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ENSURING AVAILABILITY AND SUSTAINABILITY OF WATER SUPPLY SERVICES THROUGH FULL LIFE CYCLE INVESTMENT PLANNING

Gicumbi District, Rwanda Case Study

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Water For People

WATER FOR PEOPLE IN RWANDA

A BRIEF ABOUT RWANDA

SIZE
26,338 sq. km

POPULATION
11.5 million

LIFE EXPECTANCY
64.5 years

POP. GROWTH RATE
(2016): 2.6%

GDP
US$826/capita

ADMINISTRATIVE DIVISIONS
4 provinces and City of Kigali
30 Districts (27 rural and 3 urban)
14,000 villages

GEOGRAPHICAL COVERAGE

- Registered in 2008
- Activities in Rulindo, Kicukiro and Gicumbi Districts targeting about 1 million people
- Two largest programs in terms of investment: Rulindo Challenge and Gicumbi WASH Programs
- Sanitation in seven districts in partnership with SNV and World Vision (USAID funded project)
- Sanitation marketing approaches in EF and non-EF districts
- Support Central Government

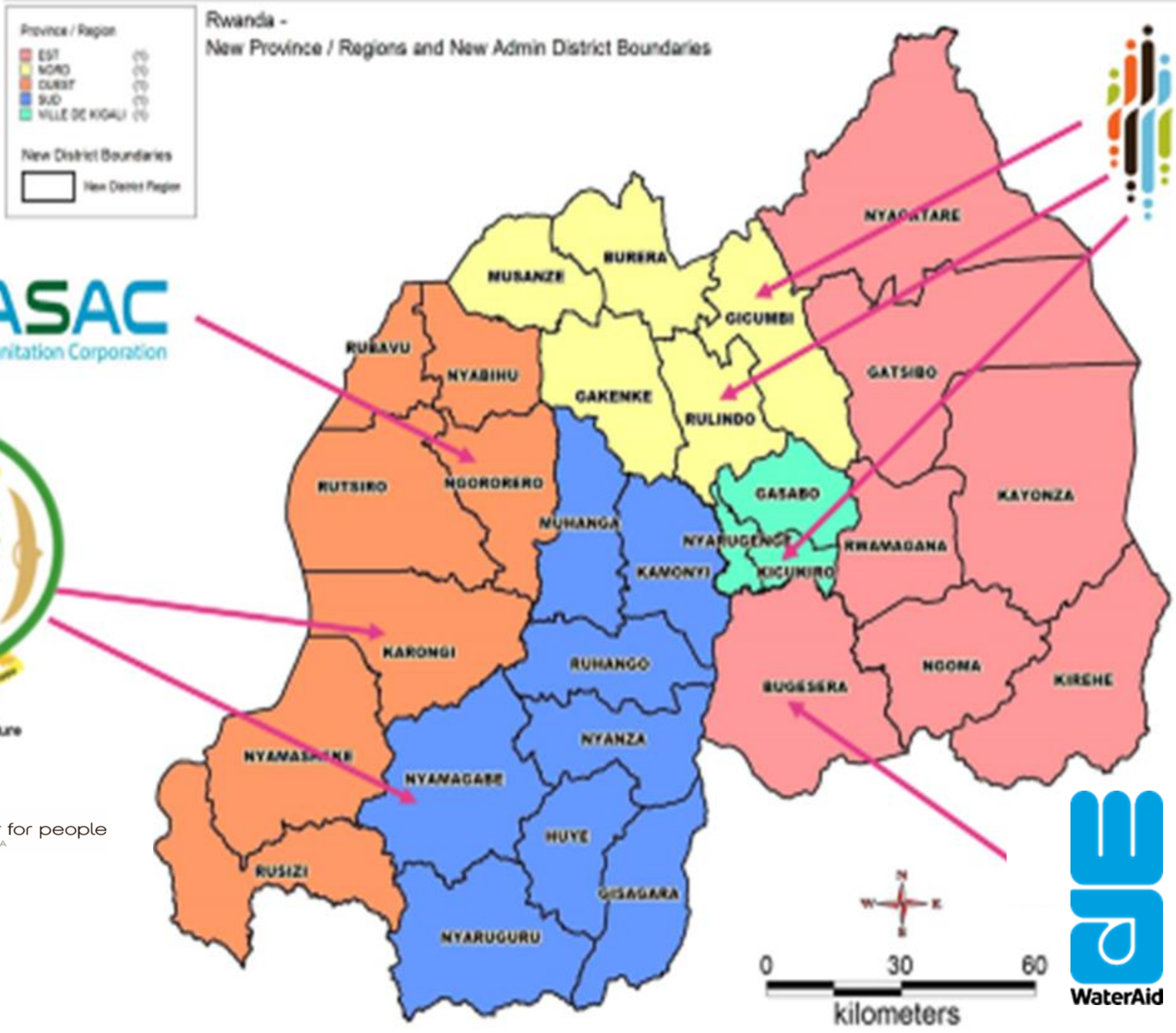
DISTRICT WIDE APPROACH

- The District Wide Approach (DWA) is a continuation of the Everyone Forever model at national level that seeks to provide systemic support to districts in their WASH service authority functions, while also recognizing the need for a strong supportive enabling environment at the national level.

- The DWA focuses on the district as the geographical entry point with the goal of the district having the systems, plans, finances, human resources, skills, knowledge, coordination and accountability mechanisms to achieve sustainable universal access.

- The DWA has been piloted in Rulindo, Gicumbi, Bugesera, Karongi, Ngorero, Nyamagabe, with the support of Water for People, WaterAid and WASAC.

Coordinated piloting of EF/ DWA in 5 districts



WASAC Water & Sanitation Corporation

water for people RWANDA everyone | forever

Ministry of Infrastructure

unicef

water for people RWANDA

WaterAid

GICUMBI DISTRICT

- The Gicumbi District is one of the 30 districts of Rwanda that assessed all required costs to ensure availability and sustainability of water supply services in the district.

- These costs include:
  1. Capital Expenditures (CapEx)
  2. Capital Maintenance Expenditures (CapManEx)
  3. Operational Expenditures (OpEx)
  4. Direct Support Cost (DSCExp)
  5. Costs required for water resources management

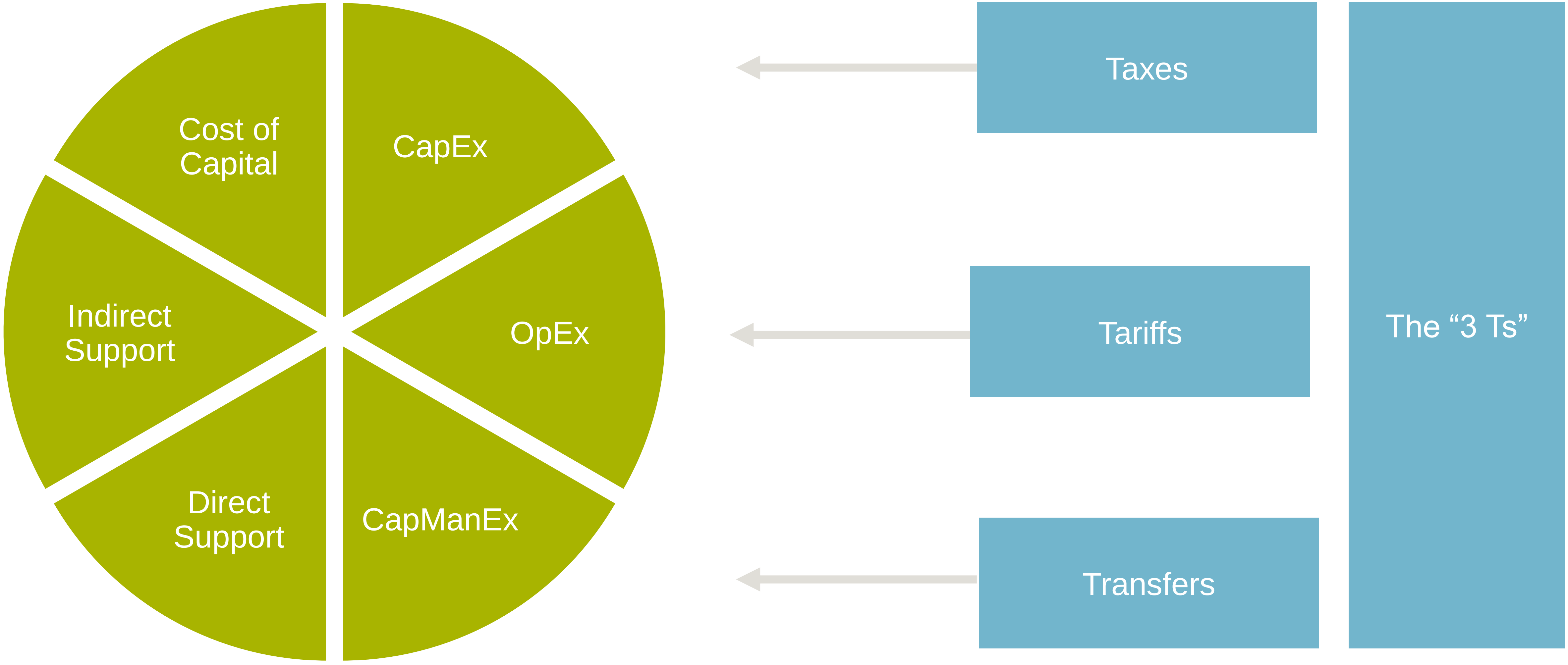
- Now the Gicumbi District is in the process of writing its full life cycle costing investment plan which will guide the district annual budgeting for water supply.

STEPS FOR DEVELOPING A WASH PLAN

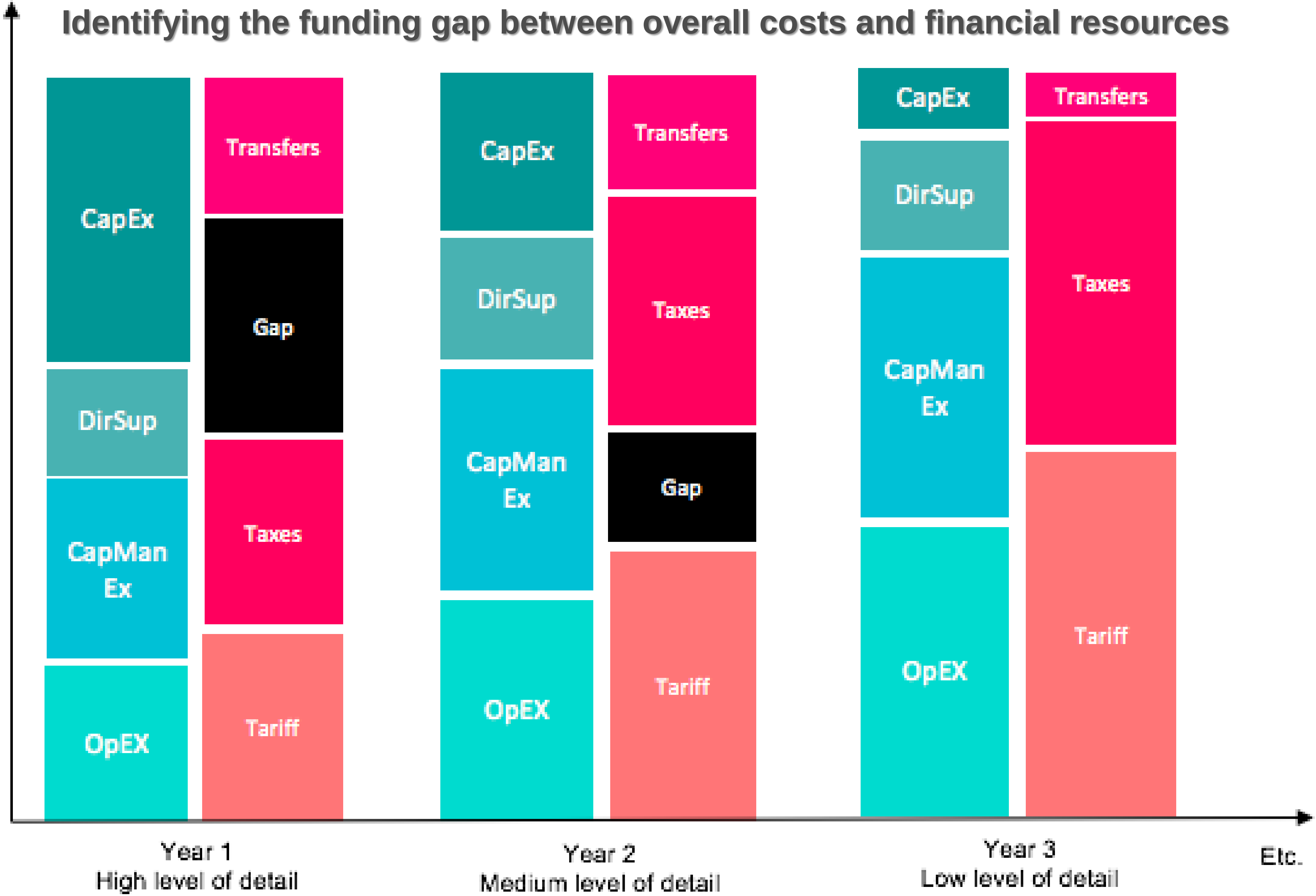
STEPS	ACTIVITIES	OUTPUTS
Assessing services, assets and capacities	• Household survey • Asset inventory • District and service provider capacity assessment	• Service level mapping • Asset registry • Analysis of capacities and gaps
Visioning and strategy development	• Engagement with district water office • Discussion and questioning	• Long term vision • Approach to implementation • Targets and milestones
Estimating the costs of achieving the vision	• Calculation/projection of CapEx, OpEx CapManEx, DSexp	• Individual costs • Consolidated costs for achieving the vision
Identifying sources of funding	• Calculation/projection of tariffs, taxes and transfers for WASH in the district	• Consolidated financial resources • Gap between costs and resources
Revisiting assumptions	• Engagement with district water office • Discussion and questioning	Consolidated WASH plan

THE LIFE CYCLE COSTS

SOURCES OF FINANCING



Identifying the funding gap between overall costs and financial resources



DATA COLLECTION

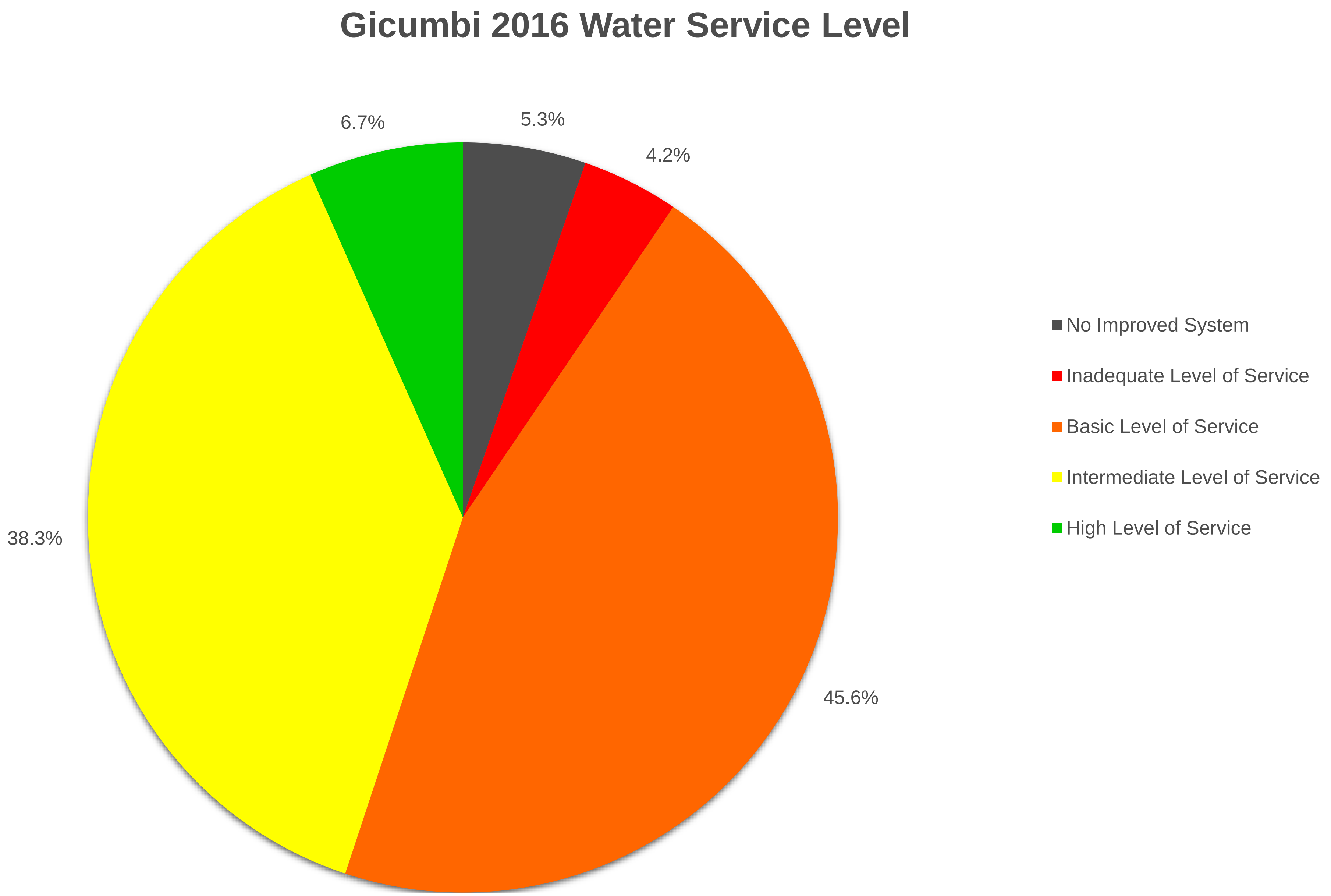
- **Service level assessment**
  - Done through AKVO FLOW
  - Used to check the baseline
  - Not used in the costing
- **Asset inventory**
  - Collected using AKVO FLOW by visiting all the existing water systems, component by component
  - Used to identify investments for costing capital maintenance needs
- **District capacity assessments**
  - Excel-based tool, capturing required staff, time dedication and skills
  - Used as input for calculating required direct support costs
- **Service provider assessment**
  - Done in five districts through interviews and guiding questions to POs
  - Answers helped to get operation and maintenance cost system by system
- **Water resources assessment**
  - A water resources management plan developed
  - Used to plan local protection works (CapEx) and larger catchment management that can be included in broader DDS

TOOL USED

- **Capital Expenditure**
  - Through detailed engineering design
  - Used freelance engineers
  - Used for 1) projecting investment costs and 2) fund mobilization
- **Operation and minor maintenance expenditure**
  - Used AtWhatCost model based on PO data
- **Capital maintenance expenditure**
  - Done through Excel tool using data from WASAC asset inventory
- **Direct support costs**
  - Done through Excel tool to calculate difference between actual and required staffs
  - What could be the cost implication in bringing more staffs
- **Water resources assessment**
  - A water resources management plan developed
  - Used to plan local protection works (CapEx) and larger catchment management that can be included in broader DDS
- **Consolidation of costs**
  - Excel sheet that draws on results of previous tools
  - Allows spreading costs over time

RESULTS

WATER LEVEL OF SERVICE



CAPITAL EXPENDITURE

Data collected

- Geographic coordinates of different existing water infrastructures and pipeline route
- Identification of water sources and estimation of their discharge using bucket and stopwatch
- Geographic coordinates of new and extensions water networks based on planned village settlement
- Shapefiles of administrative boundaries (NISR)
- Population data (district documents)
- Water Supply Standards from RBS
- Other similar studies

Design parameters

- Design period = 25 years starting in 2018
- Population growth = 3% (2019 – 2029), 2% (2029 – 2044)
- Population density = 6 people per household (HH)
- Leakage Factor = 15%
- Tap Run-Time per Day = 6 hours
- Peaking Factor (PF) = 4 (24 hours / Tap Run-Time per Day)
- Flow to Tap = [Peaking Factor] x [Average Daily Flow]
- Residual Pressure Head at Tap = 10 – 20 meters
- Friction coefficients:
    - For PVC, n = 0.021
    - For galvanized steel, n = 0.02 to 0.03
    - For cast iron/ductile iron, n = 0.03 to 0.035

CAPITAL EXPENDITURE

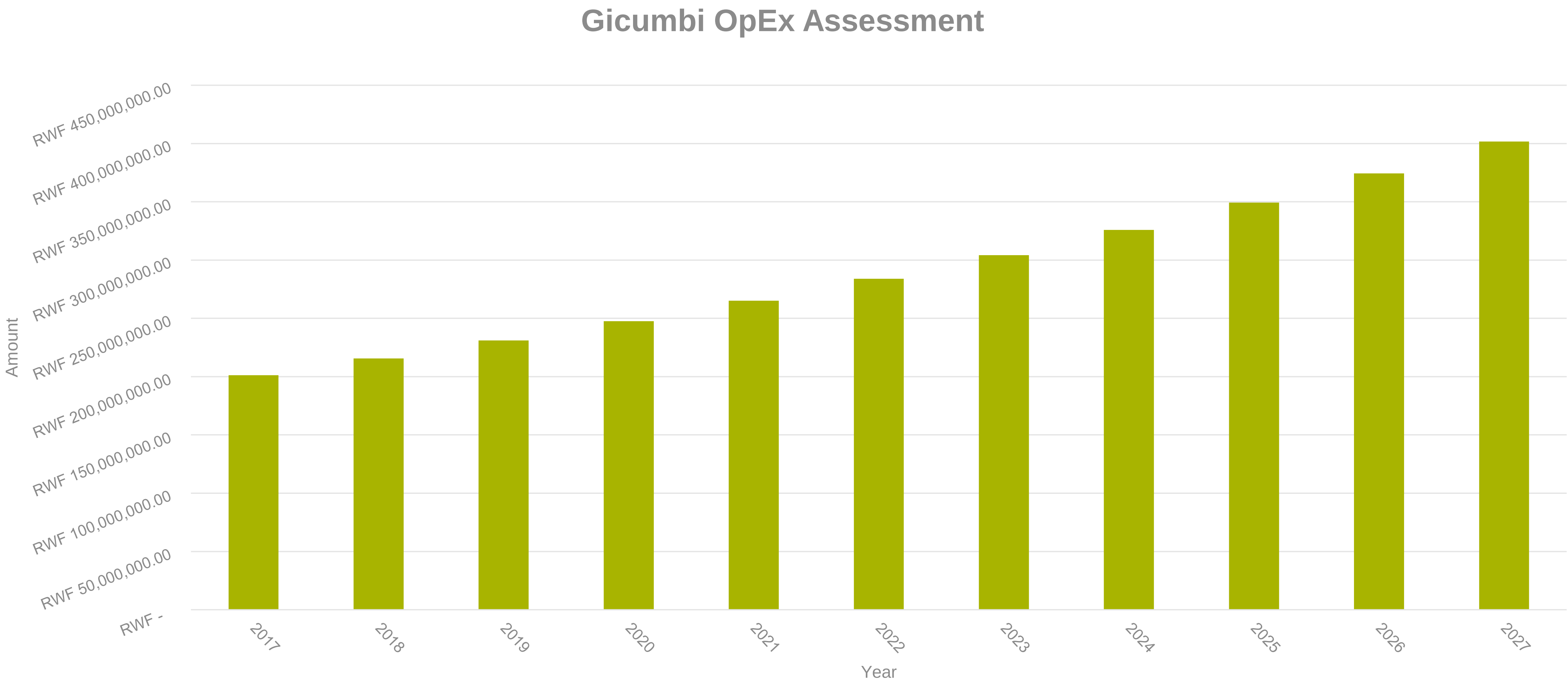
- 92 water supply systems have been designed
- 29 systems are new water systems
- 51 are to be totally rehabilitated
- 11 are partial rehabilitations
- 17 pumping water systems
- 75 gravity systems
- One reinforcement of Gicumbi city water supply network

The total cost is 42,220,896,838 Frw equivalent to $45 million

OPERATION AND MINOR MAINTENANCE EXPENDITURES

- Used AtWhatCost tool developed by Water For People and IRC
- Interviews with POs
- Filled out with general information about expenses, costs of investment in the system (calculated to determine the cost of minor replacement)
- Detailed calculation of all the projected costs for a certain period, differentiated between operation and maintenance, minor repairs, and major repairs/rehabilitations
- Gicumbi has two private operators: Ayateke Star Company and PAKAAM Ltd
- Both manage 21 water supply systems
- Both use the same tariffs and will get a new system to manage as soon as they are completed

OPERATION AND MINOR MAINTENANCE EXPENDITURES



CAPITAL MAINTENANCE COST ASSESSMENT

- Used an Asset Registry tool used to identify, catalog, and classify all water systems within a district.

- It helps to flag, prioritize, and classify different water systems within a district based on risk and need for repair.

- For prioritization, the following areas are considered:
    - Age of water system components
    - Physical state of water system components

CAPITAL MAINTENANCE COST ASSESSMENT

Cost categorization

Physical State	Definition	Life cost cycle step	
Normal	The current physical state does not impact the functionality of the particular component. Minor repairs and/or more in-depth maintenance might be needed to prevent future problems, but these deficiencies that will need eventual repairs do not inhibit the functionality of a component at the time of the assessment.	OpEx	Minor Repair
Poor	The current physical state is such that the functionality of that component is impacted and inhibited. The component will need repairs or replacement to function at full capacity.	CapManEx	Major Repair
Does not function	The component is not functional whatsoever given the significance of the repairs needed and is likely impacting the overall function of the water system itself. It will need full-scale replacement or rehabilitation, or large-scale repair to function again.	CapManEx	Construction/ Replacement

CAPITAL MAINTENANCE COST ASSESSMENT

Cost reference units

Copy of Rulindo Asset Analysis Piped Systems with System and data added columns_v9B (3) [Read-Only] - Excel

Component	Activity	DN	PVC (PN 10) accessories/fittings	PVC (PN 16) accessories/fittings	PVC (PN 25) Unit length (1m)	G.S (PN 10) accessories/fittings	G.S (PN 16) accessories/fittings	G.S (PN 40) accessories/fittings	G.S (PN 45) accessories/fittings
Conduction Line	Minor repair (Accessories/fittings)	40	5,600	35,000					
		50	16,500	40,000		11,000	18,000		
		60	21,500	50,000			25,000		
		65	31,500	85,000	150,000		26,500		
		75	53,000	110,000	175,000		35,000		
		80	120,000	115,000	200,000		40,000	45,000	
		90	150,000	193,000			55,000		
		100	185,000	200,000	230,000		85,000		120,000
		110	200,000	215,000	275,000		95,000		
		125	210,000	250,000			130,000		

Component	Material	Tank size (m^3)	Minor repair	Major repair	Construction/Replacement
Storage tank	Stone Masonry	5	208,000	2,000,000	3,800,000
		10	247,000	3,000,000	5,600,000
		15	286,000	4,200,000	7,700,000
		20	300,000	4,300,000	8,300,000
		25	325,000	5,000,000	9,950,000
		40	350,000	6,100,000	10,500,000
		50	682,500	5,400,000	12,500,000
		60	700,000	6,000,000	13,000,000
		80	975,000	6,500,000	15,000,000
		100	1,170,000	7,100,000	15,800,000
		125	2,000,000	8,000,000	17,500,000

Material	Tank size (m^3)	Minor repair
Concrete	5	
	10	
	15	
	20	
	25	
	40	
	50	
	60	
	80	
	100	2,500,000
	125	

Raw Data | ComponentCostCalc | Overview of investment needed | CostReferenceSheet | CapManEx categories

CAPITAL MAINTENANCE COST ASSESSMENT

Two types of cost are provided:

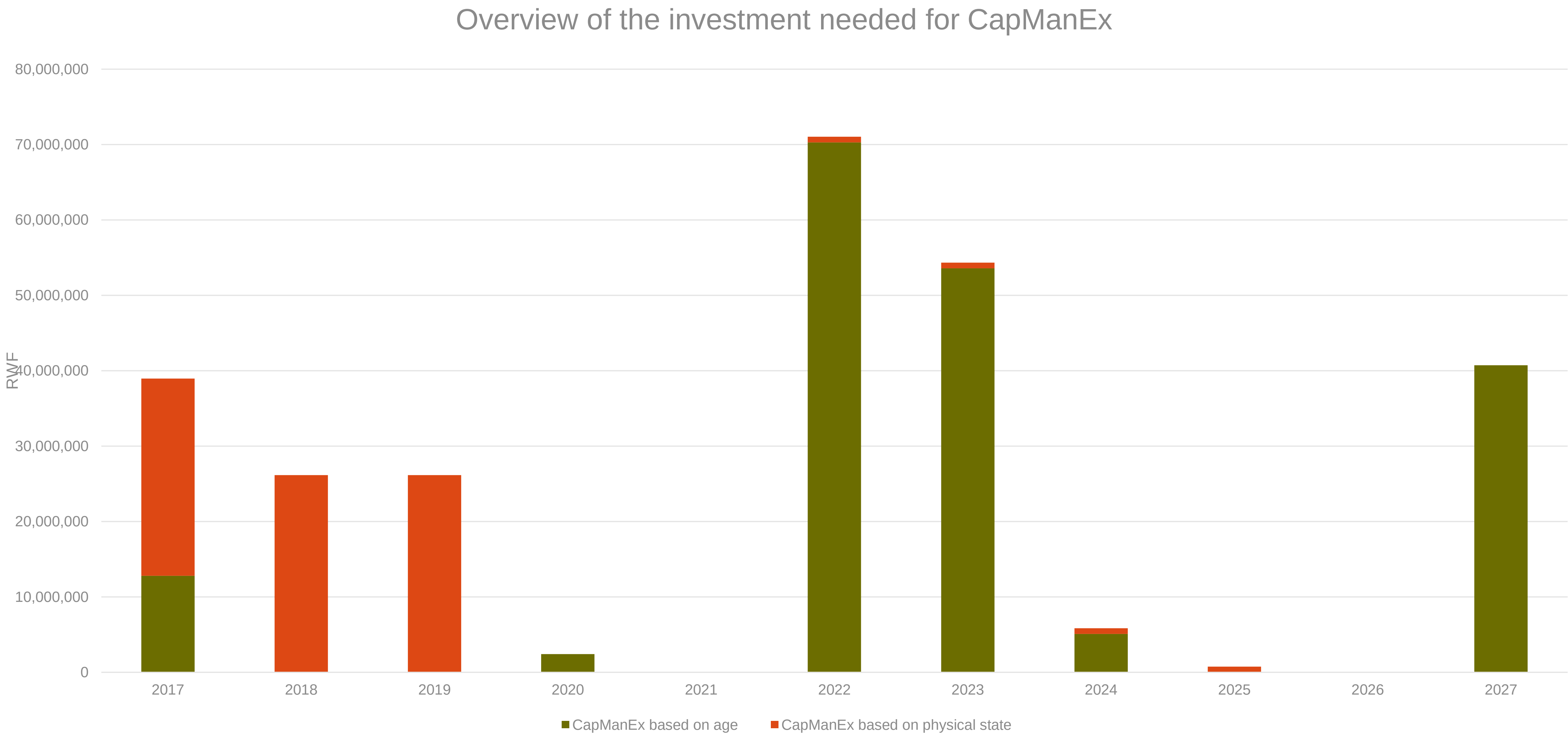
- Overview of the investment needed for CapManEx based on physical state

  When the physical state of a component is considered “poor” or “does not function” the tool considers the cost of major repair or construction/replacement respectively from the cost reference units. This is generally true, but there are exceptions noted in the CapManEx categories tab, such as tap stands, which are always OpEx even if the condition is poor/does not function.

- Overview of the investment needed for CapManEx based on remaining useful time

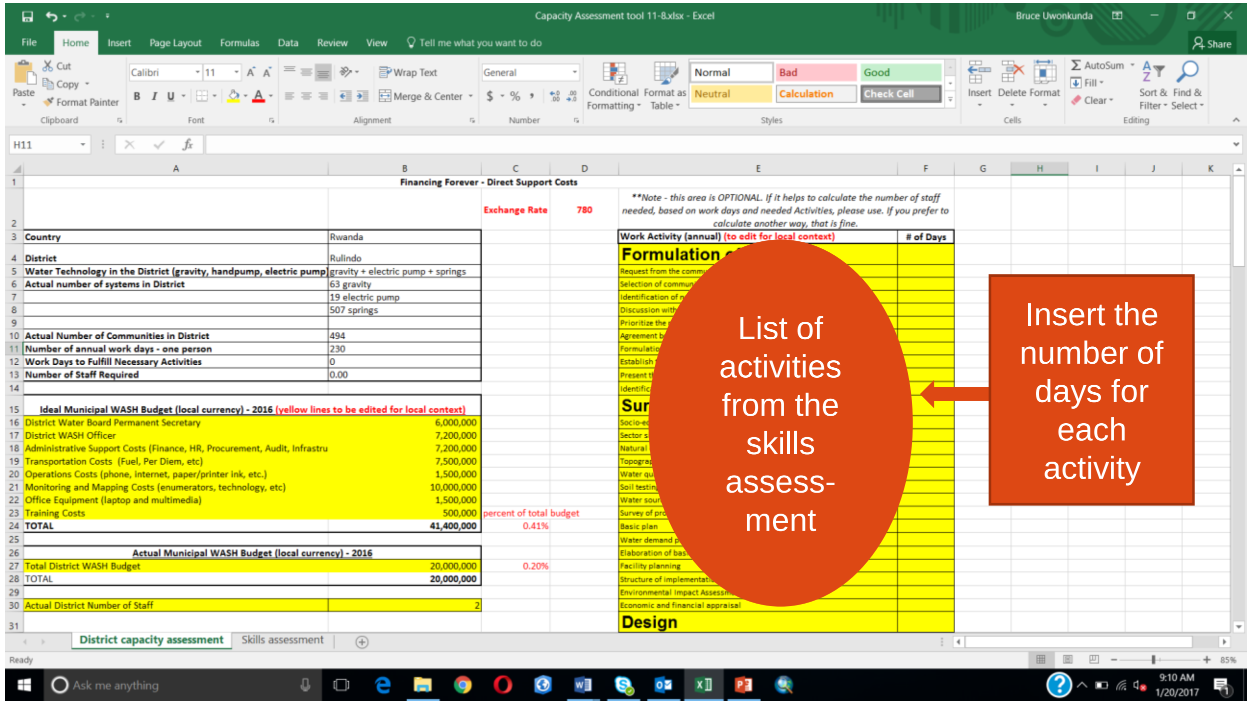
  When the physical state of a component is considered “normal”, the tool considers the cost of construction/replacement for that component and projects it into the corresponding year of replacement. The reference design lifetime information is obtained through a reference sheet tab

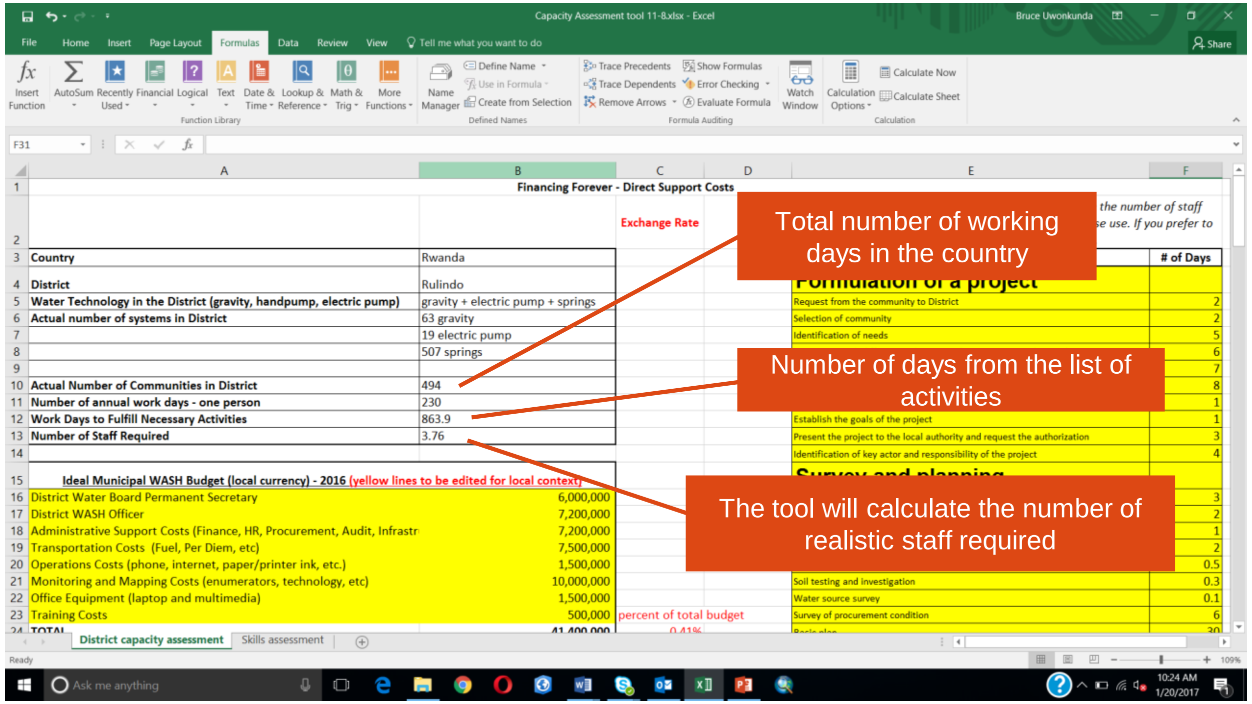
CAPITAL MAINTENANCE COST ASSESSMENT



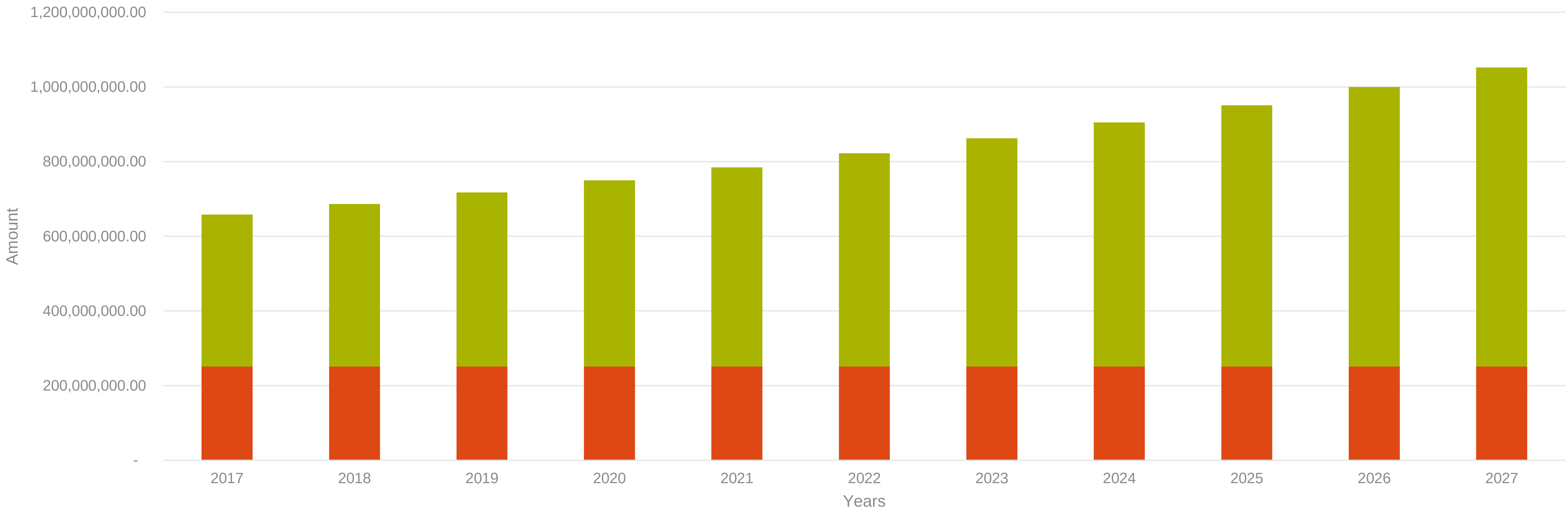
DIRECT SUPPORT COST ASSESSMENT

This tool is used to evaluate if the district has the required resources (financial & human) to ensure sustainability of WASH services.





DIRECT SUPPORT COST ASSESSMENT



WATER RESOURCES MANAGEMENT PLAN

- Gicumbi District developed district water supply sources management plans to ensure sustainability of water supply services.
- The study showed a perceived imbalance between water demand and supply in some sectors (administrative entities).
- Water quality results showed that among the seven parameters tested, total coliforms were observed in most of the springs and lower values of pH.
- The study recommended agroforestry with progressive terraces/cutoff drains, agroforestry with cutoff drains/horizontal trenches, agroforestry with radical terraces/gully treatment, forest plantations, and natural forests as collection measures at catchment levels.
- Diversion ditches, fences, planting, eucalyptus removal, and progressive terraces were recommended at immediate sources catchment level.
- To deal with the water quality aspect, the studies recommended installation of chlorination units (as disinfection facilities) and pH regulators.

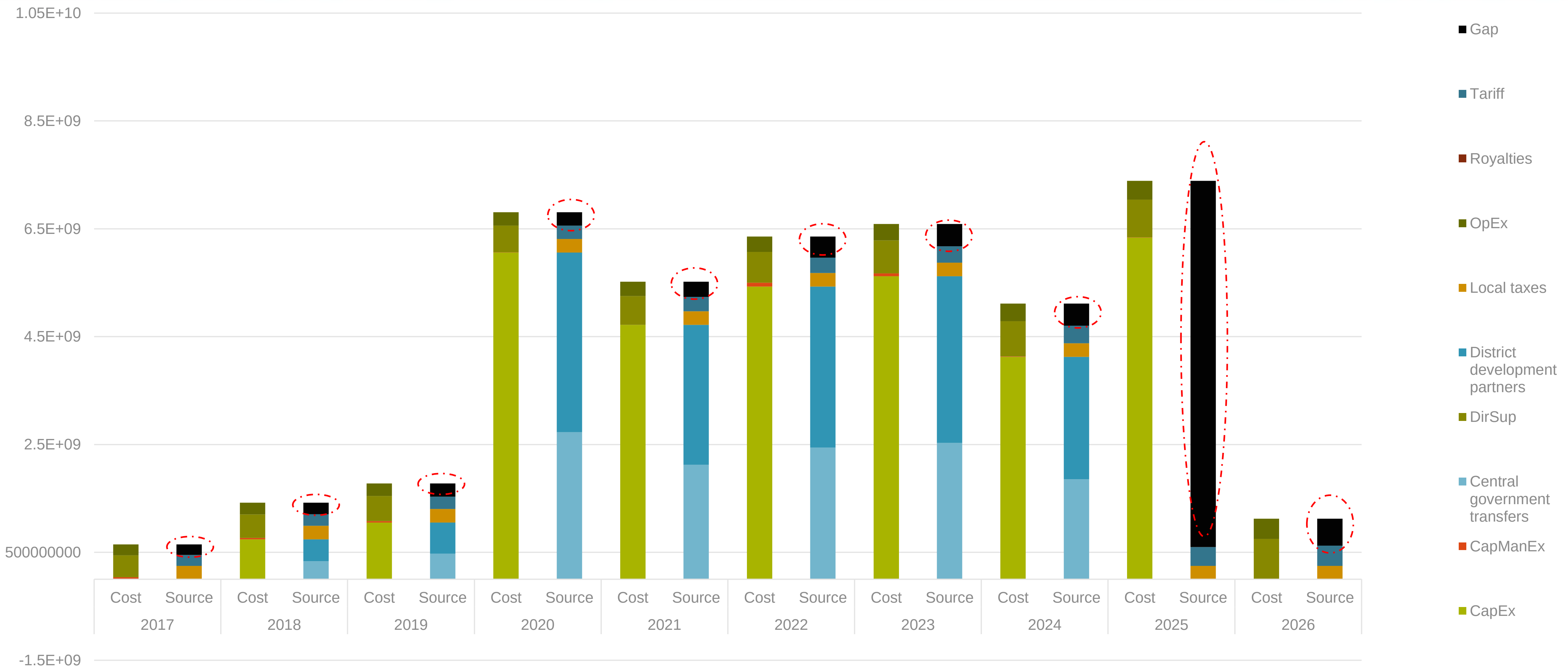
The water resources management plan implementation cost for immediate source catchment level were imbedded in the water system capital investment cost. The collective measures at catchment level were recommended to the Gicumbi District and the Ministry of Environment for consideration in their annual planning for ecosystem protection.

CONSOLIDATED COST

The tool used aggregates all costs calculated in separate tools at district level and provides an overview of all expenditure required to provide and maintain water services for the coming 10 years.

Service provider	CapEx + WRMP	CapManEx	OpEx	DSexp
WASAC utility	Entity: WASAC Dvpt Source: Central government transfers, Local taxes and District development partners	Entity: WASAC Dvpt Source: Central government transfers, Local taxes and District development partners	Entity: WASAC utility Source: Tariff	Entity: District Source: Central government transfers, Local taxes, Royalties and District development partners
Private operator	Entity: WASAC Dvpt, District Source: Central government transfers, Local taxes and District development partners	Entity: WASAC Dvpt, District Source: Central government transfers, Local taxes and District development partners	Entity: PO Source: Tariff	
Community/Individual	Entity: WASAC Dvpt, District Source: Central government transfers, Local taxes and District development partners	Entity: WASAC Dvpt, District Source: Central government transfers, Local taxes and District development partners	Entity: community Source: Tariff	

CONSOLIDATED COST



Findings and Recommendations

- The district has secured all the funds for all the new infrastructure, but it has a gap in 2025 due to the construction of a new treatment plant
- The tariff will fully cover OpEx and no gap was observed in the 10 years
- The district does not allocate budget for capital replacement cost and should start planning for that based on the result of the capital maintenance cost
- The district needs to increase the number of staff and budget to cover the gap identified in the Direct Support cost
- The full life cycle costing investment planning should be undertaken in all remaining districts of the country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