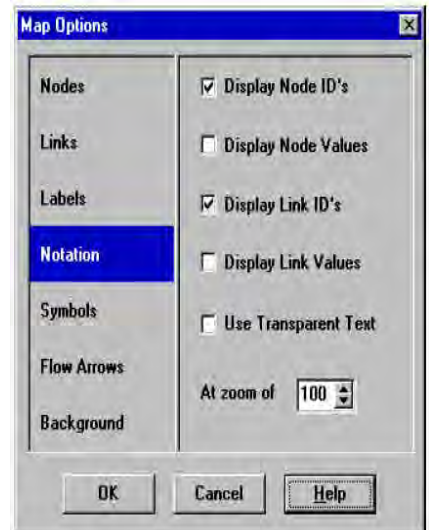
- On the ID Labels page of the dialog, clear all of the ID Prefix fields and set the ID Increment to 1
- Select the Hydraulics page of the dialog and set the choice of Flow Units to GPM (gallons per minute)



14

Map Options Dialog Form

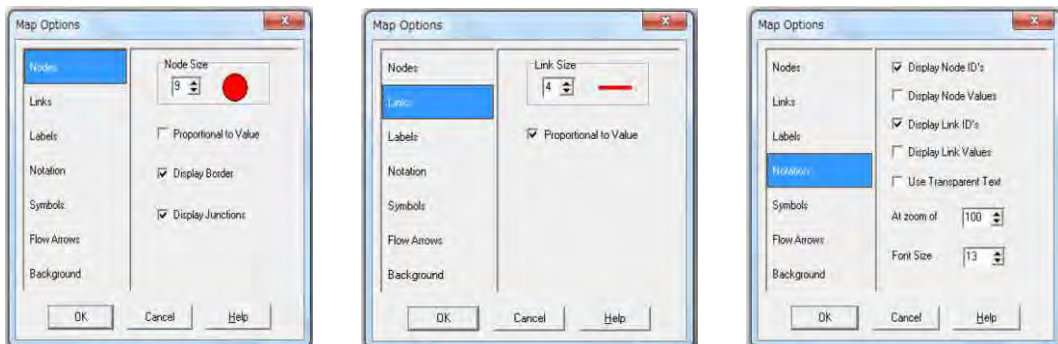
- Select **View >> Options** to bring up the Map Options dialog form
- Select the Notation page on this form and check the settings
- Then switch to the Symbols page and check all of the boxes
- Click the **OK** button to accept these choices and close the dialog



15

Map Dimensions Dialog

- Select **View >> Dimensions** to bring up the Map Dimensions dialog
- Note the default dimensions assigned for a new project. click the **OK** button




16

Drawing the Network

Drawing the Network



- Select **View >> Toolbars >> Map**



- Click the Reservoir button 
- Then click the mouse on the map at the location of the reservoir

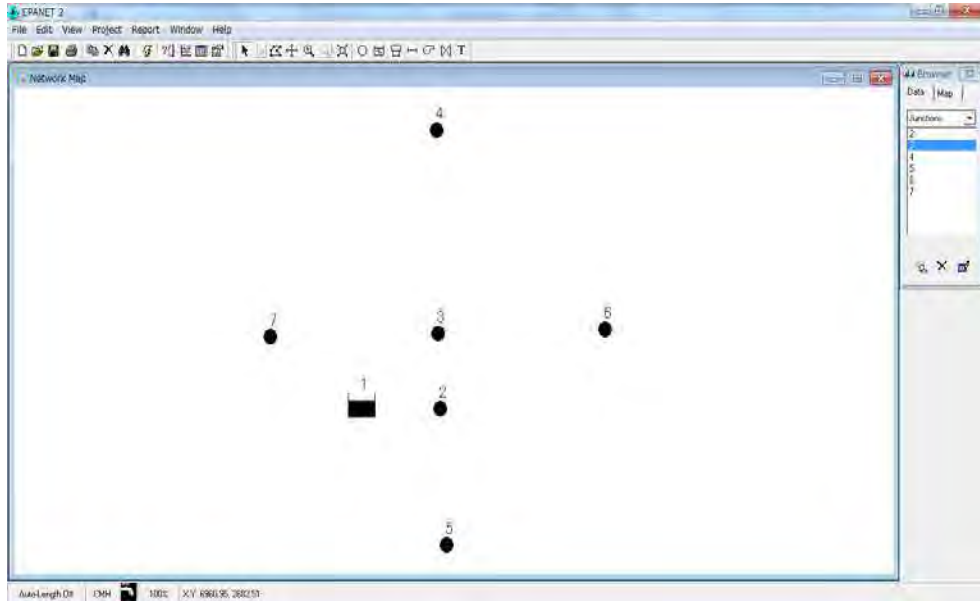
17

Adding the Nodes and Pipes

- Click the Junction button  and click on the map at the locations of nodes 2 through 7
- Click the Pipe button  (Note how an outline of the pipe is drawn as you move the mouse from node 2 to 3). Repeat this procedure for pipes 2 through 8.



18

Nodes on the EPANET



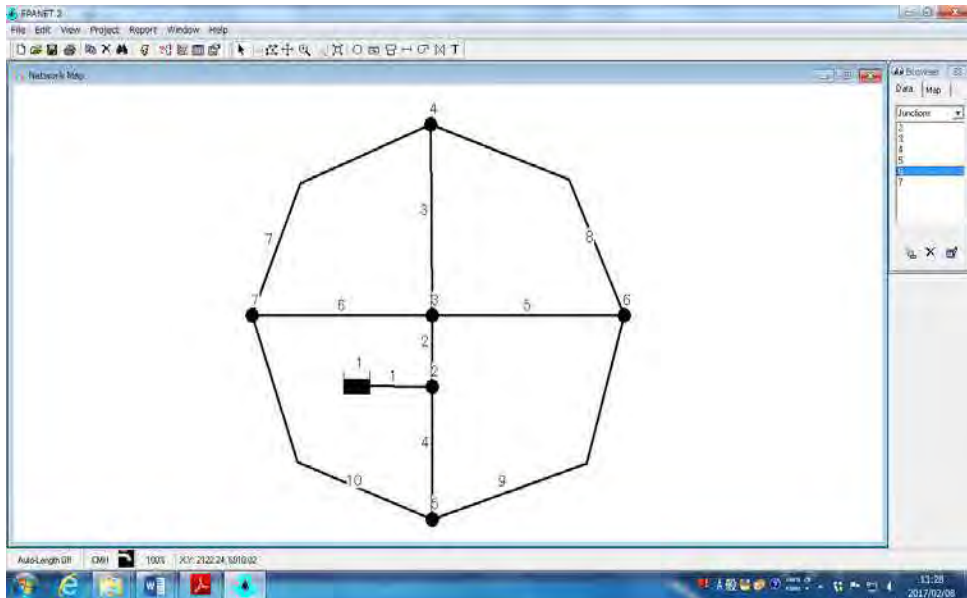
19

Labeling the Reservoir

- Label the reservoir by selecting  on the Map Toolbar. Edit Box will appear. Type here SOURCE and then hit the ENTER key
- Click the selection button  to put the map on the Object Selection Mode

20

Example Network on the EPANET



21

Setting Object properties

Setting Object Properties

- Double-click the object on the map
- Right-click on the object and select **Properties** from the pop-up menu that appears
- Select the object from the Data page of the Browser window and then click the Browser's Edit button
- Add Elevation and Base Demand (Node 2)
- Click on link to add length, diameter and roughness (c factor) for links

22

Properties Editor

Property	Value
*Reservoir ID	1
X-Coordinate	2801.36
Y-Coordinate	3412.56
Description	
Tag	
*Total Head	30
Head Pattern	
Initial Quality	

Property	Value
*Junction ID	2
X-Coordinate	4618.00
Y-Coordinate	3395.59
Description	
Tag	
*Elevation	0
Base Demand	68
Demand Pattern	

Property	Value
*Pipe ID	2
*Start Node	2
*End Node	3
Description	
Tag	
*Length	100
*Diameter	200
*Roughness	100

23

Saving and Opening Projects

- From the **File** menu select the **Save As** option.
- In the Save As dialog that appears, select a folder and file name under which to save this project.
- Click **OK** to save the project to file.

24


Saving and Opening Projects

Saving and Opening Projects

- The project data is saved to the file in a special binary format. If you wanted to save the network data to file as readable text, use the **File >> Export >> Network** command instead.
- To open project at some later time, select the **Open** command from the **File** menu.

25


Running a Single Period Analysis

- Select **Project >> Run Analysis** or click the Run button . (If the toolbar is not visible select **View >> Toolbars >> Standard** from the menu bar).
- Select Node Pressure from the Browser's Map page and observe how pressure values at the nodes become color-coded.
- To view the legend for the color-coding, select **View >> Legends >> Node** (or right click on an empty portion of the map and select Node Legend from the popup menu).

26

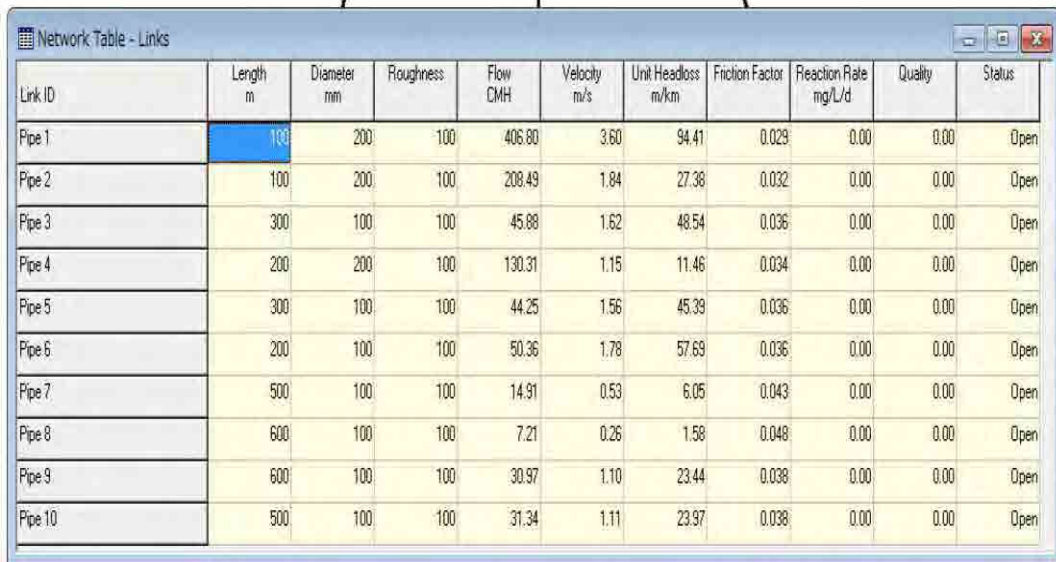
Running a Single Period Analysis

Running A Single Period Analysis

- To change the legend intervals and colors, right click on the legend to make the Legend Editor appear
- Bring up the Property Editor (double-click on any node or link) and note how the computed results are displayed at the end of the property list
- Create a tabular listing of results by selecting **Report >> Table** (or by clicking the Table button )

27

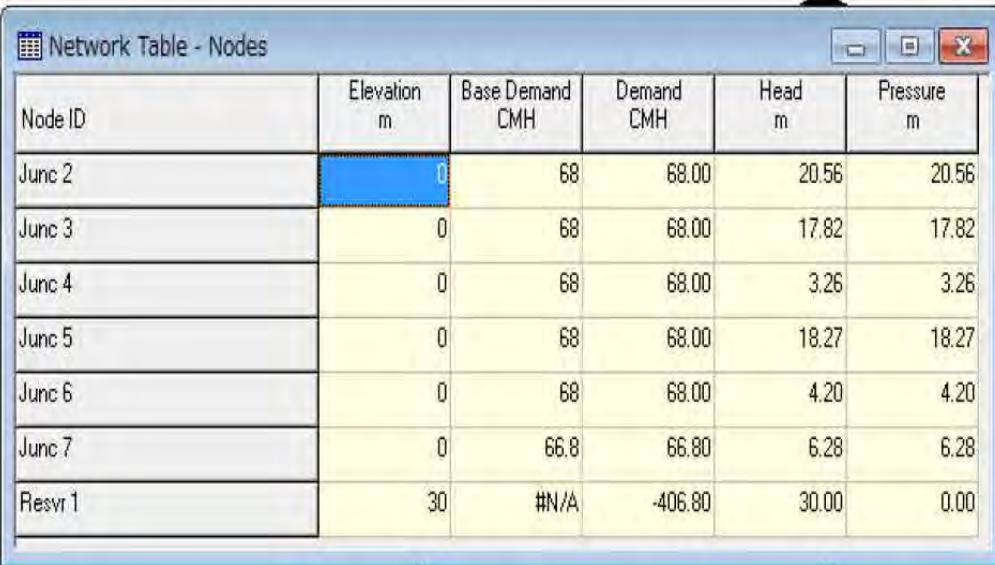
The Link Result



Link ID	Length m	Diameter mm	Roughness	Flow CMH	Velocity m/s	Unit Headloss m/kn	Friction Factor	Reaction Rate mg/L/d	Quality	Status
Pipe 1	100	200	100	406.80	3.60	94.41	0.029	0.00	0.00	Open
Pipe 2	100	200	100	208.49	1.84	27.36	0.032	0.00	0.00	Open
Pipe 3	300	100	100	45.88	1.62	48.54	0.036	0.00	0.00	Open
Pipe 4	200	200	100	130.31	1.15	11.46	0.034	0.00	0.00	Open
Pipe 5	300	100	100	44.25	1.56	45.39	0.036	0.00	0.00	Open
Pipe 6	200	100	100	50.36	1.78	57.69	0.036	0.00	0.00	Open
Pipe 7	500	100	100	14.91	0.53	6.05	0.043	0.00	0.00	Open
Pipe 8	600	100	100	7.21	0.26	1.58	0.048	0.00	0.00	Open
Pipe 9	600	100	100	30.97	1.10	23.44	0.038	0.00	0.00	Open
Pipe 10	500	100	100	31.34	1.11	23.97	0.038	0.00	0.00	Open

28

The Nodes Result



The screenshot shows a window titled "Network Table - Nodes" with a table containing the following data:

Node ID	Elevation m	Base Demand CMH	Demand CMH	Head m	Pressure m
Junc 2	0	68	68.00	20.56	20.56
Junc 3	0	68	68.00	17.82	17.82
Junc 4	0	68	68.00	3.26	3.26
Junc 5	0	68	68.00	18.27	18.27
Junc 6	0	68	68.00	4.20	4.20
Junc 7	0	66.8	66.80	6.28	6.28
Resvr 1	30	#N/A	-406.80	30.00	0.00

29

Exercise

at Supply Area in Green Town

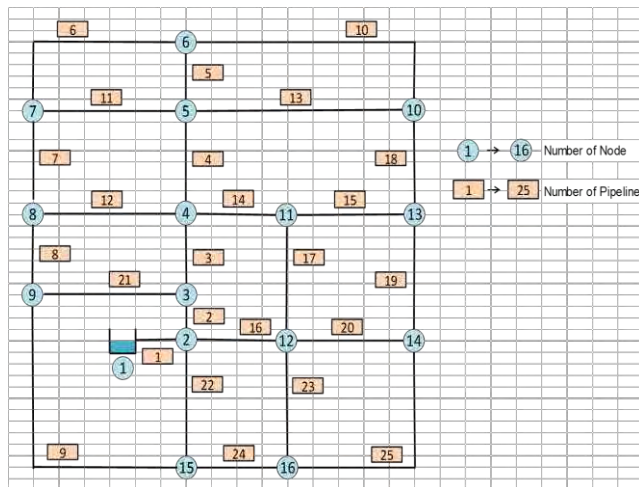
Exercise at Supply Area in Green Town

1. Select and make your main distribution network on your map



Exercise at Supply Area in Green Town

2. Numbering of Nodes and Pipelines



If number of Nodes is small, you will not be able to get good result from network analysis.
 Or if number of Nodes is too big, analysis will be complicated and it will take long hours.

Exercise at Supply Area in Green Town

3. Data Sheet of Nodes

No.	Elevation	Water Demand or Supply Amount from Node

33

Exercise at Supply Area in Green Town

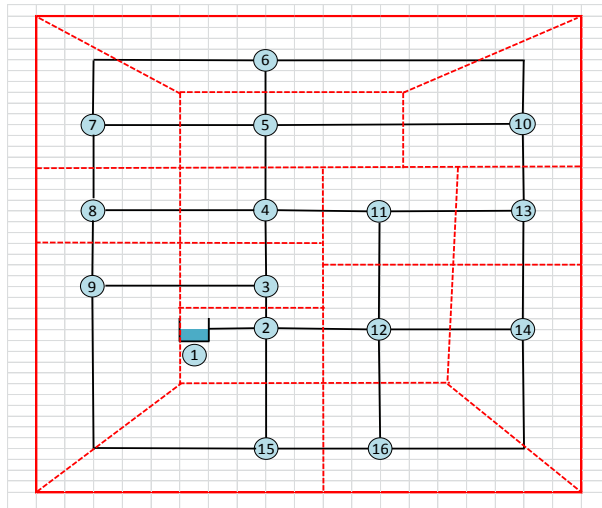
4. Data Sheet for Pipelines

No.	Start Node	End Node	Length in meter	Diameter in mm	Roughness Coefficient

34

Exercise at Supply Area in Green Town

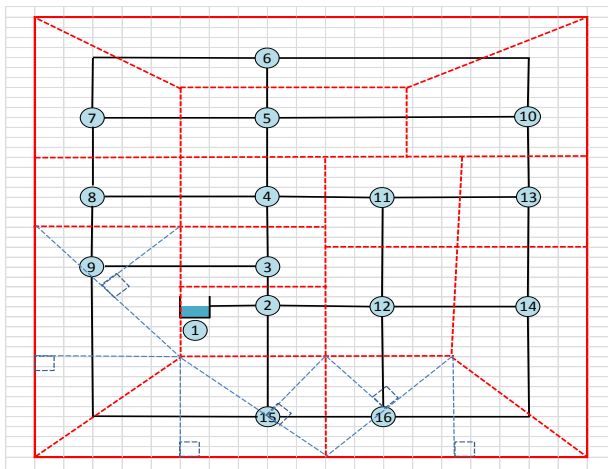
Supply amount from each node will be calculated according to area, number of customer, population density and types of customers.



35

Exercise at Supply Area in Green Town

- Divide each supply area with two right triangle and calculate base times height
- Equal supply amount at each Node (For Exercise Purpose)



36

Exercise at Supply Area in Green Town

$$\text{Supply amount from each Node} = Q/(N-1)$$

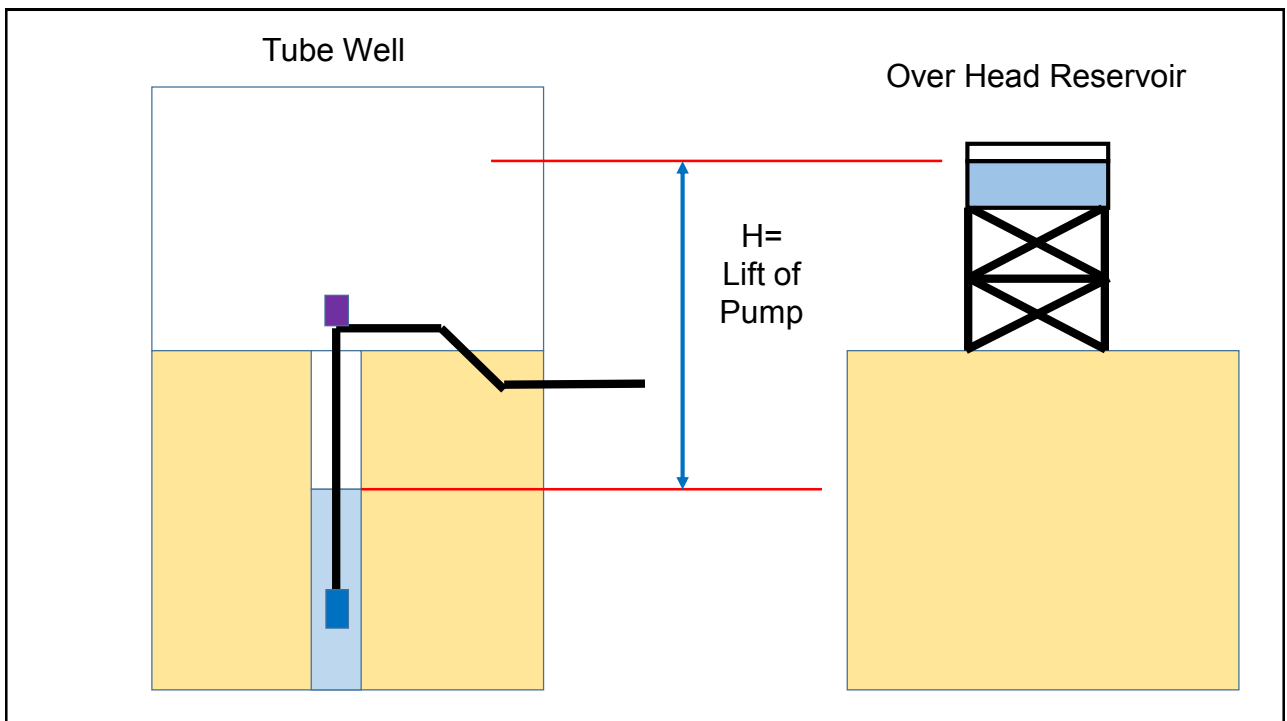
Where

Q is Capacity of Tube Well Pump

N is number of Nodes

- Node No.1 is reservoir and we assume water level of the reservoir as lift of Tube Well pump
- Flow amount from reservoir is calculated by Software

37



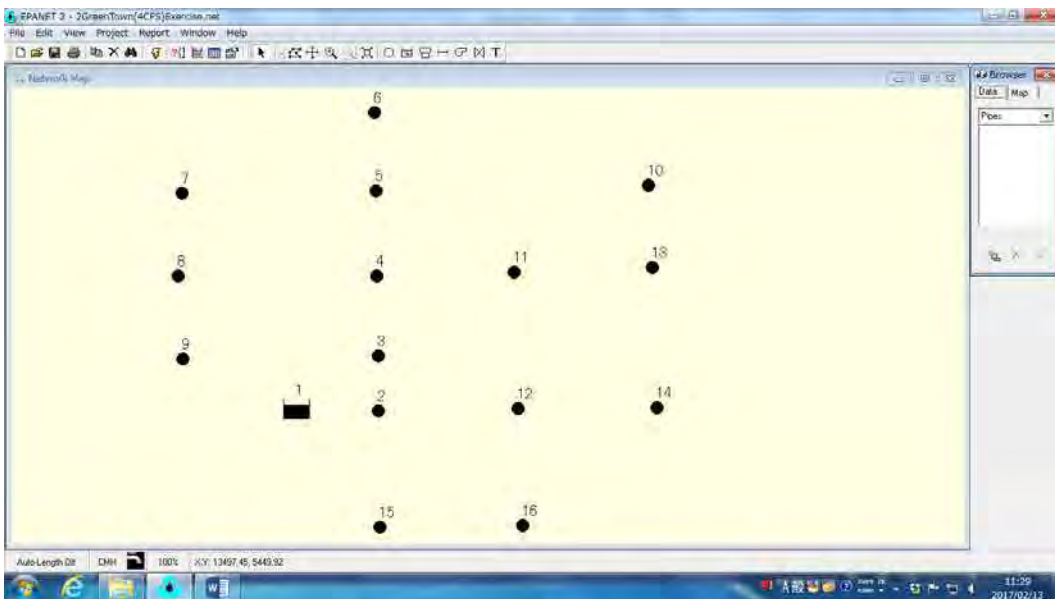
Exercise at Supply Area in Green Town

5. Putting data into EPANET

- Drawing network by making use of mouse and buttons on the Map Toolbar
- First add the reservoir (Lift of Tubewell Pump)
- Add the junction nodes
- Then add the pipes (Begin with pipe 1 connecting node 1 to node 2)
- Put all data of Nodes and Pipelines into EPA Net

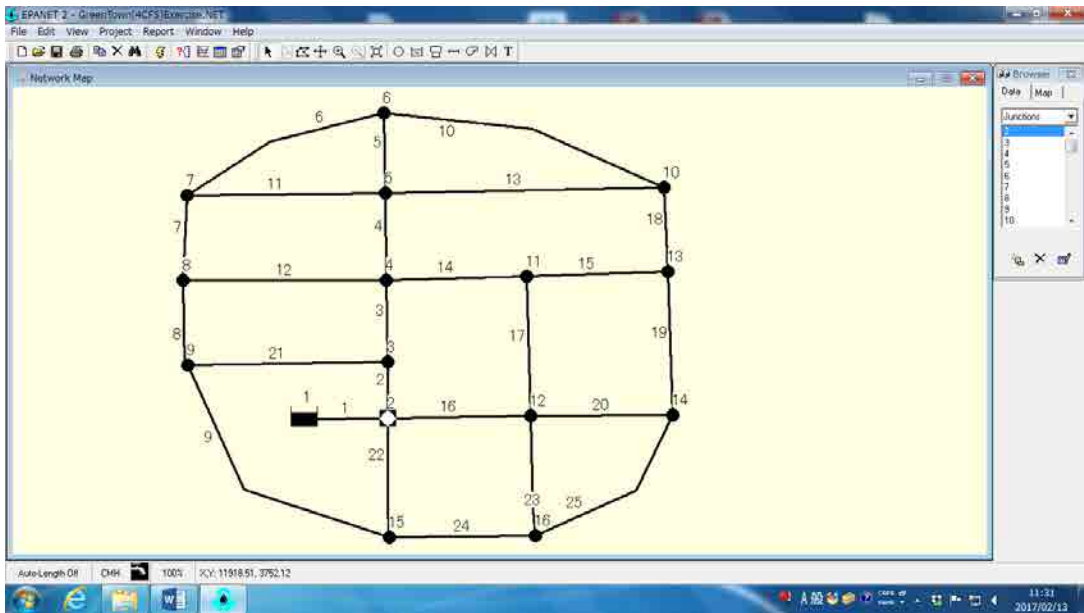
39

Nodes on the EPANET



40

Network on the EPANET



41

Analysis and Evaluation

5. Analysis

Run the analysis

6. Evaluation of Analysis Result

- Water pressure at each node
- Velocity of each pipe

42

The Node Result

EPANET 2 - GreenTown(4CFS).NET

File Edit View Project Report Window Help

Network Map

Day 1, 12:05 AM

Network Table - Nodes

Node ID	Elevation m	Base Demand CMH	Initial Quality	Demand CMH	Head m	Pressure m	Quality
Junc 2	30	0	30.00	28.40	28.40	0.00	
Junc 3	0	27	0	27.00	27.86	27.86	0.00
Junc 4	0	27	0	27.00	26.42	26.42	0.00
Junc 5	0	27	0	27.00	23.19	23.19	0.00
Junc 6	0	27	0	27.00	21.96	21.96	0.00
Junc 7	0	27	0	27.00	22.32	22.32	0.00
Junc 8	0	27	0	27.00	24.53	24.53	0.00
Junc 9	0	27	0	27.00	26.57	26.57	0.00
Junc 10	0	27	0	27.00	21.95	21.95	0.00
Junc 11	0	27	0	27.00	26.12	26.12	0.00
Junc 12	0	27	0	27.00	27.86	27.86	0.00
Junc 13	0	27	0	27.00	23.27	23.27	0.00
Junc 14	0	27	0	27.00	24.44	24.44	0.00
Junc 15	0	27	0	27.00	27.62	27.62	0.00
Junc 16	0	27	0	27.00	27.42	27.42	0.00
Reser 1	30	N/A	0	-48.00	30.00	0.00	0.00

Auto-Length Off DMH 100% XY: 8047.54, 747.03

14:15 2017/02/06

43

The Link Result

EPANET 2 - GreenTown(4CFS).NET

File Edit View Project Report Window Help

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Bulk Coeff.	Wall Coeff.	Flow CMH	Velocity m/s	Link Headloss m/km	Friction Factor	Reaction Rate mg/L/d	Quality	Status
Pipe 1	50	250	100	0	0	408.00	2.31	32.01	0.028	0.00	0.00	Open
Pipe 2	50	250	100	0	0	221.10	1.25	10.28	0.032	0.00	0.00	Open
Pipe 3	100	200	100	0	0	148.84	1.32	74.57	0.033	0.00	0.00	Open
Pipe 4	200	150	100	0	0	73.51	1.16	16.12	0.036	0.00	0.00	Open
Pipe 5	100	100	100	0	0	21.84	0.77	12.28	0.040	0.00	0.00	Open
Pipe 6	300	100	100	0	0	-6.16	0.22	1.16	0.049	0.00	0.00	Open
Pipe 7	200	100	100	0	0	-20.65	0.73	11.07	0.041	0.00	0.00	Open
Pipe 8	100	100	100	0	0	-28.72	1.02	20.38	0.038	0.00	0.00	Open
Pipe 9	400	100	100	0	0	-10.45	0.37	3.14	0.045	0.00	0.00	Open
Pipe 10	400	100	100	0	0	1.01	0.04	0.04	0.064	0.00	0.00	Open
Pipe 11	200	100	100	0	0	-12.51	0.44	4.37	0.044	0.00	0.00	Open
Pipe 12	200	100	100	0	0	-16.94	0.67	9.43	0.041	0.00	0.00	Open
Pipe 13	300	100	100	0	0	12.16	0.43	4.15	0.044	0.00	0.00	Open
Pipe 14	100	150	100	0	0	28.38	0.46	2.95	0.041	0.00	0.00	Open
Pipe 15	200	100	100	0	0	-23.70	0.84	14.28	0.040	0.00	0.00	Open
Pipe 16	100	200	100	0	0	84.81	0.75	5.17	0.036	0.00	0.00	Open
Pipe 17	150	100	100	0	0	21.31	0.75	11.73	0.041	0.00	0.00	Open
Pipe 18	250	100	100	0	0	13.84	0.49	5.27	0.043	0.00	0.00	Open
Pipe 19	150	100	100	0	0	17.14	0.61	7.63	0.042	0.00	0.00	Open
Pipe 20	200	100	100	0	0	26.20	0.93	17.20	0.038	0.00	0.00	Open
Pipe 21	200	150	100	0	0	-45.27	0.71	6.57	0.038	0.00	0.00	Open
Pipe 22	150	200	100	0	0	72.08	0.64	3.83	0.037	0.00	0.00	Open

Auto-Length Off DMH 100% XY: 4038.71, 6843.97

14:17 2017/02/06

44

Trial for Good Result

7. Changing Diameter of some Pipes and Analysis again

For Example

- Increase diameter of inlet side pipe of the Node which water pressure is low.
- Increase diameter of the pipe which velocity is too high.
- Or decrease diameter of the pipe with opposite condition.
- Try analysis again and again

45

Contact

Zia Mustafa
Water Specialist



OJT Exercise Checking of Pressure in Supply Area using Pressure Recorder FJN -501

Zia Mustafa (Water Specialist)
Ramisha Taseer (Research Associate)

March 2018

Detail of OJT Plan

Date	March 22, 2018
Training Facility	Tube Well located at Green Town WASA Sub Division
Equipment/Machinery	Pressure Recorder FJN -501
Time	2 Hours (10:00AM to 12:00 PM)

FJN-501 Pressure Recorder

Water Pressure Recorder is used to measure the pressure of water with the help of graph inside the gauge for specific hours.



Pressure Recorder FJN-501

3

Applications of Water Pressure Recorder

Pressure Recorders are used to:

- ✘ Verify low water pressure complaints
- ✘ Provide water distribution system modelling data
- ✘ Checking for fluctuations in water pressure
- ✘ Keeping track of water pressure at night when controlling water leakages by decreasing pressure
- ✘ Making a water pressure distribution chart to identify low, high pressure in Supply Area

4

Specifications of Equipment

Model and Type	FJN-501 (A-Type)	FJN-501 (C-Type)
Recording Time	4,12,24,72, 168 hours	15,30,60 Minutes
Maximum Pressure Record	1.0 MPa (10bar)	2.0 MPa (20bar)
Power Check	CPU does not work at voltage less than 2.2 V	
Mode Check	LED indicates by blinking	

Scale: 1.0 MPa = 10 Bar

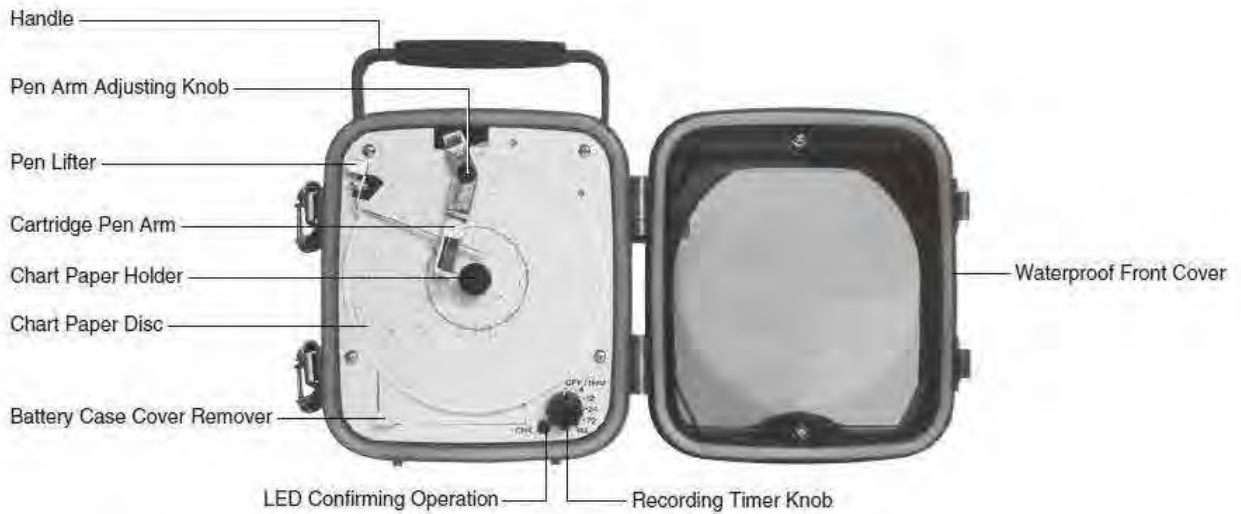
5

Specifications of Equipment

Model and Type	FJN-501 (A-Type)	FJN-501 (C-Type)
Operation Power	3.0 Volts (Minimum 2.2V)	
Weight & Size	1.35kg (Main Unit)	
Gross Weight	3.7kg (with the carrying case)	
Battery Type & Battery Life	AA - Alkaline Battery	
	4 h 80 days 12h 220 days 24h 380 days 72h 720 days 168h 970 days	15 min. 150 days 30 min. 250 days 60 min. 400 days

6

Components of Equipment



7

Components of Equipment



Fuji Coupling



13 mm Dia. Faucet Adaptor



Coupler of Fuji Coupling



Cartridge Pen



Leather Packing

8

Components of Equipment



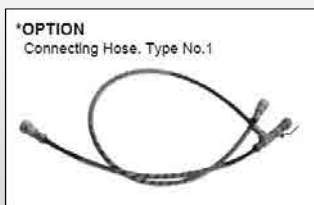
Alkaline Battery- AA Size



Chart Paper Disc
(100 Sheets per package)



Connecting Hose Type No. 4



Connecting Hose



Carrying Case

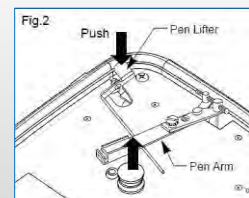
9

Procedure for Measuring Pressure in Water Distribution

1. Unlock the clip and open the front cover



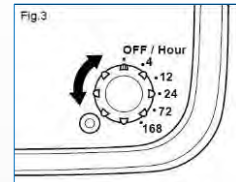
2. Push down the pen lifter to raise the lift arm. Remove chart paper holder by pulling upward and put new chart paper



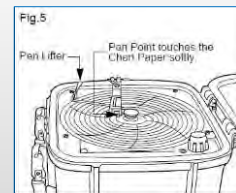
10

Procedure for Measuring Pressure in Water Distribution

3. Before mounting the chart paper, check battery status (Turn the knob to 4 hour Selector position and confirm blinking of LED for 1 minute, if LED does not light up, change the batteries)



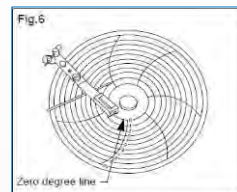
4. Open the cartridge pen and fit it on the pen holder. Release the Pen lifter so that the pen point will touch the chart paper softly



11

Procedure for Measuring Pressure in Water Distribution

5. Rotate the chart paper Disc so that the pen point will come to the starting point



6. Close the front cover and lock it with catch clips



12

Procedure for Measuring Pressure in Water Distribution

7. Open the Pipeline Valve slowly and drain water to eliminate air trapped in the water supply pipeline
8. Connect the hose pipe with supply line (through FUJI Adapter)
9. Attach the other side of Hose Pipe to the Pressure Recorder
10. Open the valve of Supply Line gradually to its full supply level



13

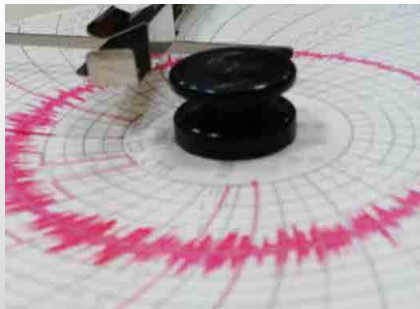
Procedure for Measuring Pressure in Water Distribution

11. Now open the Valve of Pressure Recorder
12. Open the Air Bleed knob to confirm that air is removed (continuous drop of water) and then close it
13. Place the Pressure Recorder on Firm Space for recording pressure in supply line

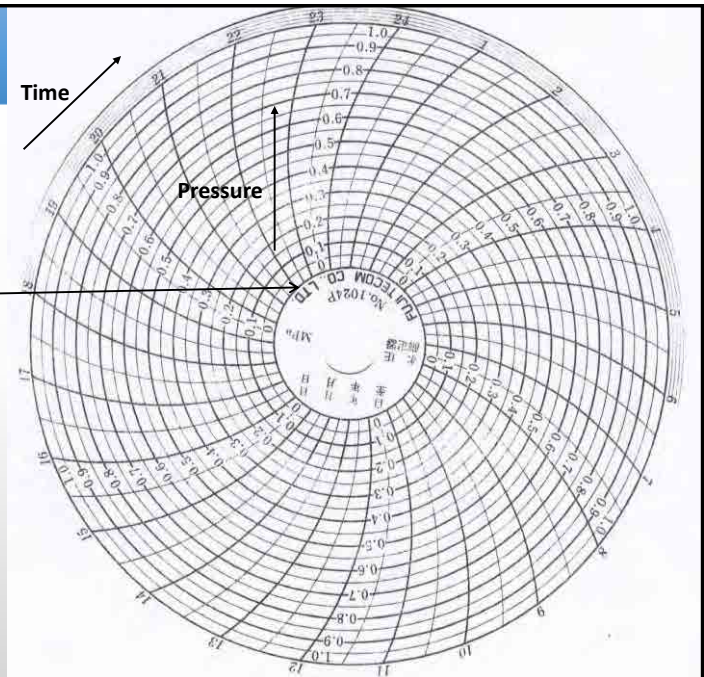


14

Chart Interpretation



Starting Point



15

Precautions

- The Pen Point should touch the Zero Line (If it is not on Zero Line adjust it with the help of screw on the pen arm)
- Always turn the knob to OFF, before changing chart paper
- After use, remove the connecting hose after releasing air completely by use of Air bleed knob
- Open the valve of supply line slowly to avoid malfunctions caused by the water pressure changes

16

T H A N K

Y O U



Checking of Residual Chlorine in Supply Area using DPD Reagent

OJT Exercise

Zia Mustafa (Water Specialist)

Ramisha Taseer (Research Associate)

March 2018

Outline of the Presentation

- Objective
- Detail of OJT Schedule
- Specifications of Equipment
- Components of Apparatus
- Applications of Residual Chlorine Measuring Kits
- Procedure

3

Detail of OJT Schedule

Day	March 22, 2018
Place	Green Town WASA Sub Division
Equipment/Machinery	DPD (N,N Diethyl-P-Phenylene diamine Reagent Kit
Time	2 hours (10:00am to 12:00pm

4

Specifications of Apparatus

Range	0 to 2.5 mg/l (ppm) Chlorine
Smallest Increment	0.5 mg/l (ppm) Chlorine
Analysis Method	Colorimetric
Sample Size	5 ml
Number of tests	50 (average)
Shipping Weight	176g (6.6oz.)
Case Dimensions	220*145*55mm

5

Components of Apparatus

Residual Measuring Kit comprises:

- 1 Color Comparator Cube
- Reagent 1 (20mL)
- Reagent 2 (15mL)



6

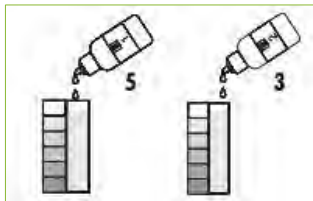
Applications

- To measure Residual Chlorine Levels in Water Supply Pipelines , reservoirs

7

Procedure

- Add 5 drops of **Reagent 1** and 3 drops of **Reagent 2** to the color comparator cube



- Fill the color comparator tube with water sample to the 5 mL mark

8

Procedure

- Replace the Cap and mix by carefully swirling the cube in tight circles and inverting it several times



- Determine which color band best matches the solution in the vessel and record the results in mg/L (ppm) free chlorine

9

T H A N K Y O U

10



Assignment 3

Preparation of Operational and Repair Action Plan

Guidelines for Preparing Assignment



- What are the prevailing operational issues in water supply system
- Possible Causes
- Control Measures

