



Coastal Municipalities Water Utility



Annual Report 2019



January 2020

TABLE OF CONTENTS

ACKNOWLEDGEMENT	4
EXECUTIVE SUMMARY	5
INTRODUCTION	8
1- TECHNICAL PROGRESS ACTIVITIES	10
A. <i>Improve the Water Quantities</i>	10
A.1 Overall Water Distribution System Efficiency	10
A.2 Improve Water Facilities.....	20
1- Construction New Water Wells.....	20
2. Electrical Refurbishment, Upgrading and Repairs Installations.....	20
3- Mechanical Refurbishment, Upgrading and Repairs Installations	28
4- Fuel Distribution	31
A.3 Improve Water Wells Functionality	32
A.4 Improve Energy Consumption	34
B. <i>Improve Water Quality</i>	37
B.1 Disinfection Efficiency.....	37
B.2 Residual Chlorine Monitoring Program	37
B.3 Chlorine Dosing Units:.....	41
B.4 Chlorine Supply and Chemicals Delivery for Desalination Plants:.....	41
C. <i>New Water Resource</i>	42
C.1 Sea Water Desalination Plants	42
C.2 Brackish Desalination Plants:	45
C.3 Water Networks	46
C.4 Water Tanks	47
C.5 Gaza Sustainable Water Supply Program (Associated Works for Gaza Desalination Project).....	48
D. <i>Waste Water Treatment Plants:</i>	49
D.1 Gaza Central WWTP Project.....	52
D.2 Khan Younis Wastewater Treatment Plant (KHWWT)	57
D.3 The Permanent Northern Treatment Plant (NGEST).....	59
E. <i>Storm Water Activities</i>	59
F. <i>Waste Water Activities</i>	61
F.1 WW Networks.....	61
F.2 Electromechanical Services for Waste Water & Storm Pumping and Treatment Facilities.....	61
2- PROGRAM ACTIVITIES PROGRESS	69
2.1 <i>Geographic Information System (GIS)</i>	69
2.2 <i>Environmental Management Plan (EMP)</i>	69
3. OTHER ACTIVITIES	70
3.1 Enhance the identity of the CMWU as fully functional service provider:	70
3.2 Coordinate with other entities:	70
3.3 Donors and missions to visit the CMWU Facilities:	72
MAIN OBSTACLES	75
SUCCESS STORY	76
CONCLUSION	78

List of Figures

Figure 1 Overall Annual Water Networks System Efficiencies -Year 2019.....	11
Figure 2 Total annual water supply (m3) January-December 2019	16
Figure 3 Total annual Production (m3) January-December 2019	17
Figure 4 Mekorot water supply as per municipality -December 2019.....	17
Figure 5 Municipal Water Supply Quota L/C/D: January-December 2019	19
Figure 6 Part of the upgrading activities	21
Figure 7 Part of maintenance works	25
Figure 8 Part of SCADA Works.....	26
Figure 9 SCADA system for water wells.....	27
Figure 10 PV systems installed	28
Figure 11 Part of mobile mechanical maintenance and repair workshop activities.....	31
Figure 12 Monthly Functionality Percentage for served Areas-Year 2019	34
Figure 13 Monthly Specific Energy Consumption 2019	35
Figure 14 Monthly Water Disinfection Percentage 2019.....	37
Figure 15 Chlorine solution supply to water facilities.....	41
Figure 16 Deir Al Balah Sea Water Desalination Plant	42
Figure 17 Ongoing activities at Sea Water Desalination Plant – Southern Governorates	43
Figure 18 Gaza STLV Desalination plant	44
Figure 19 Gaza STLV Main power line	44
Figure 20 Rehabilitation of brackish RO plants	45
Figure 21 Abasan Al Kabera RO plant.....	46
Figure 22 Rehabilitation of Al Shifa water network	47
Figure 23 Al Amal and Al Sattar Water Tanks- Khan Younis.....	47
Figure 24 BLWWTP terminal pumping station Spare parts and maintenance activities	50
Figure 25 Cleaning of anaerobic wastewater lagoons –Rafah wastewater treatment plant..	52
Figure 26 Central WWTP Pressure line	54
Figure 27 Central WWTP Gravity Pipeline.....	55
Figure 28 Solar Panels installation.....	55
Figure 29 Parts of Shiekh Ejleen Measures	56
Figure 30 Part of Wadi Gaza measures	56
Figure 31 Khanyounis Central TP.....	57
Figure 32 Infiltration Basin at Al Fokhari	58
Figure 33 Storm water preparedness activities	60
Figure 34 new automatic basket screen.....	62
Figure 35 Installing mechanical Bar Screen at Hesbit Alsamak PS	63
Figure 36 Installing sand removal clam shell at Al Wafia PS	63
Figure 37 Sewage PS repairs.....	63
Figure 38 Heavy Machinery Repairs	64
Figure 39 CMWU Public Awareness Activities	74

List of Tables

Table 1. Overall Annual Water Networks System Efficiencies -Year 2019.....	11
Table 2 Networks Repair Jobs January – December 2019	13
Table 3 Total Annual water supply 2019 /All resources:.....	14
Table 4 Total annual MEKEROT Water supply (Israel Line) - Year 2019.....	15
Table 5 Total Annual Water Supply from different sources – Year 2019.....	15
Table 6 Water Quota L/C/D-Consumption side: January-December 2019	18
Table 7 summarized the upgrading works during 2019.....	22
Table 8 Summarized the Maintenance works during 2019.	24
Table 9 Water wells with SCADA system.....	26
Table 10 List of upgrading works at water facilities	29
Table 11 The monthly water wells specific power consumption - YEAR 2019	35
Table 12 Water Disinfection Monitoring Program -Year 2019.....	39
Table 13 List of major rehabilitation and repair works/ WW&SW facilities	64

Annexes

Annex 1: list of Implemented solar energy interventions in 2019

Annex 2: Average Wastewater Quantities and Treatment Efficiency for the WWTPs during 2019

Annex 3: Report's summary in Arabic

ACKNOWLEDGEMENT

This annual report has been prepared by the Coastal Municipalities Water Utility (CMWU), the report is mainly composed of all relevant activities progress schemes implemented from January to December 2019.

Special thanks are to PWA leadership for their input as a supportive regulator for the sector and to the Board of Directors of the Coastal Municipalities Water Utility for their valuable support in order to pass through the hard times and achieve CMWU's goals through implementing different activities and projects.

Thanks also continue to all CMWU's partners & donors to their continuous support in financing water and waste water projects such as KFW, ICRC, UNICEF, EU, OCHA, IsDB, AFD, QO, NRC, Oxfam, GVC, AAH, Islamic Help, Human Appeal, UNDP, Save the Children, Qatar Charity, Muslim Hands and Ma'an.

High appreciation especially for ICRC, UNICEF, Oxfam and AAH for their interventions to bridge the gap in O&M activities to keep running the water and wastewater services. Without their supports it would have been difficult to overcome many of the humanitarian problems, also their assistance to implement some of emergency projects, upgrading activities, and operation supports to avoid environmental disasters and further deterioration of the water sector as their interventions are the reason behind keeping the provision of the adequate level of water supply and wastewater collection in Gaza Strip.

EXECUTIVE SUMMARY

Throughout this year, the CMWU team manage and carry out all normal operations and maintenance tasks with all monitoring programs set as per several utility performance indicators. The overall hydraulic efficiency of the existing water distribution networks is **64%** with **36% of** Non-Revenue Water (NRW) for Middle, Khanyounis and Rafah governorates, while it reached **63%** in average for the Gaza Strip, Water Wells functionality efficiency is **98%**, water disinfection efficiency is over **98.9%**. Also, manage weekly quality monitoring program for all wastewater treatment plants through utilizing CMWU central lab.

Despite of catastrophic deterioration of electric power supply connected to various wastewater treatment plants all over Gaza strip and having most of the plants hydraulically and biologically overloaded, the records showed satisfactorily progressive achievement of **80%** average removal efficiency for the year 2019.

The CMWU carries out more than **215** predictive, preventive and corrective maintenance job orders at various areas for the existing **86** back up electric power supply generators that are heavily and severely affected by long daily hours of operations which create lots of repair and maintenance needs and parts. During the period of this year the grid electricity supply has been slightly improved to have daily scheduling scheme of 8 hours on ,8 hours off,8 hours on, but unfortunately emergency Diesel fuel supply for wash facilities was finished on November 2018 which negatively affected in somehow various services provisions.

The CMWU carries out on time reactions with all programmed inspections and preventive maintenance requirements for all water and wastewater facilities, more than **954** repair job orders were carried out during 2019 for all municipalities.

Moreover, and due to the deteriorated economic situations that the Gaza strip faces under political division, alleged reconciliation procedures (salaries deduction percentages, Early retirement, etc..), and siege continuity, the collection ratios in the Southern Governorates declined from 31% in the last quarter of 2018 to **less than 25%** as an average by the end of December 2019.

On the other hand, other strategic activities are on-going:

1. The construction of STLV seawater desalination plant 6,000 m³/day; which is funded by EU and implemented by UNICEF in cooperation with PWA and CMWU is operated, while the construction of the second phase to expand the plant to reach 20,000m³/day has been commenced early this year with targeted completion and commissioning mid-2021

.Also, on-grid 560KWp PV solar power field was successfully commissioned and brought into operation mode under sharing scheme with the Grid to serve south STLV desalination plant and reduce specific power consumption by 12%.

2. The construction of two water tanks, carrier water lines and pumping stations in El Amal and El Satar areas through EU fund is accomplished April 2019; as a complementary program to the STLV Southern sea water desalination plant.
3. The construction of the of Gaza sea water desalination plant (10,000 m³/day) as part of the STLV funded by KDF-IsDB was successfully completed and commissioned by Diesel generators on August 2019 matching all contractual performance guarantees, and wait for grid electricity to be connected by March 2020, enabling the plant to be fully operated to serve western districts of Gaza city.
4. The work is finished in the expansion of Middle area desalination plant to increase the capacity from 2600 m³/day to reach 6000 m³/day as part of the STLV early 2019.
5. The construction of Gaza central wastewater treatment plant with capacity 60,000m³ /day as phase I; is still ongoing; the project is funded by KFW and implemented by the CMWU, and the plant is currently under testing and commissioning still ongoing; the project includes upgrading Al Sheikh Ejleen existing WWTP which is also completed, in addition to another ongoing activity for providing the WWTP with 5 Megawatt of solar energy system, and cleaning Wadi Gaza.
6. The construction of Khan Younis central wastewater treatment plant with capacity of 26,000m³ /day (phase I) is completed and the plant is still under trial operation; the project is funded by KDF-IsDB & Japan and implemented by UNDP in cooperation with CMWU and PWA.
7. The CMWU in cooperation with UNICEF through USAID fund has implemented a Storm water detention basin of 140,000-m³ capacity and a pumping station of 1500 m³ /hr to collect the Storm water from Nujili and Abeda depression zones in Rafah. The project is operational now and its positive impact has been touched during 2019/2020 winter season. Recently, through EU fund the existing storm water box culvert will be extended to cover additional catchment areas at Rafah, in addition infiltration boreholes will be constructed inside the basin to infiltrate the collected rain water to the aquifer.
8. The CMWU in cooperation with Oxfam through EU fund is implementing a project for strengthening the Effectiveness of the public brackish desalination plants in Gaza Strip,

the project includes rehabilitation works at 16 Ro plants in addition to providing solar system for 8 RO plants.

9. In cooperation with PWA and CMWU, Unicef through Kuwaiti fund has launched the consultancy services tender for construction storm water system at Khan Younis & Dair Al Balah, to protect 100,000 inhabitants from yearly floods, in addition to providing 6 WASH facilities with solar energy. The physical works will be started on the ground by September 2020.
10. Through EU fund, the CMWU in cooperation with PWA and MoF is preparing the tender documents for NRW program, the tenders are supposed to be launched by MOF during the second quarter of 2020. The programme will reduce the NRW in the southern governorates from 35% to 20% and will include installation of pre-paid meters, disconnect the illegal connections, replace the old network and public awareness program to enhance the people to accept the idea of the program activities.
11. Through EU fund, the CMWU is also working on preparation the tender documents for storm water project in Rafah and providing 3 WASH facilities with PV solar system, the consultancy tenders will be launched by MOF as well during 2020.
12. Construction of Aslan Storm water basin at Beit Lahiya, over 8000 m² is to protect 25000 people from flood and infiltrate 0.3 Mm³/ year the project is ongoing and implemented by Emm'ar Gaza through IsDB fund.
13. Reuse the treated wastewater in irrigation at Rafah, the project is completed and it is financed by EU through Oxfam.
14. As a part of KHWWT, the CMWU in cooperation with UNDP and through KDF-IsDB fund has completed the construction of Al Fukhari infiltration basins over 100 dunum, the basins are capable to infiltrate around 9,000,000 m³/year of treated water, and that will enhance the aquifer in that agricultural area as the infiltrated water will be utilized later for irrigation.
15. In cooperation with Ministry of local governorate CMWU will follow up with the assigned consultant to prepare the detail design of the wastewater system in the eastern towns of Khanyounis which supposed to be finished by October 2020. This project will include design of 170 KM of sewer pipe lines, 4 sewage pumping stations.

INTRODUCTION

Throughout 2019 year, all efforts and activities have been directed in parallel with some contributions towards implementing the essential required water, wastewater and storm water projects and managing a set of operational and maintenance tasks, especially after operating the newly constructed facilities (STLVs and WWTPs), such projects are playing a great role to improve the level of services for people in the Gaza strip and to mitigate various environmental and health risks. Hence to achieve the following;

- Develop a management, operational and financial system within quality performance criteria in different areas of Gaza Strip, which affects positively the type and level of service provided.
- Offer a comprehensive vision on the water and environmental situation in all areas; consequently, it is easier to prepare plans and find solutions to avoid the rapid deterioration in water situation in Gaza Strip.
- Achieve the operational performance of all working systems efficiently, which results in lowering the operational costs, using these operational systems wisely without affecting the quality of service provided for people and reaching fairness and non-profitable endeavours.
- Participate in developing and implementing the water strategic plan such as wastewater treatment plants, desalination plants, carrier lines and water tanks. Afterwards, focus on the operation and maintenance of such strategic projects, as well as decrease the operational costs so the people can benefit from such services in the long run.
- Work together in developing different available resources and capacities (humanitarian, technical, etc.) to manage and to have the water and wastewater sector functional, especially in times of crises and emergencies.
- Implement various plans, studies, and strategic projects, accredited and approved from parties such as PWA, MOP, EQA and MOLG, in order to elevate the quality of services offered to the citizens in a fair way and without any bias to any specific area.
- Develop and prepare the O&M budgetary plan for 2019-2025 which details the annual operation and maintenance expenses and costs required to maintain water and wastewater services at acceptable level over the coming five years.
- Develop and update the CMWU strategic plan for 2018-2023,

During the year, CMWU teams through several funding agencies such as ICRC, AAH, OXFAM, KFW, EU, save the children and GVC continue upgrading, rehabilitation, and resizing the water and wastewater facilities and networks to improve the water and wastewater services.

However, the implementation of different interventions has been facing a number of obstacles and restrictions to get the needed materials and equipment across the commercial gates. These restrictions and control over materials and equipment deliveries through the borders' gates have continued to cause several development strategies and plans to be in a noticeable delay and have affected on PWA and CMWU efforts to keep the service running without any main or major breakdown.

The continuity of the electricity problem and unreliable sources is still the reason behind the negative impacts on the operational schemes despite of providing many of water and wastewater facilities with solar energy systems to improve the operational situations of the targeted water wells, pumping facilities besides the treatment plants.

In Addition, Several financing and humanitarian agencies e.g. ICRC, UNICEF, ISDB, OCHA (HRF), KFW.... etc. have continued to play their great roles to assist and support part of O&M needs but with limited capabilities and interventions. Therefore, it has become relatively so difficult to fulfil, complete, and operate other strategic projects in the due time.

Meanwhile the difficulties are everywhere in the service area; so the challenges are the motivated forces to CMWU staff to run the services and even sometimes in cooperation with PWA attract the donors to implement some of the developmental projects.

Therefore, CMWU teamwork continues to manage and implement various repair, refurbishment and overhauling works related to more than **286** water wells, **55** water Storage tanks, **48** small scale brackish water desalination plants, **3** Sea water desalination plants, **30** water Booster stations, **67** wastewater pumping stations, **5** waste water treatment plants, water networks, storm water networks, sewage collection networks and basins with all associated equipment and systems upgrading and monitoring requirements. Purpose has been kept with high level of response towards several events of preventive and corrective repair and maintenance activities to minimize the risk of breakdown and operation time loss. Therefore, the CMWU has launched many services contracts during 2019, with local contractors for specialized upgrading, maintenance and repair needs e.g. generators, deep well water pumping sets...etc.

1- TECHNICAL PROGRESS ACTIVITIES

This report describes the progress achieved during the period from January to December 2019 in order to achieve the CMWU's targeted performance indicators. The running activities are being classified into different categories such as water wells activities; water desalination plants, water networks, metering management, disinfection activities, water storage tanks, wastewater pumping stations, networks and wastewater treatment plants activities with all associated mechanical and electrical upgrading, refurbishment and repair activities.

IMPROVING QUALITY & QUANTITY OF WATER

A. Improve the Water Quantities

A.1 Overall Water Distribution System Efficiency

Throughout 2019, and despite of various operational, economical constraints and challenge, CMWU continue managing, implementing and monitoring several programs and provide all relevant resources in order to improve the overall hydraulic efficiency of the existing water distribution networking systems and reduce the quantities of Non-Revenue Water (NRW) down to 36% in the Middle and Southern Governorates. The annual records and monitoring data figures on monthly basis showed that the hydraulic system efficiency is 64 %. CMWU believes that through the initiatives and procedures currently in place will allow the system efficiency to be monitored and improved with similar focus in the future. The improved management of data introduced by CMWU continues to be a valuable tool to monitor and report the figures of overall system efficiency and non-revenue water each month. Meter readings continue to be collected by the Municipalities and CMWU regional areas' staff. Although new data collection and verification procedures were introduced, some difficulties were experienced in the municipal reports; this requires CMWU to perform additional verification crosschecking and refinement of the submitted figures. The overall annual system efficiencies recorded are as follows:

Table 1. Overall Annual Water Networks System Efficiencies -Year 2019 /Middle and Southern Governorates

Water Distribution System Efficiency Report for 2019				
Monthly Average Values- South-Middle Areas				
No.	Month	Water production m ³	Water billed m ³	System Efficiency %
1	Jan-19	3000591	1961091	65.4%
2	Feb-19	2912649	1960875	67.3%
3	Mar-19	3134919	2012728	64.2%
4	Apr-19	3506248	2157350	61.5%
5	May-19	3640567	2159854	59.3%
6	Jun-19	3916653	2421308	61.8%
7	Jul-19	3849021	2471456	64.2%
8	Aug-19	4110909	2609400	63.5%
9	Sep-19	3853601	2435253	63.2%
10	Oct-19	3669245	2337171	63.7%
11	Nov-19	3439672	2267654	65.9%
12	Dec-19	3357826	2125653	63.3%
Total		42391901	26919793	63.5%

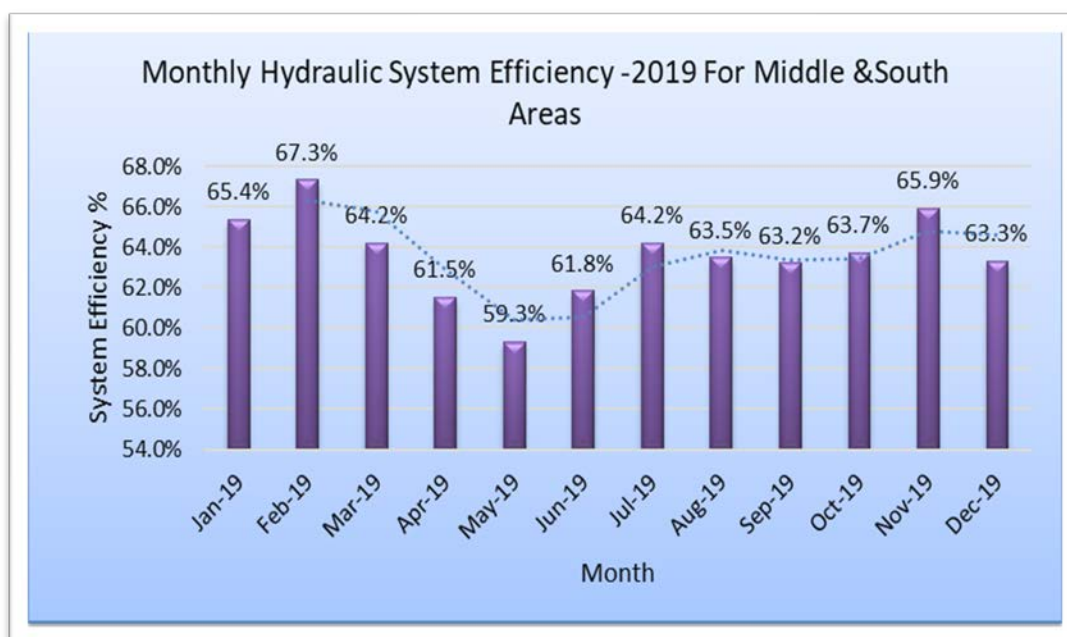


Figure 1 Overall Annual Water Networks System Efficiencies -Year 2019 /Middle and Southern Governorates

The normal trends of behavior and increase or decrease for hydraulic system efficiency of water distribution networks in the case of Gaza strip are subject to the seasonal water demand requirements and temperature conditions. Therefore, system efficiency increases during winter months and starts to decrease when it comes hotter where illegal connections especially used for irrigation which form about 20% of Non-Revenue Water

(NRW) consume a lot of water during hot weather and negatively affects the whole system efficiency. The efforts and initiatives to improve the system efficiency have continued during year 2019 and recently crowned by EU fund with totaling budget 8 Million Euro for NRW program which will take place at Rafah and Khan Younis areas during 2020 till 2023. The program includes networks' rehabilitation, domestic and district meters' installation, leaks detection activities in addition to public awareness campaigns, all those activities and interventions aim towards legalization of illegal connections and reduce the leakage and other losses towards improving the overall system efficiency. The following describes the main interventions implemented during 2019:

- Network Rehabilitation:

The water mains rehabilitation and repair program all over the Gaza Strip have continued to be applied by CMWU repair and maintenance team through the KFW, ICRC, UNICEF & ACF, and other interventions; in addition to the works done by CMWU mobile workshop specialized for such purposes. All the sites have been successfully handed over and operated again. The work for the construction and rehabilitation programs of water distribution networks were carried out based on criteria that was oriented towards reducing the unaccounted for water of both commercial and technical characteristics including disconnection of illegal connections. A comprehensive network repair and maintenance program were introduced to the targeted areas during the year 2019. Several works of water networks repairs were directly initiated and applied for all emergency repairs to assure water supply system continuity at various areas of Gaza strip municipalities. This program has been implemented in co-operation with the municipalities and regional offices network repair staff. CMWU procures the repair materials and issues them from warehouse to the teams in a well-controlled procedure. The Municipal crews carry out the repairs under the supervision and support of the CMWU's staff. Repair materials including repair clamps, MDPE fittings and joints and couplings continue to be issued to the municipalities from CMWU central warehouse.

A summary of 2049 repair jobs performed during the period from January to end of December 2019 are listed in the following table provided here below:

Table 2 Networks Repair Jobs January – December 2019

Annual Water Networks Repair Monitoring Records - Number of repairs-YEAR 2019/ Diameter ≥ 2 inches													
No.	Municipality	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Al Zahra	3	4	4	4	6	8	3	7	5	2	3	4
2	Wadi Gaza	2	2	4	3	2	2	3	3	3	2	2	2
3	Musader	2	3	3	2	2	5	6	3	2	2	4	3
4	Wadi Al salqa	3	2	2	3	3	2	4	3	2	3	3	3
5	Moghrakah	3	3	6	2	7	8	5	8	6	7	6	9
6	Buraij	8	5	6	8	8	10	7	12	13	10	9	11
7	Maghazi	6	8	4	6	10	7	6	5	9	7	9	10
8	Deir Balah	8	7	12	14	14	12	22	19	9	11	18	14
9	Zuwaida	4	4	6	7	8	9	7	10	7	5	7	7
10	Nusirat	10	14	19	24	13	15	21	18	14	16	20	14
11	Khan Younis	20	14	20	26	20	24	31	30	23	19	21	19
12	Khoza'a	4	5	5	7	6	4	6	6	5	6	9	5
13	Qarrara	4	5	8	6	6	7	8	4	9	9	6	8
14	Abassan Kabira	5	8	4	7	7	3	6	7	14	19	15	12
15	Bani Suhaila	9	9	15	10	17	14	16	10	6	15	10	11
16	Abassan Jadidah	4	4	3	6	8	7	5	1	7	6	5	3
17	Al Fukhari	3	4	2	2	3	5	2	5	6	4	4	4
18	Al Naser	3	2	4	5	4	7	2	5	3	6	3	2
19	Al shokah	7	5	5	6	2	3	4	6	5	3	2	4
20	Rafah	27	24	21	22	25	30	33	32	37	23	33	21
Total		135	132	153	170	171	182	197	194	185	175	189	166
Total Networks Repairs		2049											

This program of water distribution networks' repairs has contributed significantly to the reduction of the unaccounted for water. CMWU anticipates that through the efforts put into this task and the procedures developed; the network repair and maintenance program will continue with a similar focus in the future.

- **Meter Installation:**

The meter's installation program has been initiated and continued during the period of this report. It is anticipated that the effect of the installation of new accurate meters for both household level and bulk water level, particularly replacing blocked meters, will continue to improve the overall efficiency of the system and significantly reducing non-revenue water.

The meter installation program has continued to cover non-metered buildings including Hospitals, Schools, Mosques, Universities, Parks, etc. which are consuming water that is unaccounted for either financially in terms of revenues, or technically in terms of cubic meters of water consumed. The meter readings for these buildings are considered. Usually there are reconciliations among the municipalities, the CMWU and Ministry of Finance with regard to water bills for public buildings in lieu of health insurance for employees.

The tables below illustrate the production and consumption for each municipality on a monthly basis during the past year of 2019 including the received quantities from MEKEROT.

Table 3 Total Annual water supply 2019 /All resources:

No.	Municipality	Monthly Water Supply (m ³) - Year 2019 /All Resources (Wells & Mekorot)												Total Annual Production m ³
		January	February	March	April	May	June	July	August	September	October	November	December	
		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	
1	Um Al Nasser	18579	17270	20215	19839	23100	25509	28116	27787	27148	25177	23673	22150	278563
2	Beit Hanoun	259740	267850	287300	324500	415000	380650	414210	408680	371960	425030	335751	301163	4191834
3	Beit lahia	500489	432863	481113	467822	586078	610614	541136	521890	555638	503130	526032	437834	6164639
4	Jabalialia	925744	913739	1005415	1174234	1148591	1149886	1128784	990948	1000083	925744	1077758	906871	12347797
5	Gaza	2549596	2658004	2852910	2780295	3098474	3124801	3173744	3152256	3313117	3176218	3279570	2555319	35714304
6	Wady Gaza	10796	10113	12210	13020	14277	15304	18634	16339	14526	16195	13354	12493	167261
7	Al Moghraka	41875	41875	40130	47500	68170	68540	79675	79675	74690	70730	58305	58305	729470
8	Al Zahra	23316	24172	29380	45224	51660	40927	26704	53020	55185	31719	46132	34501	461940
9	Al Nusseirate	344580	318850	333570	393740	421590	421864	367530	404998	394030	389430	384430	408920	4583532
10	Al Burij	138346	146237	164088	168280	172790	216990	190220	210820	204220	180870	159670	183860	2136391
11	Al Maghazy	116350	111066	126114	141785	139900	145057	130889	145374	149458	121664	124760	121807	1574224
12	Al Zawaida	52220	86654	92928	112561	84037	146079	121925	126029	121458	121245	105290	95048	1265474
13	Al Mussader	15357	10253	17375	18162	24838	25201	17080	23310	20876	25346	12098	21569	231465
14	Deir Al Balah	453802	384664	410605	476176	447681	470880	441056	507157	469884	502620	439797	437541	5441863
15	Wady Al Salqa	12340	10540	14530	22170	30370	30900	34220	30786	26500	20984	18050	14490	265880
16	Al Qrara	97020	81037	107432	121044	148972	141535	145614	134517	145081	101526	104690	100016	1428484
17	Khanyounis	609609	607658	666456	681423	726198	831841	871171	858067	798727	783388	759183	712319	8906040
18	Bani Suhila	127550	138260	149100	177040	193060	203670	210520	223230	205030	164220	180970	130380	2103030
19	Abssan Al Kabera	102900	111000	102300	109400	114700	136100	159370	139200	142400	145700	115300	109700	1488070
20	Abssan Al Jadedda	26430	24540	30090	37060	41415	43687	49193	46782	45321	34160	29166	21842	429686
21	Khezaa	42024	46440	45838	54330	61762	69735	70135	69747	65957	59796	56972	48576	691312
22	Al Fokhary	24895	23055	26850	28275	33500	32945	37580	37700	34705	23843	23660	24783	351791
23	Al Nasser	30720	35090	25270	36130	35260	50040	55280	44910	39890	35510	39521	36920	464541
24	Al Shuka	45310	42570	45790	42170	45750	34220	47400	44140	45870	54930	49260	49050	546460
25	Rafah	685151	658575	694863	784178	784637	790814	774825	915100	799793	785369	719064	735706	9128075
Total Water Supply (m ³)		7,254,739	7,202,375	7,781,872	82,763,58	8,911,810	920,7789	913,5011	9,212,462	9,121,547	8,724,544	8,682,456	7,581,163	101,092,126
Total Mekorot Water Supply (m ³)		1099500	1037200	1070200	1088700	1104240	1003678	1100022	1047100	1053550	985350	958000	936600	12484140
Total Water Supply (m ³) water wells only		6,155,239	6,165,175	6,711,672	7,187,658	7,807,570	8,204,111	8,034,989	8,165,362	8,067,997	7,739,194	7,724,456	6,644,563	88,607,986

Table 4 Total annual MEKEROT Water supply (Israel Line), (m3): Year 2019

No.	Municipality	Monthly Mekerot Water Supply (m3) - Year 2019												Total Annual Mekerot Supply 2019
		January	February	March	April	May	June	July	August	September	October	November	December	
		m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	
1	A.L Nussirate	96400	83200	90000	94100	95400	75700	71116	67900	65750	81300	65700	70500	957066
2	A.L Bureij	31310	57490	6500	11000	13320	36200	22380	20110	19450	31930	24610	37100	311400
3	Al Maghazi	44390	40510	65400	66900	68280	55800	15004	27190	25300	8770	30390	31700	479634
4	Bani Suhaila	97430	80407	91318	107263	104372	109984	75981	115669	102918	70614	90244	34695	1080894
5	Abassan Kabira	98353	89655	86824	94260	92902	104252	119252	106787	110387	105849	80280	68912.08	1157713
6	Abassan Jadidah	24899	17686	24697	30821	32520	31763	33183	32963	32316	19733	16328	8174	305081
7	Khoza'a	38819	34852	36961	43556	48207	50102	44384	49382	48679	38304	36548	26519	496312
8	GAZA	667900	633400	668500	640800	649240	539878	718722	627100	648750	628850	613900	659000	7696040
Total Mekerot Water m ³		1099500	1037200	1070200	1088700	1104240	1003678	1100022	1047100	1053550	985350	958000	936600	12484140

Table 5 Total Annual Water Supply from different sources – Year 2019

Water Supply Categories	Monthly Water Supply (m3) - Year 2019												Total Annual Water Supply
	January	February	March	April	May	June	July	August	September	October	November	December	
	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	m ³	
Total Production m3-Water Wells	6,155,239	6,165,175	6,711,672	7,187,658	7,807,570	8,204,111	8,034,989	8,165,362	8,067,997	7,739,194	7,724,456	6,644,563	88,607,986
Total Mekerot Water m3	1,099,500	1,037,200	1,070,200	1,088,700	1,104,240	1,003,678	1,100,022	1,047,100	1,053,550	985,350	958,000	936,600	12,484,140
Total Monthly water supply (m3) -Year 2019	7,254,739	7,202,375	7,781,872	8,276,358	8,911,810	9,207,789	9,135,011	9,212,462	9,121,547	8,724,544	8,682,456	7,581,163	101,092,126

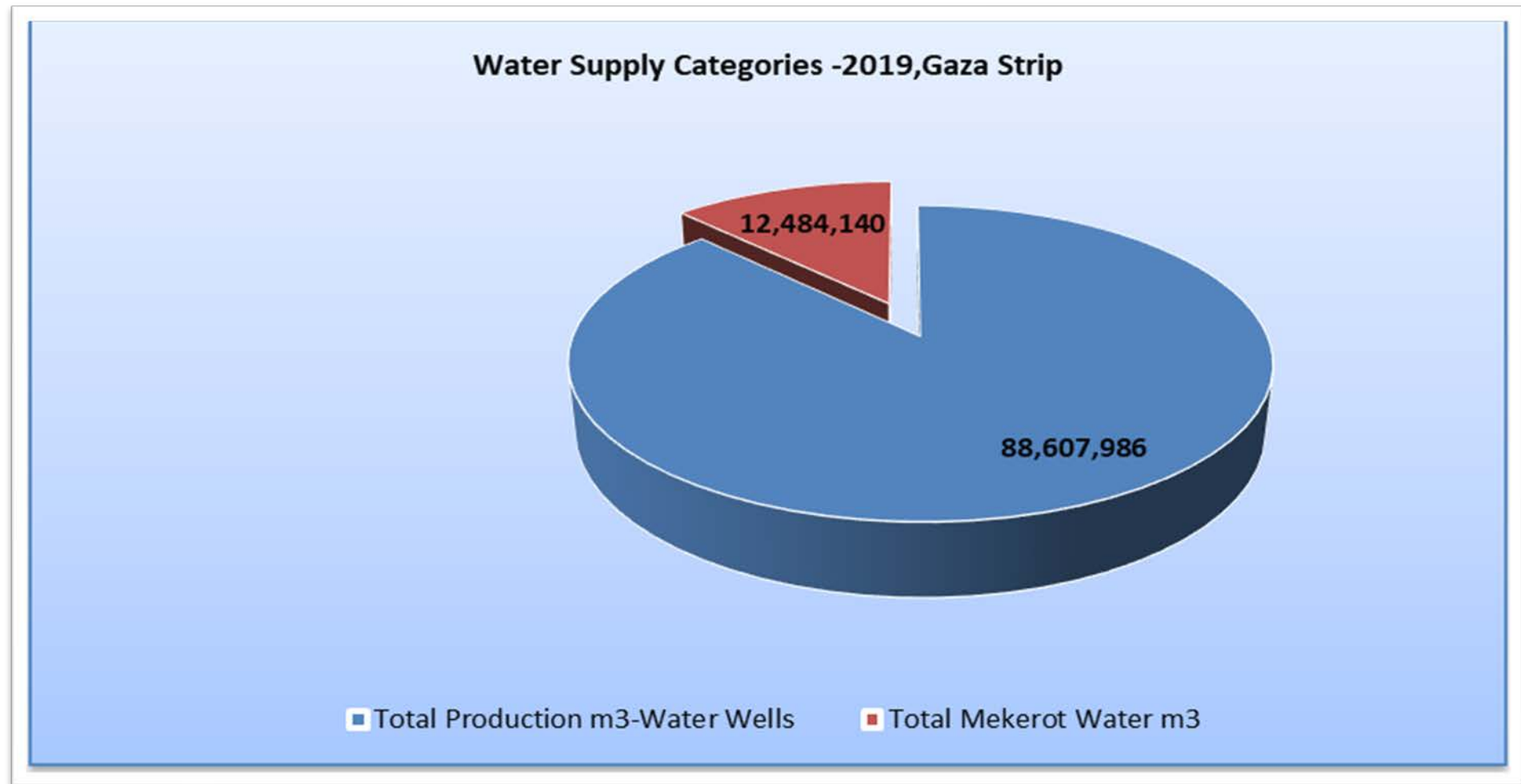


Figure 2 Total annual water supply (m3) January-December 2019

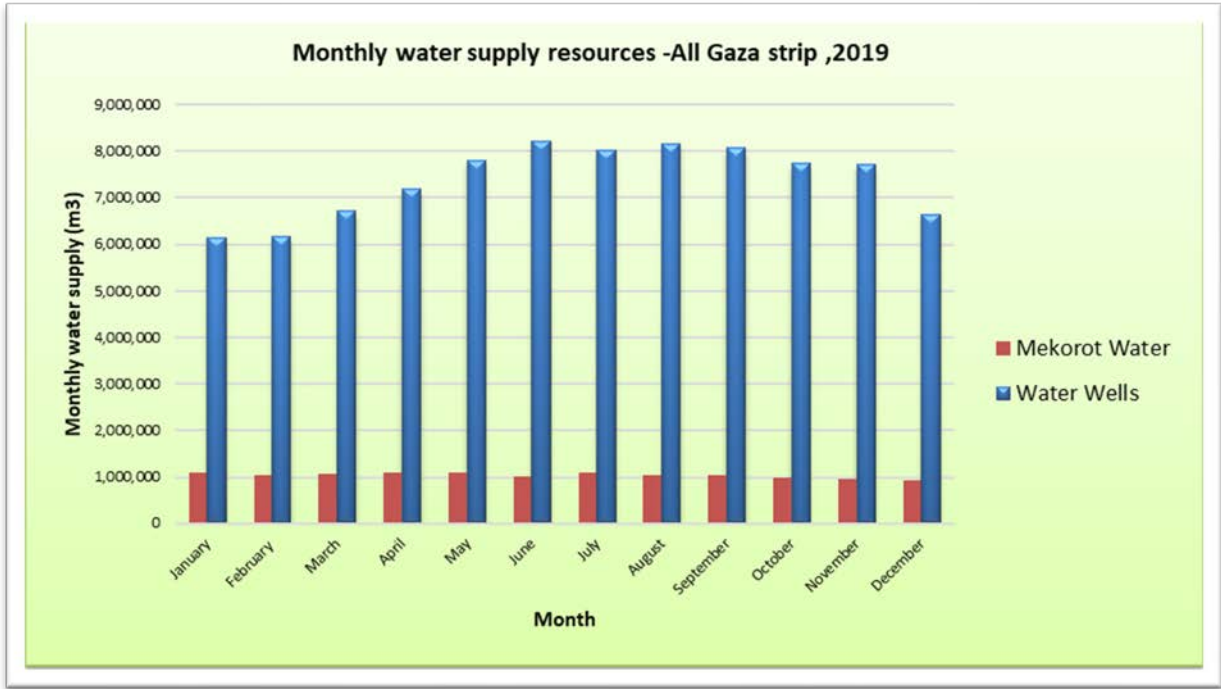


Figure 3 Total annual Production (m3) January-December 2019

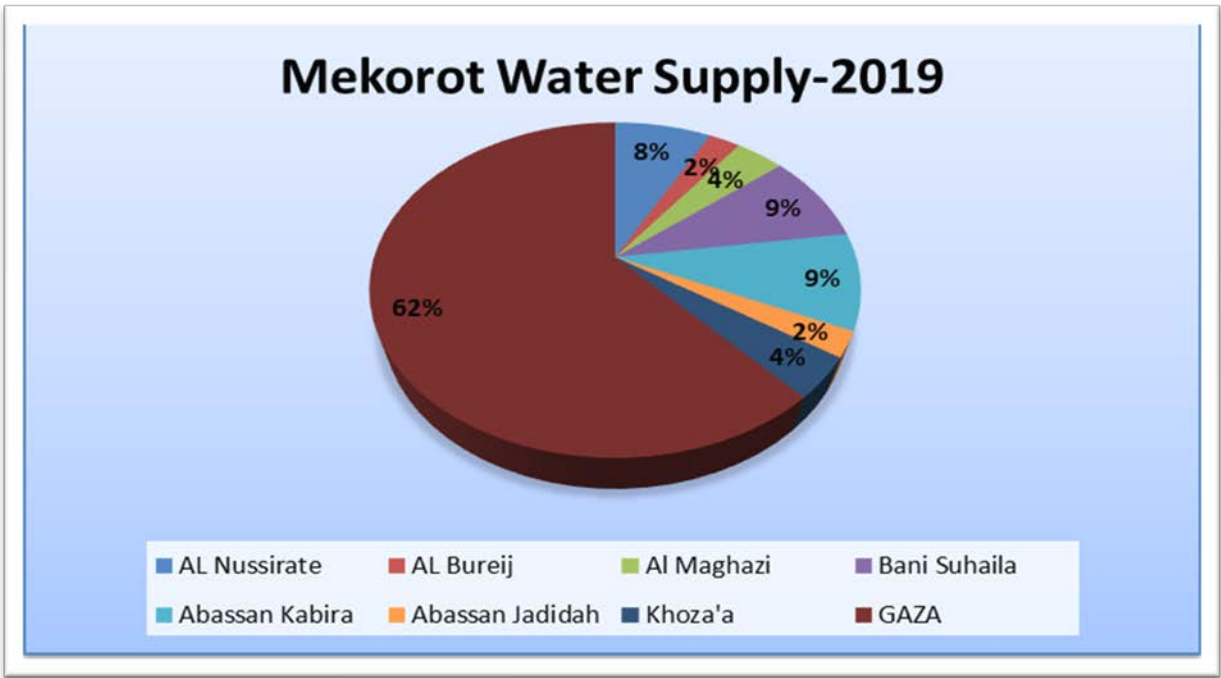


Figure 4 Mekorot water supply as per municipality -December 2019

Table 6 Water Quota L/C/D-Consumption side: January-December 2019

** : The water quota supplied to the people was drastically affected in some areas by continual prevailing conditions of electricity cut off and the lack of enough fuel to operate backup generators.

No.	Municipality	Annual Water Production from water wells	Annual Water supplied from Mekerot (Israel Co.)	Total Annual Water supplied from different resources	served Population	Non Revenue Water -NRW	Total Annual Water Consumption	Daily Water Consumption Rate (Quota)	Daily Water Production Rate (Quota)
		m ³	m ³	m ³	Capita	%	m ³	liter/c/day	liter/c/day
1	UmAl Nasser	278563	0	278563	4567	13.62%	240612	149	172
2	Beit Hanoun	4191834	0	4191834	61812	41.22%	2463891	112	191
3	Beit Iahia	6164639	0	6164639	100763	51.22%	3006966	84	173
4	Jabalia	12347797	0	12347797	267951	32.59%	8323078	88	130
5	Gaza	28018264	7696040	35714304	744426	35.00%	23214298	88	135
6	Wady Gaza	167261	0	167261	4492	29.28%	118281	74	105
7	Al Moghraka	729470	0	729470	10057	58.08%	305811	86	205
8	Al Zahra	461940	0	461940	6639	31.39%	316918	135	196
9	Al Nusseirate	3626466	957066	4583532	101409	40.67%	2719635	76	128
10	Al Buriij	1824991	311400	2136391	53016	41.61%	1247509	66	114
11	Al Maghazy	1094590	479634	1574224	35410	46.84%	836824	67	125
12	Al Zawaida	1265474	0	1265474	26526	42.40%	728864	78	135
13	Al Mussader	231465	0	231465	2933	49.43%	117062	113	223
14	Deir Al Balah	5441863	0	5441863	95330	51.02%	2665359	79	161
15	Wady Al Salqa	265880	0	265880	7235	33.00%	178128	69	104
16	Al Qrara	1428484	0	1428484	30397	37.24%	896450	83	133
17	Khanyounis	8906040	0	8906040	277293	26.40%	6555097	67	91
18	Bani Suhila	1022136	1080894	2103030	48746	29.17%	1489649	86	122
19	Abssan Al Kabera	330357	1157713	1488070	28312	20.03%	1190002	119	148
20	Abssan Al jadedda	124605	305081	429686	9327	21.91%	335548	102	130
21	Khezaa	195000	496312	691312	14065	22.78%	533824	107	139
22	Al Fokhary	351791	0	351791	8516	31.93%	239480	79	117
23	Al Nasser	464541	0	464541	9973	16.59%	387466	110	131
24	Al Shuka	546460	0	546460	16967	36.64%	346252	58	91
25	Rafah	9128075	0	9128075	247154	37.41%	5713558	65	104
		88607986	12484140	101092126	2213317	36.52%	64170562	79	125

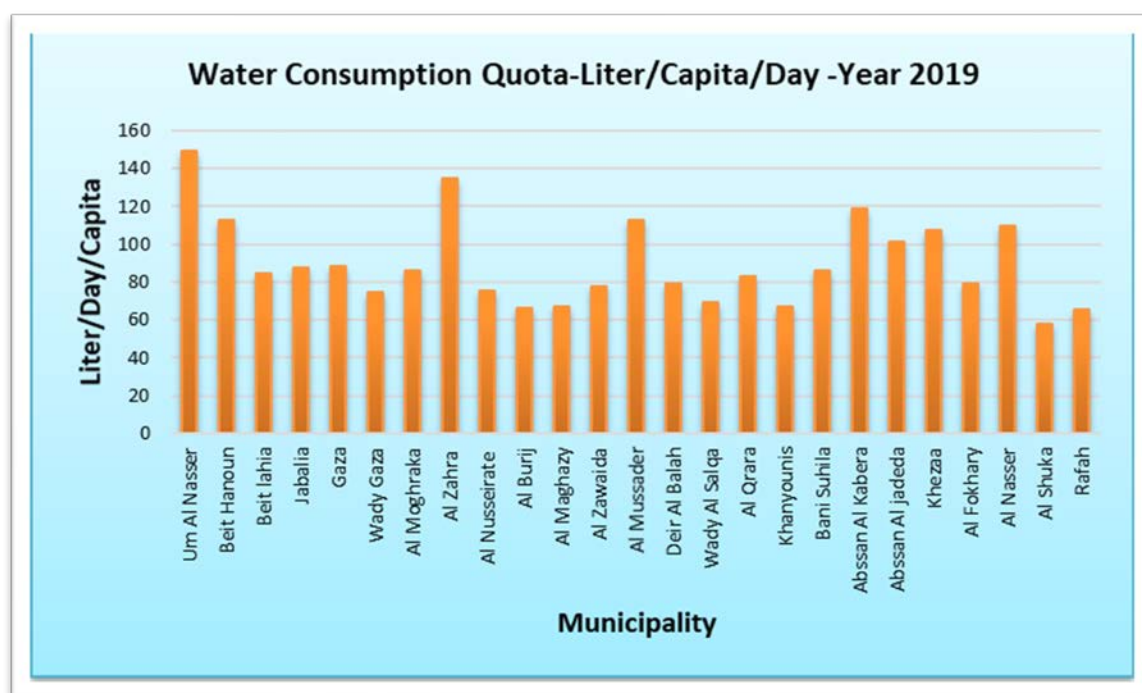
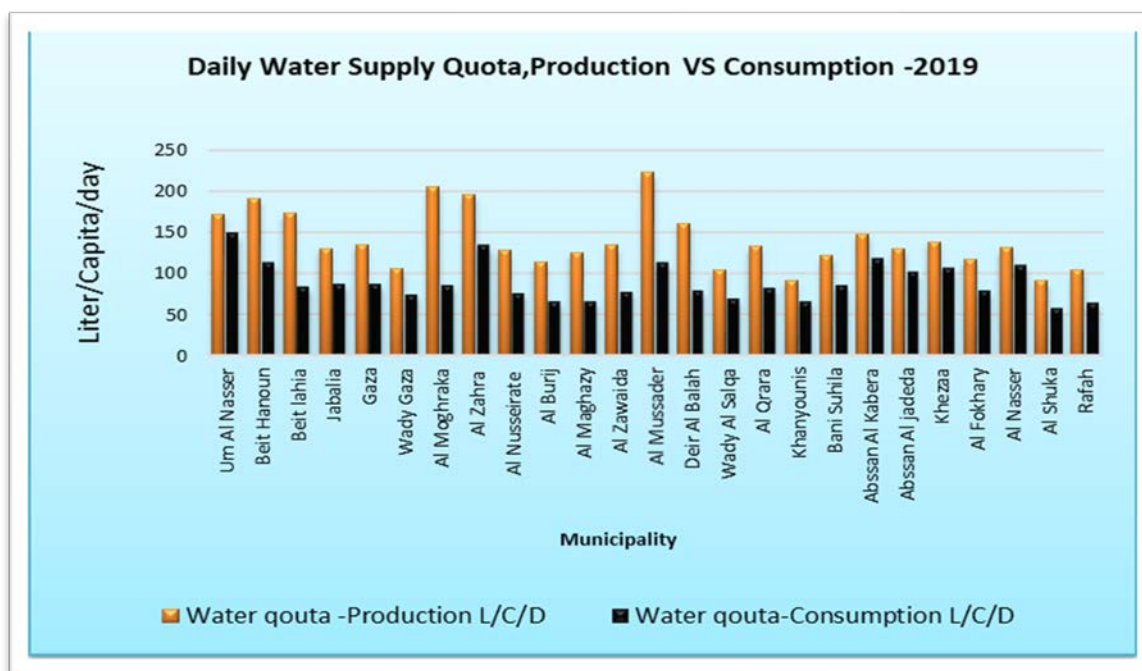


Figure 5 Municipal Water Supply Quota L/C/D: January-December 2019

A.2 Improve Water Facilities

1- Construction New Water Wells

In coherence with the PWA national plan to reallocate, resizing, and closing some designated water wells throughout the Gaza Strip in order to decrease water abstraction from the aquifer and improve the water quality as well; CMWU during the past three years stopped proposing any new construction for water well and all interventions are limited to maintain and rehabilitate the existing wells or reallocate some damaged or malfunctioned ones, besides completion the construction of some low production water wells to replace the closed wells with high production rates. The last newly constructed well in 2019 was Al Zohor at Rafah, it was financed by MAKKA association, the well is operational now and it feeds the adjacent reservoir.

2. Electrical Refurbishment, Upgrading and Repairs Installations

CMWU has continued to carry out and manage all electromechanical works and installations required to improve the functionality of the water wells and other associated systems providing for optimum operating and maintenance conditions. This will secure and safeguard the water productivity level over different seasonal periods of demand and throughout regional areas.

CMWU have continued its strategy towards the electrification of all newly constructed water wells and other water facilities e.g. water tanks with booster stations, desalination plants and some of existing wells by connecting them to the public electricity gridlines, all in coordination with Gaza Electricity Distribution Co. (GEDCo) and PWA. The electrification activities include the followings:

- The installation of both high and low tension electrical grid lines with all associated transformers for some water facilities have been already initiated while there are still other facilities waiting the materials entry to Gaza Strip in order to complete connecting all the facilities with electricity.
- Supply and install 2nd electricity power lines for critical water and wastewater facilities (Sewage pumping stations, water reservoirs and booster stations), where new four facilities have become electrified by second electricity feeder from GEDCo in addition to the previous facilities which will be electrified during emergency and hostilities conditions. This program was funded by ICRC to enhance operational readiness under emergency preparedness plan EPP established for water sector in Gaza strip.
- Provide and install automation and SCADA equipment and connections for 100 sites of water facilities which are located at the remote areas, and this will secure the water services and facilities operations' needs during hostilities without human interference, 18 water wells of 100 sites have

a SCADA system using SMS media to complete control with facility without any human intervention.

- Supply and install some standby power supply generating sets at various water wells and pumping sites to overcome the problems of electricity cut-offs which occur daily in Gaza strip.

Due to unavailability of spare parts resulting from continual security control by Israel authorities over the materials supplied across the borders and dual use classification, severe shortages of essentially required spare parts have been encountered. Due to this process CMWU still facing problems in transferring materials to Gaza especially the electrical materials like all types of power and control cables, soft starters, variable speed drives, electrical and electronic instruments.... etc. Fortunately, some of the required material were available at CMWU main warehouse, and have been used for electrical repairs and maintenance works in several water and waste water facilities during the past year. Therefore, more than 110 job orders have been issued either for rectifying or repairing some damages or to apply the routine and corrective maintenance in the water facilities. The main repair and maintenance works during year 2019 are classified to upgrading, maintenance, rehabilitation up to development works summarized here below:



Figure 6 Part of the upgrading activities

Upgrading Works:

Table 7 summarizes the upgrading works during 2019

Upgrading Works				
No	Municipality	Facility Type	Facility Name	Work Description
1	Dair El Balah	Seawater DP	Al Bassa DP 600m3/d	Upgrading works for small scale desalination plant with capacity 600 m3/d, the work includes supply and install new membranes, instrumentations, pumps, lap testing devices and other equipment.
2	Bait Lahia	WWTP	Bait Lahia WWTP	Supply and install new VFD for two pumps with power rated 350 KW per each one for the north WWTP in Bait Lahia through ICRC to keep the pumping unit active and to avoid any flooding in the waste water on Um Al Nasser village, Also the flow is available to go to NGEST plant in the eastern area.
3	Bait Lahia	Water well	Fatmah Al Ali	Supply and install new electrical control panel with current subscription 63 A
4	Khanyounis	Water well	Al Amal New	Supply and install new electrical control panel with current subscription 160 A
5	Al Buriij	Brackish DP	S-72	Supply and install new PLC instead the defect one, The work includes reprogramming the operation steps.
6	Jabalia	Pumping station	Abu Rashed	Supply and install new manual change over with rating current 1600 A, which is required to obtain of a secure and rugged operation and change between electrical sources.
7	Rafah	Booster Station	Al Zouhor Reservoir	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.
8	Rafah	Brackish DP	Al Salam	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.
9	Bait Lahia	Pumping station	Al Manshiia & Aslan No.4	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.
10	Khanyounis	Pumping station	Hesbet El Samak	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.
11	Jabalia	Pumping station	Mahader	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.
12	Nusirate	Pumping station	Al Mukhaiiam Al Jadeed	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.
13	Um El Nasser	Pumping station	Um El Nasser	Supply and install ultrasonic level meter. The works include connect the changeover electrical circuit with level meter.

14	Dair El Balah	Pumping station	Al Bassa	Upgrading works for electrical room, the work includes rehabilitation on the electrical panel, change some of PLC modules, supply and install new disconnect switches for existing pumps, relocation for the main panel to another room which is so far from waste gases dissipated from pump room.
15	Nusirate	Brackish DP	Taj Al Waqar	Supply and install head of magnetic flow meter for permeate outlet of desalination plant.
16	Rafah	Booster Station	CANADA Reservoir	Supply and install head of magnetic flow meter for the permeate water inlet of reservoir which is feeding from STLV of Khanyounis area.
17	Rafah	Brackish DP	Al Shooath	Supply and install head of magnetic flow meter for permeate outlet of desalination plant.
18	Bani Suhila	Pumping station	Bani Suhila	Supply and install head of magnetic flow meter for Bani Suhila P.S.
19	Bait Hanoon	Booster Station	Khadija Reservoir	Supply and install head of magnetic flow meter for Khadija reservoir
20	Rafah	Pumping station	Jomaizat Al-Sabeel P.S, AL Junina P.S, Tal AL Sultan	Supply and install complete PV system with rated energy 1 KW, the system includes PV panels, solar inverter, OPZ-V battery and other fittings to maintain the essential loads of critical water and wastewater facilities live like PLC, flow meter, magnetic float sensors, The targeted sites are as below:
21	Khanyounis	Pumping station	Al Wafia, Hesbit Al Samak, Al Majadlh	Ditto.
22	Dair El Balah	Pumping station	Al Bassa	Ditto.
23	Dair El Balah	Seawater DP	Al Bassa DP 600m3/d	Ditto.
24	Nusirate	Pumping station	Al Hassaina, Al Mokhaiam Al Jadeed, Main P.S	Ditto.
25	Zawaidah	Pumping station	Al Sawarha	Ditto.
26	Jabalia	Pumping station	Abu Rashed	Ditto.
27	Bait Hanoon	Pumping station	Al Sultan Abdul Hamid, Main P.S, Al-Zaitoun	Ditto.
28	Bait Lahia	Pumping station	Amer, Al Mashroa'a, Al Manshia	Ditto.

Maintenance:

Table 8 Summarizes the Maintenance works during 2019.

Maintenance Works				
No	Municipality	Facility Type	Facility Name	Work Description
1	Dair El Balah	Seawater DP	Al Bassa DP 600m3/d	Change some of PLC input output modules of Al Bassa desalination plant with capacity 600 m3/d.
2	Rafah	Booster Station	CANADA Rservoir	Maintenance works for Canada reservoir in the ATS panel, also, fabrication works for the existing bus bar to be secured and safe.
3	Bait Lahia	Pumping Station	Bait Lahia TPS	Repair and maintenance works for north waste water terminal pump station in Bait Lahia, the works include repair the electrical equipment and change another one by new one to keep the pumps functionality active mode which is mean the NGEST receive the daily waste water flow quantity.
4	Rafah	Booster Station	Al Saudi reservoir	Change 2 remote operator motor for the existing motorized change over
5	Bani Suhila	Brackish DP	Interpal	Repair the Interpal Desalination plant in Bani Suhila, the work includes reprogramming the existing PLC with new operation program.
6	Zawaidah	Pumping Station	Sawarha	Float level switch of type EMN-10 Three phase power Contactor from 16KW up to 50 KW, 100 Amps (DILM65) Three phase power Contactor DILK20 Panel Mounted Digital Ammeter or voltmeter , 96X96 mm
7	Rafah	Booster Station	Tika Reservoir	Three phase power Contactor DILK25. Panel mounted Digital Ammeter or voltmeter. Technical visit to a specified site according to a written or verbal instructions of the engineer
8	Rafah	WWTP	Rafah WWTP	Panel mounted Digital Ammeter or voltmeter. Technical visit to a specified site according to a written or verbal instructions of the engineer. Control Board for RVSDN starter. Miniature Circuit breaker MCB 3X25A Contactor DILK23 30 KVAR capacitor bank
9	Khanyounis	Storm water	Al Araishyah	Control Board for RVSDN starter.
10	Khanyounis	Well	Al Amal Opec	Control Board for RVSDN starter.

11	Khanyounis	Well	Al Satar	Three phase power Contactor 50 KW to 100 KW, 200 Amp (DILM170).
12	Al Shouka	Well	Malizy	Pressure switch of Danfos type 0 - 16 bar, Water proof (RT 116). Panel mounted Digital Ammeter or voltmeter.
13	El Nasser	Well	Municipality well	Under voltage and phase sequence protection relay. Three phase power Contactor from 50 KW to 100 KW, 200 Amp (DILM 115). Panel mounted Digital Ammeter or voltmeter.
14	Rafah	Pumping Station	Block O	Float level switch of type EMN-10. XLPE cable 4 cores Copper each of 16 mm ² . XLPE cable 4 cores Copper each of 10 mm ² .
15	Bait Lahia	Pumping Station	Aslan No.4	Supply and install complete power factor correction panel 90 KVAR. XLPE cable 4 cores Copper each of 95 mm ² of Seval type or any approved equivalent.

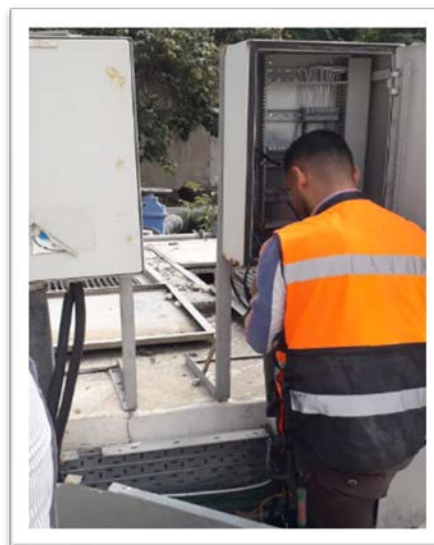


Figure 7 Part of maintenance works

Development Works:

The works to develop the WASH facilities targeted the water facilities by Automation and SCADA operation and provide second electrical power feeder or PV solar systems.

Automation and SCADA

- Automation and SCADA system targeted 8 wells as full SCADA and more than Fifty wells fully automated. The aim of this work is to avoid operational risks during war and to develop SCADA operation in the future.
- The targeted wells are distributed for seven municipalities and the SCADA is positioned near borders and open area.
- In this stage of installation, the entire SCADA system shall be purposely driven by mobile message to access facility for operation and monitoring until getting modular and sustainable system which will include master control room at CMWU and other branches at municipalities.



Figure 8 Part of SCADA Works

Table 9 Water wells with SCADA system

List of unaccessible water wells in Emergency Situation						
PROPOSED BASED ON RISK FACTOR						
NO.	MUNICIPALITY	WELL NAME	WELL No.	AUTOMATION	SCADA	YEAR
1	BEIT HANOON	EL SINA'AIA	C-76	DONE	DONE	2018
2	BEIT HANOON	EL SALAH	C-167	DONE	DONE	2018
3	BEIT HANOON	JAMEEL SHAWWA		DONE	DONE	2018
4	BAIT LAHIA	GHABEN	A-180	DONE	DONE	2018
5	BAIT LAHIA	AI NUZHA		DONE	DONE	2019
6	BURAIJ	MAKBOLA	F-94	DONE	DONE	2018
7	DEIR EL-BALAH	KFARDAROOM		DONE	DONE	2018
8	QARARA	ABU MARAZEEQ	L-179	DONE	DONE	2019
9	RAFAH	TRC 1		DONE	DONE	2018
10	RAFAH	TRC 2		DONE	DONE	2019
11	RAFAH	URKY RESERVOIR WELL		DONE	DONE	2019
12	FUKHARY	NO.1		DONE	DONE	2018
13	EL NASSER	QATARY		DONE	DONE	2019
14	JABALIA	HESSI		DONE	DONE	2018
15	JABALIA	AL SHEIFA		DONE	DONE	2019
16	MAGHAZI	حصاني	S.82	DONE	DONE	2019
17	KHANYOUNIS	بئر التحلية الشرقية		DONE	DONE	2018
18	NUSIRATE	Well No .15	UN	PROPOSED	DONE	2019



Figure 9 SCADA system for water wells

Second Electrical Feeder

Four facilities have become electrified by second electricity feeder from GEDCo in addition to the previous facilities which were electrified during emergency and hostilities conditions. This program was funded by ICRC to enhance operational readiness under emergency preparedness plan EPP established for water sector in Gaza strip.

Photovoltaic solar Renewable Energy

During 2019 different WASH facilities have been provided with PV solar energy through different donations in order to improve the operational conditions in terms of increasing the operation hours and decreasing the O&M cost related to the consumed fuel, electricity and generators' repairs. Also, donors like EU and KFW are committed to implement PV systems during 2020 to other WASH facilities. Part of the implemented solar energy interventions in 2019 are listed below whereas all are listed in **Annex 1**.

- Providing PV solar energy 50kW for Al Zahra water well, the project was completed and financed by ECHO through UNICEF.
- Providing Al Kawther water well in Al Moghraka with 50kw solar energy, the project was completed and financed by Muslim Hands.
- Providing 4 water tanks in Gaza city (Al montar, civil defense, Sheikh Radwan and Al Safa), with PV solar systems, 460 KW will be generated for the 4 sites, project is ongoing and financed by UNICEF.
- Providing Maan's two water wells with 150kw of PV solar system, the project is completed and financed by Oxfam.
- Providing Al Shoka Ro plant with 40kw of PV solar system, the project is completed and financed by Oxfam.
- The CMWU in cooperation with PWA will provide 6 WASH facilities with PV solar energy, the project is financed by KDF through UNICEF. The consultancy services tender for this project will be launched in January 2020.
- Small 6 sewage pumping stations have been fully operated by PV system through PHG.

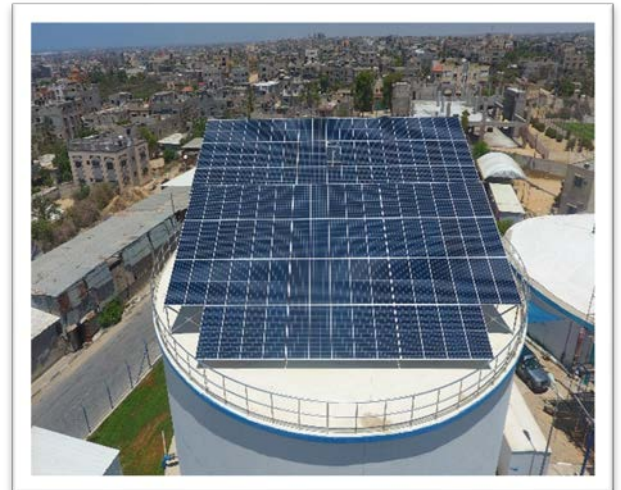


Figure 10 PV systems installed

3- Mechanical Refurbishment, Upgrading and Repairs Installations

During the period of this report from January to December 2019, several mechanical refurbishment repairs, upgrading works and repair installations have been continued to be managed and carried out at various operating water facilities. Purpose has been applied to keep the existing and the new water installations functioning well to cover service demands and improve the level of reactivity towards some operational constraints such as unreliable power supply and shortages of spare parts and fuel supplies. Besides carrying out and on time reactions with all programmed inspections and preventive maintenance requirements for all water sites with all associated minor repairs and adjustment works; the regular continuous repairs and maintenance works besides major upgrading works have been provided and completed for several water wells, water tanks and pumping water sites listed here below:

Table 10 List of upgrading works at water facilities

No	Well Name	Municipality	Description Works
1	Abo Bereka'a	KhanYounis	Rewinding of 75 HP , hollow shaft electrical motor and Supply and install lower bearing for 75 HP , hollow shaft electrical motor
2	Al Montazah	Al Zahra'a	Maintenance works for the pumps include dismantle the pump parts , replace column the motor , maintenance the gland packing box
3	Al Turkey	Rafah	Replacement three cast iron , supply and install check valve 6" , ARV 2" , gate Valves 6" , stainless steel pipe 6" for chlorine, high / low pressure switch, install steel pipes for the reservoir
4	Al Mawasi	KhanYounis	Rewinding of 75 HP , hollow shaft electrical motor
5	Central Booster Pump	Bani Souhiala'	Rewinding of 75 HP , hollow shaft electrical motor
6	EV2	Bani Souhiala'	Rewinding of 75 HP , hollow shaft electrical motor and Supply and install lower bearing for 75 HP , hollow shaft electrical motor
7	EV3	Bani Souhiala'	Complete maintenance for the pump
8	G56	Nussirate	Rewinding of 50HP , hollow shaft electrical motor and Supply and install lower bearing for 50 HP , hollow shaft electrical motor
9	Ground Reservoir	Bani Souhiala'	Electromechanical rehab0ilitation , upgrading and repair works for undetectable works for KSB centrifugal pump 400 m3/hr
10	S71	Maghzi	Maintenance works for the pumps include dismantle the pump parts , replace (the rubber sleeves, the Gland packing box ,three bronze bearing , the couplings of the columns, five connectors), trimming works for the columns and the steel pipes , change the lower and upper bearing of the motor and reinstall the pump parts
11	Western Water Well	Wadi Al Salka	Maintenance works for the pumps include dismantle the pump parts , replace (the rubber sleeves, the Gland packing box ,three bronze bearing , the couplings of the columns, five connectors), trimming works for the columns and the steel pipes ,
12	T52	Wadi Al Salka	Rewinding and Supply & install lower and upper bearing for 60 HP , hollow shaft electrical motor
13	UNDP	Rafah	Dismantle and reassemble vertical discharge pipe from the water well ,change two column shaft , Alignment the column
14	Abo Hamam	Deir Al Balah	Complete maintenance for the pump
15	Abo Marazeeek	Al Qararah	Complete maintenance for the pump
16	Al estad Al Reyadi	KhanYounis	Complete maintenance for the pump , and maintenance works for the Motor 75 HP
17	Al Khawalda'a	Zawidaa	Dismantle and reassemble submersible pump and rewinding the motor
18	Al Salateen	Bait Lahia	Rewinding the motor 150 hp , change lower bearing, Maintenance the Gland Packing Box
19	Al Senaya	Beit Hanoon	Complete maintenance works for the pump and change the Bearings for 100HP
20	Al Furkan	Nussirate	Complete maintenance for the pump
21	Al Saudi Booster Pump	Rafah	Maintenance works for the Booster and rewinding the motor 150HP with change The lower Bearing
22	Al Turkey Booster Pump	Rafah	Maintenance works for the Gland packing Box and replace it Column
23	Al Waledayn	KhanYounis	Change the column motor
24	Ghaben	Beit Lahia	Change the Dosing Pump
25	Aslan	Beit Lahia	Change the Dosing Pump
26	Al basa	Deir Al Balah	Change the Dosing Pump
27	W2	Rafah	Change the Dosing Pump
28	Abo Gazala	Beit Hanoon	Supply and install 6" PN 16 , Gate valve
29	Al Aqsa	KhanYounis	Supply and install 4" Swing check valve PN16
30	G49	Nussirate	Supply and install 4" Swing check valve PN16
31	Al Nada	Beit Hanoon	Supply and install 8" Gate valve
32	Al safa	Rafah	Complete maintenance for the Pump
33	Al Malisy	Al Shouka	Complete maintenance for the Pump
34	Aya	KhanYounis	Supply and install 6" Swing check valve PN16
35	Canada	Rafah	Complete upgrading of booster pumps with new pumping system
36	Khadeja	Beit Hanoon	Supply and install 6" PN 16 , Butterfly valve
37	Abo Gazala	Beit Hanoon	Supply and install 6" PN 16 , Butterfly valve
38	TRC1	Rafah	Supply and install high pressure Gauge 100mm (0-16) bar and Supply and install 4" PN 16 , Check valve
39	TRC2	Rafah	Supply and install high pressure Gauge 100mm (0-16) bar
40	TRC	Rafah	Supply and install high pressure Gauge 100mm (0-16) bar
41	P15	Rafah	Supply and install high pressure Gauge 100mm (0-16) bar
42	Al Shouka Booster Pump	Al Shouka	Maintenance works for the Booster
43	Al Aqsa	Deir Al Balah	Supply and install high pressure Gauge 100mm (0-10) bar

44	Torazi	Deir Al Balah	Supply and install high pressure Gauge 100mm (0-10) bar
45	Abo Nasser	Deir Al Balah	Supply and install high pressure Gauge 100mm (0-10) bar
46	Al Sahel 6	Deir Al Balah	Supply and install high pressure Gauge 100mm (0-10) bar
47	Khaled Ben Al Waleed	Zawidaa	Supply and install high pressure Gauge 100mm (0-10) bar , and Maintenance the pump part
48	Rawda'a	Zawidaa	Supply and install high pressure Gauge 100mm (0-10) bar
49	Aisha'a	Zawidaa	Supply and install high pressure Gauge 100mm (0-10) bar
50	Al Shoot DP	Rafah	Change the Membranes , and rewinding the motor with change the bearings
51	Al Amal New	KhanYounis	Supply and install PN16 Butterfly valve 4"
52	Al Amal opec	KhanYounis	Complete maintenance for the pump
53	Al Aqsa,	Deir Al Balah	Supply and install PN16 Butterfly valve 4"
54	Al Motared	Deir Al Balah	Supply and install PN16 Butterfly valve 4"
55	G57	Nussirate	Supply and install Gate Valve 4"
56	K21	Deir Al Balah	Complete maintenance for the pump
57	P145	Rafah	Supply and install Butterfly valve 8"
58	Um Al naaser well	Um Al naaser	Change the Upper and lower bearing for 75 HP
59	W1	Rafah	maintenance of the Packing Box
60	Al Farouk	Nussirate	Supply and install flow meter 4" , Change the 25 HP motor
61	Ben Sayed	Boureej	Dismantle and re-assemble vertical discharge pipe from the water well
62	Al yaman al sayed	Boureej	Change the 25 HP motor
63	Al Waka'la	Maghazi	Dismantle vertical discharge pipe from the water well
64	Tika	KhanYounis	Rewinding the motor 75 hp , change bearing, Maintenance the Gland Packing Box, Supply and install High Pressure Gages 100 mm
65	Reshwan C	KhanYounis	Dismantle the Pump pipes
66	Kalabosh	Nussirate	maintenance the Pump , and modified the Borehole
67	Al tahdi	KhanYounis	Dismantle the Pump pipes
68	Al Fukhary east	Al Fukhary	maintenance the Packing Box
69	Al Sala7	Bait Hanoun	Complete maintenance for the pump
70	P124	Rafah	Change the Upper and lower bearing for150 HP
71	Al Zohour	Jabalila	Change the bad 125 HP with 100 HP
72	Sahel 5	Deir Al Balah	Change the Upper and lower bearing for 50 HP
73	WB	Al Nasser	Upgrading of borehole, Complete maintenance for the pump, Rewinding the motor 75 hp , change lower bearing, Maintenance the Gland Packing Box
74	Al Nasser 3	Al Nasser	Complete maintenance for the pump
75	Abo Zohry	Rafah	Supply and install Gate Valves
76	Al Seka	Rafah	Complete maintenance for the pump, Rewinding the motor 75 hp , change lower bearing, Maintenance the Gland Packing Box
77	Al Montazah	Deir Al Balah	Complete maintenance for the pump, Maintenance the Gland Packing Box
78	Al Rahma	KhanYounis	Complete maintenance for the pump, Rewinding the motor 75 hp , change lower bearing, Change the Gland Packing Box
79	Al Matahen	Qararah	Complete maintenance for the pump, Maintenance the Gland Packing Box
80	Al Satar	KhanYounis	Rewinding the motor 75 hp , change lower bearing
81	Sala7 Al Deen	Maghazi	Maintenance of Gland Packing Box
82	F208	Nussirate	Rewinding the motor 75 hp , change lower bearing
83	Eastern well	Abassan Jadedda	Maintenance of Gland Packing Box
84	Al Awqaf	Bait Hanoun	Supply and install Gate Valve 6"
85	shaikh Zaid	Bait Lahia	Supply and install 6" Swing check valve PN16
86	Al Bahar	Rafah	Reallocation and complete upgrading

The repair records show that more than **237** predictive, preventive and corrective maintenance job orders were carried out and applied at various areas. While, the registry of major mechanical & electrical repairs, and maintenance job orders reached 194 of various repairs.

In addition to all the above mentioned activities the **Mobile mechanical maintenance and repair workshop** also implemented list of activities to assure the services continuity such as:

- The mobile mechanical service maintenance unit established by CMWU continues to provide all metal works repairs for various municipal water wells and other facilities including specialized pipelines connections which used to be repaired in the past by private services contractor.
- Mechanical repairs and refurbishment of 22 water pumping manifolds for both water and wastewater pumping stations.
- Repair and adjustment of 15 water meters for water wells exits
- Mechanical repair of water distribution valves on the network throughout all operating areas of Gaza strip, 26 job orders.
- Carry out 36 mechanical repairs and preventive maintenance activities for south Gaza STLV sea water RO desalination plant.
- Carry out several water and wastewater networks repairs, replacement and reconnection works at various CMWU operational areas along Gaza strip.



Figure 11 Part of mobile mechanical maintenance and repair workshop activities

4- Fuel Distribution

Despite of electricity scarcity and unreliability in Gaza strip and having regards to slight improvement of grid supply this year, but still electrical power deficit reaches more than 50% compared with demand requirements, which continue to affect water and wastewater services provisions in Gaza strip. Since November 2018, all emergency Diesel fuel supply programs from different donors were stopped assuming that the slight improvement of grid electricity enough to mitigate the risks, leaving services under threatening conditions.

All activities and programs of rehabilitation and upgrading electrical and mechanical works; besides the slight improvement of grid electricity supply this year have significantly contributed to safeguard acceptable level of services, and positively impacted the water wells functionality, and energy consumption. Despite, the continual and endless prevailing socioeconomic and politically unstable

conditions with unreliable electricity power supply and shortages of spare parts and materials for repair which had heavily and severely affecting back up electricity generators and created lots of repairs and maintenance needs and parts, CMWU had continued to manage the services under pressure and protecting environmental and health life aspects. Hereunder the achieved targets details.

A.3 Improve Water Wells Functionality

The functionality of Water Wells indicator aims to make sure that all breakdowns of water production wells in Rafah Area, Khan younis Area and Middle Area to be rectified in a very short time to achieve the satisfaction of the water customers in those areas. The functionality and readiness of the water production wells will be measured on monthly basis by measuring the efficiency of the water well functionality in each area:

$$\text{Water Well functionality Efficiency} = \frac{\sum Q_w * D_w}{(\sum Q_w) * D_m}$$

Where:

Qw: flow rate of each well.

Dw: No. of working days of each well in the month

Dm: No of days of the month

Water wells operating hours have been managed and recorded as per operational registry data-base representing the tool of measurement for the actual level of serviceability and functionality. The records of each water well pumping facility against breakdown and repair down time hours have been traced and calculated for the targeted period from which the annual target of functionality efficiency for year 2019 has reached its targeted level of 98 % which express the high level of operational readiness for water wells.

It is worth to note that the availability of wells is measured and expressed in functionality efficiency, which is subject to the time, consumed (operating hours) to carry maintenance and repair activities for the whole targeted sites under normal conditions.

Despite the continuation of several operational constraints and difficulties by having unreliable electricity power supply from grid lines and shortages of spare parts and fuel supplies, CMWU team work with high level of determination has relatively succeeded to manage on time repairs and maintenance

requirements. This reduces the negative impact of faults and breakdown events and safeguards the level of functionality for water wells which represent the major source of water in Gaza strip. Also, it is worth to mention that the collaborative efforts exerted by O&M team work to reach this level of cooperation with the abnormal situation are remarkable and unique.

The operational availability time for each well was kept secured and ready for operation as per the water demand at various regions. The repair records show that there are no more than two sites of water production wells at the same time out of service waiting for repair or refurbishment.

The monthly monitoring program of water wells functionality measured throughout the services targeted Southern and Middle areas for the year 2019 has been illustrated here below. Despite of catastrophic electricity deficit, which continued to occur during this year and its negative impact on the sequential occurrence of faults and number of repairs, the functionality efficiency and the overall annual target of 98% is achieved.

Table 11 The monthly water wells functionality efficiency -Middle and South Governorates -YEAR 2019

Month	Regional Area	Total No of working hours of all Wells	Monthly Water Production	Sum of flow rates of all wells (QW)	total No. of working days of all wells (Dw)	weighted value	Wells Functionality Efficiency	Monthly Functionality Efficiency
		hour	m ³	m ³ /hr		Qw* Dw	%	%
January	Khan Younis Area	11364	769547	2427	1236	71438	98.13%	98.56%
	Middle Area	15033	1041050	3799	1674	112655	98.84%	
	Rafah area	7514	670730	1653	596	48942	98.72%	
February	Khan Younis Area	10731	765545	2644	1173	77645	97.89%	98.30%
	Middle Area	14556	959037	3574	1585	106851	99.66%	
	Rafah area	7191	644139	1674	583	48878	97.34%	
March	Khan Younis Area	11724	863588	2745	1175	80903	98.24%	97.96%
	Middle Area	16812	1087471	3485	1564	103163	98.67%	
	Rafah area	8056	681645	1624	610	47251	96.97%	
April	Khan Younis Area	12505	908907	2668	1180	78655	98.27%	97.91%
	Middle Area	19792	1293425	3624	1590	105891	97.39%	
	Rafah area	8951	770043	1669	618	49097	98.08%	
May	Khan Younis Area	15025	1074150	2618	1154	77380	98.54%	97.89%
	Middle Area	19423	1297915	3587	1802	104271	96.91%	
	Rafah area	8851	769507	1693	589	49879	98.23%	
June	Khan Younis Area	16653	1192746	2763	1240	81452	98.25%	98.44%
	Middle Area	22381	1437280	3748	1747	111127	98.84%	
	Rafah area	9530	778035	1634	617	48149	98.23%	
July	Khan Younis Area	17863	1237075	2775	1249	80217	96.35%	97.45%
	Middle Area	20367	1336962	3865	1717	114372	98.63%	
	Rafah area	9427	763871	1622	582	47392	97.38%	
August	Khan Younis Area	17665	1223264	2807	1207	80213	95.24%	97.85%

	Middle Area	22185	1445317	3859	1755	114978	99.32%	
	Rafah area	10447	903564	1796	651	53323	98.98%	
September	Khan Youins Area	15874	1120968	2796	1239	82306	98.13%	97.98%
	Middle Area	21268	1369236	3796	1743	112248	98.57%	
	Rafah area	9532	785885	1769	646	51621	97.25%	
October	Khan Youins Area	14872	1053364	2806	1216	83165	98.80%	96.98%
	Middle Area	20667	1368079	4051	1738	114141	93.91%	
	Rafah area	8887	768382	1735	674	51145	98.24%	
November	Khan Youins Area	14091	978577	2670	1134	77835	97.16%	97.79%
	Middle Area	18511	1184318	3584	1719	106240	98.80%	
	Rafah area	8221	724643	1586	553	46358	97.42%	
December	Khan Youins Area	12424	957180	2913	1241	85613	97.98%	97.52%
	Middle Area	20169	1341238	3632	1604	104242	95.67%	
	Rafah area	8509	717596	1548	563	45936	98.93%	
Average water Wells Functionality Efficiency % in Jan-December 2019								98.97%

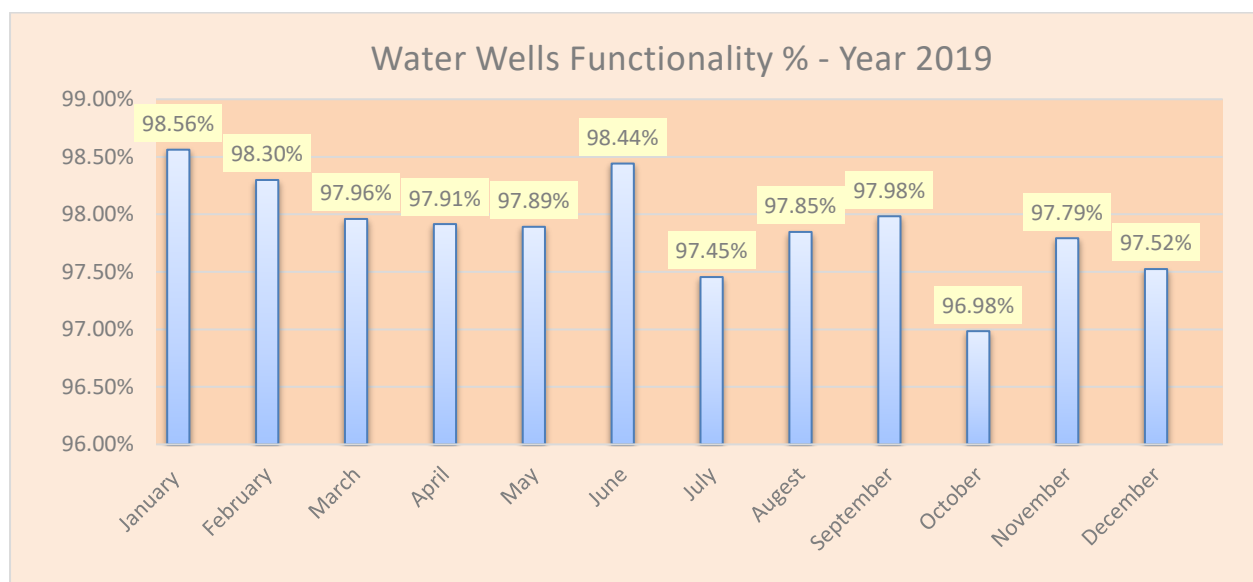


Figure 12 Monthly Functionality Percentage for served Areas-Year 2019

A.4 Improve Energy Consumption

The objective of this indicator is to manage the energy consumption in the water wells, by continued measuring the Specific Energy Consumption for all water wells in the three targeted regional areas and calculated as follows:

$$\text{Specific Energy Consumption (KWh/m}^3\text{)} = \frac{\text{Consumed Energy in KWH}}{\text{water produced in m}^3}$$

During the year 2019, the prevailing conditions of electricity cut off occurred and scheduled on daily basis has become part of the operating inputs and conditions for the systems in the Gaza Strip, and the annual targeted value of specific power consumption of water production wells within the targeted areas have been progressively improved to reach **0.439 KWh/m³** of water produced from wells where the base line value was **0.55 KWh/m³** mid of 2014.

CMWU have continued to manage the efficiency of the pumping equipment utilized in the water wells, where more than 6 water wells pumps turbines throughout several services areas have been replaced and changed by new more efficient turbines. This intervention improves the pumping efficiency and reduces the specific power consumption for each cubic meter of water produced under the same hydraulic conditions. The management program set for monitoring of energy consumed by water production wells shows that during the year 2019 of project period, the overall specific Energy consumption in the three targeted regional Areas is **0.439 KWh/m³**.

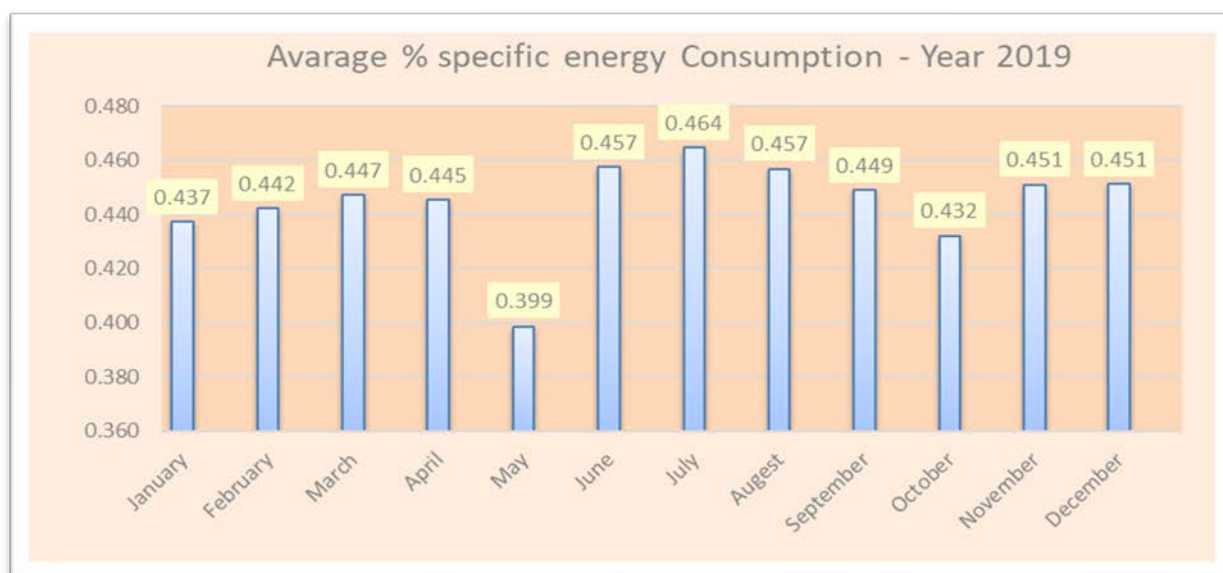


Figure 13 Monthly Specific Energy Consumption 2019

Table 11 The monthly water wells specific power consumption -Middle and South Governorates -YEAR 2019

Average % specific energy Consumption - Year 2019					
Month	Area	Production	Energy	% Specific	Average % per month
		m3	KW	KWh/m3	
January	Khan Younis	679669	329861	0.485	0.437
	Middle	1005362	393356	0.391	
	Rafah	663469	288542	0.435	
February	Khan Younis	734636	383581	0.522	0.442
	Middle	955678	355448	0.372	

	Rafah	639266	276590	0.433	
March	Khan Younis	863249	457842	0.530	0.447
	Middle	1082007	430109	0.398	
	Rafah	694604	287483	0.414	
April	Khan Younis	908333	475253	0.523	0.445
	Middle	1264984	468458	0.370	
	Rafah	768349	340206	0.443	
May	Khan Younis	1474786	560044	0.380	0.399
	Middle	1266268	491814	0.388	
	Rafah	765711	327731	0.428	
June	Khan Younis	1191632	619681	0.520	0.457
	Middle	1381587	535573	0.388	
	Rafah	768436	356875	0.464	
July	Khan Younis	1236775	647710	0.524	0.464
	Middle	1279493	489145	0.382	
	Rafah	737108	359329	0.487	
August	Khan Younis	1178661	639604	0.543	0.457
	Middle	1385497	531469	0.384	
	Rafah	40164	17837	0.444	
September	Khan Younis	1103189	537701	0.487	0.449
	Middle	1308198	535279	0.409	
	Rafah	714264	321656	0.450	
October	Khan Younis	1052939	512624	0.487	0.432
	Middle	1288493	501016	0.389	
	Rafah	706227	297047	0.421	
November	Khan Younis	977454	468048	0.479	0.451
	Middle	1150801	464367	0.404	
	Rafah	692505	325723	0.470	
December	Khan Younis	957071	450708	0.471	0.451
	Middle	1158639	464804	0.401	
	Rafah	670504	322976	0.482	
Yearly Average % specific energy in January-December 2019					0.439

B. Improve Water Quality

B.1 Disinfection Efficiency

Despite of all prevailing operational conditions, the water disinfection task was of high priority and the maximum recorded disinfection efficiency for the period from January to December 2019 approaches around **98.9 %** by the end of December 2019. Over the report period, the disinfection efficiency has progressively increased successfully maintaining a high level of Chlorination throughout the water distribution networks in all Gaza strip governorates. As indicated through the chlorine monitoring program, CMWU is confident that most of the water supply and distribution networks can be disinfected to maximum coverage using the chlorination systems installed, operated and maintained at various water production and pumping facilities.

Monthly disinfection efficiencies recorded as part of the Residual Chlorine Monitoring Program are illustrated in the graph below:

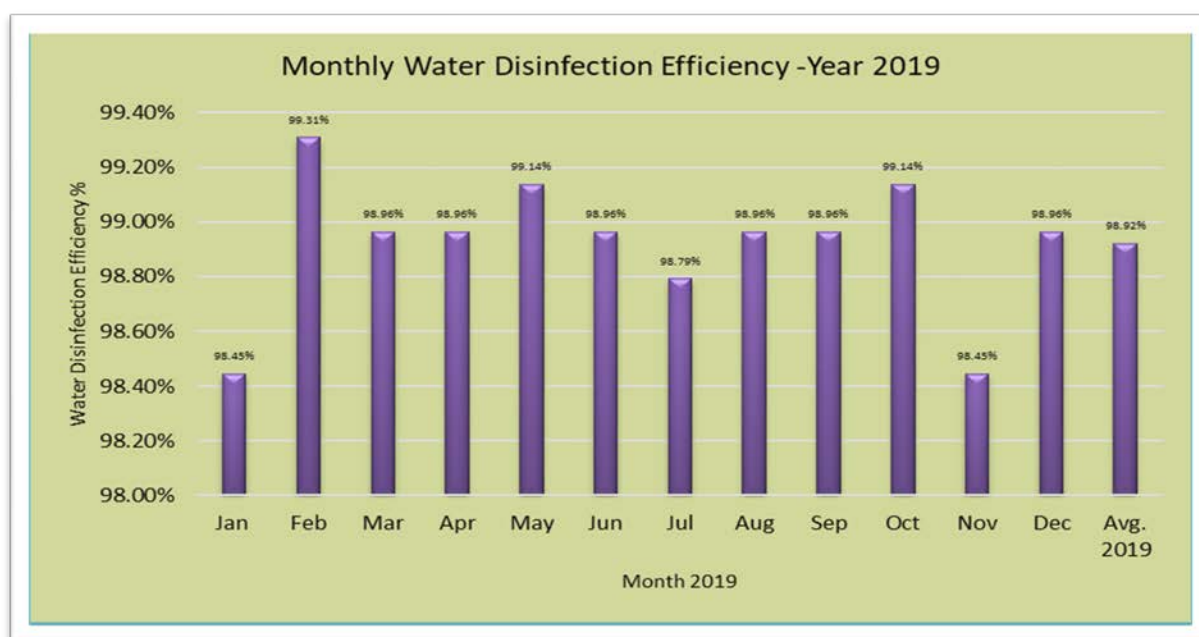


Figure 14 Monthly Water Disinfection Percentage 2019

B.2 Residual Chlorine Monitoring Program

The monitoring program continues to be performed in all the municipalities and regional areas on a regular basis using the Photometer test kit, which was made available to the health department of each municipality. Consumables required to run the program were provided as planned in the standard disinfection procedure.

Tests are being carried out for free and total chlorine on a fixed number of sampling points of 580 locations (sampling points) carefully selected to give a true representation of the whole distribution network.

It is clearly shown that by the end of December 2019 there is a significant achievement in which the disinfection efficiency target of the network has been progressively approached and reached the targeted value.

The test results show a maintained residual chlorine level that is consistent within each municipality. During the year 2019, CMWU have continued to monitor the reports of high chlorine levels through the customer complaints whereas the strength of the chlorine solution has been reduced by dilution before it is injected into the network or in some cases dosing pumps have been replaced to match the dosing requirements.

The results of the monitoring program are tabulated and illustrated here below table 12:

Table 12 Water Disinfection Monitoring Program -Year 2019

Monthly Water Disinfection Monitoring Program -Year 2019														
No.	Municipality	Total No. of Samples	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			Number of negative samples**	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples	Number of negative samples
1	Um Al Nasser	12	0	1	0	0	0	1	0	0	0	2	0	1
2	BeitHanoun	19	0	0	0	0	0	0	0	0	0	0	0	0
3	Beitlahia	26	5	5	5	5	5	5	5	5	5	5	5	5
4	Jabalia	42	0	0	0	0	0	0	0	0	0	0	0	0
5	Gaza	86	5	6	2	1	5	4	5	3	6	4	3	3
6	Wady Gaza	12	0	0	0	0	0	0	0	0	0	0	2	0
7	Al Moghraka	12	0	0	0	0	0	0	0	0	0	0	0	0
8	Al Zahra	12	0	0	0	0	0	0	0	0	0	0	0	0
9	Al Nusseirate	24	0	0	0	0	0	0	0	0	0	0	0	0
10	Al Buriy	20	0	0	0	0	0	0	0	0	0	0	0	0
11	Al Maghazy	24	0	0	0	0	0	0	0	0	0	0	0	0
12	Al Zawaida	24	0	0	0	0	0	0	0	0	0	0	0	0
13	Al Mussader	12	0	0	0	0	1	0	0	0	0	0	1	0
14	Deir Al Balah	30	0	0	0	0	0	0	0	0	0	0	0	0
15	Wady Al Salqa	12	0	0	1	0	0	0	0	0	1	0	0	0
16	Al Qrara	16	0	0	0	1	0	0	2	0	0	0	0	0
17	Khanyounis	44	0	1	2	0	2	2	2	2	0	0	1	0
18	BaniSuhila	20	0	0	0	0	0	0	0	0	0	0	0	0
19	Abssan Al Kabera	18	0	0	0	0	0	0	0	0	0	0	0	0
20	Abssan Al jadedda	16	0	0	0	0	0	0	0	0	0	0	0	0
21	Khezaa	16	0	0	0	0	0	0	0	0	0	0	0	0

22	Al Fokhary	12	0	0	0	0	0	0	0	0	0	0	0	0
23	Al Nasser	12	0	0	0	0	0	0	0	0	0	0	0	0
24	Al Shuka	12	0	0	0	0	0	0	0	0	0	0	0	0
25	Rafah	46	0	0	0	0	0	0	0	0	0	0	0	0
Total		579	10	13	10	7	13	12	14	10	12	11	12	9
Monthly Disinfection Efficiency			98%	98%	98%	99%	98%	98%	98%	98%	98%	98%	98%	98%
Average Disinfection Efficiency			98.09%											

****:** Denotes points have no residual chlorine detected by photometer

Monthly water disinfection efficiency records -2019												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg. 2019
98.27%	97.75%	98.27%	98.79%	97.75%	97.93%	97.58%	98.27%	97.93%	98.10%	97.93%	98.45%	98.09%

B.3 Chlorine Dosing Units:

CMWU have continued to manage the repair and replacement of faulty dosing units and all associated systems. The records show **that 8 new chlorine dosing units were installed** to replace defective units and **83** repair jobs have been applied for malfunctioning systems at various water wells and pumping facilities.

Since the chlorine dosing pumps are the critical units in each dosing system, CMWU and its crew in charge have continued to take great care to maintain the essential stock of spares and consumables at the stores. The delivery and repair procedures have continued to be carried out through the regional offices and the Municipal chlorination technicians.

During the year 2019 CMWU has continued to provide support through a new On-Call Service Procedure allowing Municipal chlorination technicians to contact CMWU at any time to log faulty systems, CMWU then ensures the repair is carried out within 48 hours. This procedure has improved the availability of operational dosing pumps, ensuring all water entering the distribution network is securely well disinfected.



B.4 Chlorine Supply and Chemicals Delivery for Desalination Plants:

Since the start of year 2019, a total quantity of 820 m³ of Sodium Hypochlorite solution NaOCl (10%-12% active chlorine) has been managed, supplied and distributed to the water production and treatment installations throughout all Gaza Strip governorates. The scope of chlorine delivery and supply contract managed by CMWU has included in addition to Chlorine, other water treatment chemicals necessary for the operation of both 48 small and medium scale RO brackish and three Short Term Low Volume (STLV) sea water desalination plants in the Gaza strip. This includes Hydrochloric Acid, citric acid, Sodium Met-bisulfite, Caustic Soda and Anti-scalant and ferric chloride. The provision of these chemicals is essential to the operation of reverse osmosis desalination plants, and contributes significantly to the improvement of water quality at various served areas of Gaza strip.



Figure 15 Chlorine solution supply to water facilities

C. New Water Resource

As the underground coastal aquifer is the main source for water supply to the population of more than 2 million living in the Gaza Strip, and Based on various relevant studies, the groundwater deterioration has continued in both quality and quantity in the Gaza Strip due to over abstraction of the aquifer compared to the recharge quantities which led to seawater intrusion and lowering the groundwater table. It has become crucially important to safeguard available fresh water supplies and provide new additional potable water supplies to protect the lives and public health of the people in Gaza. The provision of a Short-Term Low Volume (STLV) seawater desalination plant is one of the mitigation measures integrated in the Comparative Study of options for additional supply of water for the Gaza Strip.

C.1 Sea Water Desalination Plants

CMWU in cooperation with PWA throughout different donations has started the implementation of the three short term low volume desalination plants which are:

1- Extension of Existing Deir al Balah Sea Water Desalination Plant –Middle area

The construction of 2000 m³/Day sea water RO desalination modules funded by IsDB was completed before the last offensive and the plant was operated to treat the sea water and turning it into drinkable water. Also, it is linked and connected to the existing 600m³/Day module, producing in total 2600 m³/day to serve 30,000 inhabitants of the Middle area residence (Deir Al Balah & Al Zawaida cities) through 4000 m³ capacity water blending tank (Al Aqsa).

During November 2016 the site was handed over to the contractor to start the activities of “expansion of this plant capacity to reach 6000 m³/day, by adding new containerized desalination modules of total production capacity 3400 m³/day; the project is funded by USAID and the works at the plant is accomplished but it’s still under commissioning.



Figure 16 Deir Al Balah Sea Water Desalination Plant

2- Construction of 6,000 m³/Day Sea Water Ro Desalination Plant

A Southern governorate sea water RO desalination plant of capacity 6000m³/day was completed to serve around 75,000 inhabitants of both Khanyounis and Rafah Western parts. The project was funded by EU and managed by UNICEF in co-operation with PWA & CMWU. The CMWU started the plant's operation by standby generators as the plant was not connected with electricity network, during 2019 EU has financed the solar energy project to provide the plant with 0.5 Megawatt, the works have been completed and the installed PV system is designed to operate one train of the plant to produce 2000 m³/day as the plant consists of three sea water RO desalination trains each of 2000m³/Day production capacity. Besides that, the expansion project which includes installation of additional 14,000m³/day of Ro modules has already started on the ground, the detailed design was accomplished and endorsed early 2019, whereas the works started on site in June 2019 and still ongoing.



Figure 17 Ongoing activities at Sea Water Desalination Plant – Southern Governorates

3- Construction of 10,000 m³/day Sea Water Ro Desalination Plant in Gaza City:

The signed agreement December 2013 between CMWU and IsDB was to implement sea water desalination plant in Gaza city with a total amount 15 M\$. As it was one component of the STLV program that will improve the potable water supply system with a production capacity 10,000 m³/day

of desalinated water to blend it with selected municipal water wells with acceptable chloride concentration levels; in order to serve 250,000 inhabitants in the Western part of Gaza city.

The CMWU in cooperation with PWA had selected a consultant to carry out the detail design and prepare the bidding documents of all downstream facilities of the plant. The facilities were divided into four packages as follow:

- 1st package: Blending tank with 5000 m³ capacity and booster pumping station is completed.
- 2nd Package: Transmission line 500 mm diameter, of 6 Km length from the desalination plant to the blending tank, the project is completed.
- 3rd package: Design-build sea water desalination plant, all the plant's activities have been accomplished and the plant is operational since August 2019.
- 4th package: Construction of main electrical power supply line for Gaza SWDP, the tender has been awarded in June 2019 and the work is still ongoing.
- whereas there are three tenders will be launched early 2020 to equip the RO with all needed furniture, tools and spare parts.

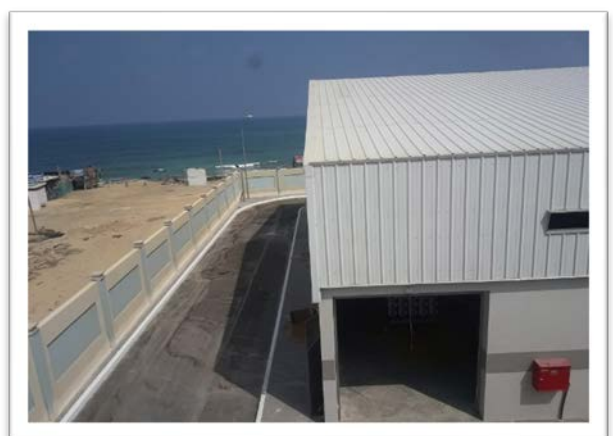


Figure 18 Gaza STL Desalination plant



Figure 19 Gaza STL Main power line

The Overall progress of Gaza desalination plant project is 93%

C.2 Brackish Desalination Plants:

Besides that, CMWU have continued to manage, upgrade, rehabilitate and monitor the 48 existing brackish desalination plants of total capacity 12,000 m³/day, which were installed from different donations in several areas whereas the groundwater quality is not acceptable for distribution aiming at providing adequate water service for specified areas that are used to be deprived of water supply system. The small capacity plants supply the surrounding population by fountains outside the plant; while the other plants with 600 m³/day or more are used to feed the network in certain areas.

- CMWU in cooperation with ACF and Oxfam has assessed all Ro small units through Gaza Strip in order to maintain and rehabilitate those units through different projects to improve their operation efficiency. CMWU and ACF during 2019 have intervened and finished the maintenance and rehabilitation of 14 Ro units at the southern governorates, besides providing 20 Ro units with PV solar system.
- In cooperation with Oxfam and through EU fund, the CMWU has launched two tenders during 2019 under the recent agreement with Oxfam, the first for rehabilitation of 16 Ro plants. It was awarded in October 2019 and still ongoing, whereas the second tender for "supply spare parts and providing new filling points for the targeted Ro plants", it is under evaluation and will be awarded in January 2020.



Figure 20 Rehabilitation of brackish RO plants

- Besides that, under the same agreement some of the targeted RO plants will be provided with PV solar energy, the CMWU is working to produce the design and tender documents for this activity to be launched in March 2020.
- New brackish desalination plant has been constructed in Abasan Al Kabera during 2019 through Haifa Association/ Inter-Pal fund, the production capacity of the plant is 50m³/day and it serves 5,000 inhabitants.



Figure 21 Abasan Al Kabera RO plant

- Through EU fund, the CMWU in cooperation with Oxfam has completed the works of the PV solar energy project at Al shoka RO plant 200 m³/day capacity, this plant serves 10,000 inhabitants with drinking water and the installed PV system will assure a good operation for that plant,
- The CMWU in cooperation with MoG will relocate and rehabilitate Tal Al Hawa RO plant 600m³/day, the project is financed by Inter-Pal through Haifa Association, it includes construction of water well 40m³/hr. at the new location- east of Gaza city to feed the pump in addition to rehabilitation and maintenance works for the plant itself.
- Through KDF fund, Al Forqan brackish RO plant at Al Nusirat will be provided with 80 KW -PV solar system, the PV system will be developed to operate separately the RO Desalination plant or the existing water well.

C.3 Water Networks

This section handles water network plans, upgrading, reconfiguration, resizing. CMWU has succeeded during the year 2019 to implement water networks projects varies between upgrading, reconfiguration, and construction new carrier lines and distribution systems at different areas in the Gaza Strip as follows:

1. Rehabilitation water networks at Beit Hanoun through ANERA (USAID fund), the project is ongoing and the overall progress is 15%.
2. The CMWU in cooperation with PWA through EU fund is going to implement NRW program in the southern governorates "Rafah & Khan Younis", the ToR for consultancy services has been developed in order to enable the MOF to proceed with tendering process.
3. The CMWU in cooperation with GVC has completed the rehabilitation of water networks at Moghraqa and Nusirat Municipal areas.

4. The CMWU in cooperation with PWA through EU fund, has completed the construction of Al Amal and Al Satar associated water networks, 3.5 KM with different diameters were installed at Al Amal area and 3.8 KM at Al Sattar area.
5. The CMWU through UNICEF has completed the rehabilitation of Al Shifa hospital water network, the work includes replacement of the internal pipes and replacing the pumps of the existing booster.



Figure 22 Rehabilitation of Al Shifa water network

C.4 Water Tanks

This section lists the main activities achieved during the period of this report for the new water tanks and water booster pumping stations:

- Construction of two water tanks at Al Amal and Al Satar areas each of 5000m³ capacity, the project is financed by EU through MOF, all the works have been completed and both tanks are operational now.



Figure 23 Al Amal and Al Sattar Water Tanks- Khan Younis

- The newly constructed 8 reservoirs through USAID fund 5000 m³ capacity each at (Beit lahia, Al Nusirat, Deir El Balah ,Khan Younis,Al Maghazi, Al Buraj, Dair Al Balah and Rafah), all are operational now and have a positive impact on the water supply at the mentioned areas.
- Construction of Al Shoka water tank 2000m³ capacity. The implementing agency was ANERA in cooperation with CMWU and the project is financed by USAID, it has been completed and handed over by December 2018 and it is in operation mode since January 2019.
- Construction of Al Fokhary water tank 2000m³ capacity, the implementing agency is ANERA in cooperation with CMWU and the project is financed by USAID, it has been completed and handed over by December 2018 and it is in operation mode since January 2019.
- Upgrading of Tal El Sultan pumping station and Providing Canada booster station with PV solar system, the project is funded by ICRC and the work is still in progress.

C.5 Gaza Sustainable Water Supply Program (Associated Works for Gaza Desalination Project)

The consultancy service aimed to prepare the design and tender documents of the associated works for Gaza desalination project. The project was financed by the world Bank and administrated by the PWA.

The CMWU was part of the technical team in addition to PWA who supervised the consultant during the whole assignment implementation.

The consultant (Lotti) has prepared and submitted to PWA and CMWU the following documents and reports as per the TOR:

- Hydraulic Analysis Report
- Asset Inventory Report and Associated Maps for the existing water distribution system
- Non-Revenue-Water Reports and Maps including NRW strategy and NRW management plan.
- Develop an Investment Plan
- Energy Supply and Energy Management Plan Report
- System Operating Cost Report
- Public Awareness Improvement Report
- Note on SCADA Communication System
- Preliminary ESIA Report

Tender Documents and Complete Tendering Process Report including the following packages:

- ✓ 1st. Package: Southern Carrier including the main pumping stations, Carrier pipes and reservoirs.
- ✓ 2nd. package: North Carrier including the main pumping stations, Carrier pipes and reservoirs
- ✓ 3rd. package: Reconfiguration of Water Distribution System – Southern Gaza Governorates.
- ✓ 4th. package: Reconfiguration of Water Distribution System – Northern Gaza Governorates.

- ✓ Mekorot water Improvement Works – Middle and Khan Younis Governorates Contract Package

The last tender (Mekorot improvement works) has been issued for tenderers by PWA and financed by the KDF.

D. Waste Water Treatment Plants:

Wastewater Treatment Plants

There are five operational waste water treatment plants in the Gaza strip, three of them considered intermediate plants located in Beit Lahia, Gaza and Rafah areas as well as two temporary treatment plants in Khan Younis (Mawasi area) WWTP and Wadi Gaza WWTP. CMWU has continued its operational and management roles to manage and carry out comprehensive monitoring program related to the wastewater treatment plants located throughout Gaza strip Governorates and provide for all mitigation measures and improvement programs.

Due to the insecure and intermittent supply of the electricity from GEDCO Grid, it is operationally unrealistic to have sustainable and stable treatment process, however the improvement of the supply for some time during the year had a little effect in the treatment process. Power is needed all the time for continuous oxygen supply of the aerobic bacteria. Also, the Diesel quantities quota is not enough to bridge the gaps of electricity shortages by backup generators, which negatively impacting the aeration requirements at various treatment plants. Therefore, the pollutants removal efficiency despite all the odds is recording relatively well (around 75 %), where annual records shown in **Annex 2** stated that during the whole year 2019 about 46 Million cubic meters of sewage were collected and pumped towards various treatment plants.

This section describes the main activities implemented in the treatment plants to improve their treatment efficiencies:

North Gaza Wastewater Treatment Facilities:

Since April 2018 ,the newly commissioned north Gaza wastewater treatment plant (NGWWTP) of nominal capacity 35600 m³/day treatment capacity was operated by contractor/operator and supervised by Palestinian Water Authority (PWA) and the operator left the entire site by the end of July 2019 and the plant is currently under emergency /safe mode operation with minimum staff requirements .CMWU has continued to provide technical operation and maintenance support and assistance for the terminal sewage pumping station and lagoons facilities in Beit Lahia ,from which the sewage pumped to new NGWWTP. The main activity in this year in the north area was the implementation of ICRC-financed maintenance and

refurbishment contract provided to safe guard and upgrade the Terminal Pumping Station (TPS) including the following items:

- Installation of flexible joints which stopped the frequent rupture of the stainless-steel manifold and eliminate vibration.
- Installation of a new pump and the procurement of spare parts for all the pumps including new impellers.
- Procurement of two new Variable frequency drives for pumps and spare parts for the other three VFD sets.
- Construction of a 60 square meters' store room for the plant and many other maintenance items that would help a smooth functioning and increase the flexibility of the operation of the plant.



Figure 24 BLWWTP terminal pumping station Spare parts and maintenance activities

Gaza Wastewater Treatment Facilities –Sheikh Ejleen

The completion of all refurbishment and upgrading works and installations, existing Sheikh Ejleen wastewater treatment plant (WWTP) brought back into operation mode; the results of treated effluent WW meet the pre-set design figures achieving about 60 ppm of BOD.

The progress of the construction works and associated installations of the Central Treatment Plant (Al Buriej WWTP) funded by KFW is satisfactory with total daily capacity of 60,000m³/day and, it is anticipated that 30,000 m³/day of Gaza wastewater will be diverted to the BWWTP in order to improve the treatment. The sea contamination by the wastewater is stopped due to the operation of Sheikh Ejleen WWTP.

3.4 MW of solar energy project is under construction in the central wastewater treatment plant (BWWTP) and 1 MW module shall be constructed at Al Sheikh Ejleen WWTP as well, all funded by KFW.

Wadi Gaza Wastewater Treatment Facilities

Wadi Gaza temporary WWTP is overloaded and once BWWTP is in operation it will be shut-down, the situation of the wadi is grieve.

All the wastewater of the middle area will be treated in BWWTP, and this would eliminate the catastrophe of wadi Gaza.

Khan Younis Wastewater treatment plant

The records showed that only 8000m³/day of about total 15000 m³/day of wastewater collected from various Khanyounis districts are being pumped to KY WWTP newly commissioned and located east of AL Fukhari area, the existing pumping systems is under upgrading and refurbishment to cope with the hydraulic characteristics and the remaining wastewater quantity is being pumped to the temporary WWTP lagoons system located west of the city.

Rafah Wastewater treatment plant

The existing wastewater treatment plant in Rafah with 14000m³/day average capacity is relatively stable as a subsequent of energy provision stability, but the treatment technology itself having bio towers treatment process has limited removal efficiency and it needs upgrading and modernization to achieve a good quality effluent matching with reuse requirements.

Two phases of solar energy provision were executed to feed 320 KW to the plant, which help improve the functioning of the plant.

The Japanese financed ongoing project that include, Grit removal and sand removing system with mechanical bar screen equipment and cleaning anaerobic inlet lagoons, will improve the treatment efficiency.



Figure 25 Cleaning of anaerobic wastewater lagoons –Rafah wastewater treatment plant

In Parallel with the operation follow up schemes and monitoring the treatment efficiencies of the mentioned plants; CMWU is following up the construction, commissioning and operation of the two central treatment plants Eastern Al Buraij (KFW) and Eastern Khanyounis (IsDB and UNDP& JIKA) besides negotiating the operational needs for the NGEST with the PWA and municipalities .

The following are the main implemented activities in the three Central Treatment Plants:

D.1 Gaza Central WWTP Project

KFW has allocated 86.5 million Euros for the construction of Gaza Central Wastewater treatment plant. After completion of the Emergency sewage works in Gaza City and upgrading wastewater treatment plant Sheikh Ejleen; KFW has approved addendum 4.

The addendum agreed to re-plan and update the central WWTP project to take into account changes that have occurred since the original project documents were prepared; the project includes the following:

- o Buriej Central Wastewater Treatment Plant and Wadi Gaza Central PS
- o Pressure Pipelines from Wadi Gaza PS to Buriej WWTP
- o Gravity Collector from Shiekh Ajleen WWTP (Gaza City) to Wadi Gaza PS, including connections to the Central Communities wastewater system.
- o Solar Energy source.
- o Sheikh Ejleen Measures
- o Wadi Gaza Measures

Contract 1: Bureij Central Wastewater Treatment Plant and Central Pump station at Wadi Gaza

The contractor has completed all the civil works and most of the electro-mechanical works in the plant as detailed in the following table:

Activity	Percentage completed %
Final Clarifiers	99
Bioreactor	100
Blower Station	100
Primary Clarifier	100
Supernatant Pumping Station	100
4 No. Sludge Thickener Tanks	100
Thickened Sludge Pumping Station	100
Scum Pumping Station	100
1 No. Thickened Sludge Tank	100
Digester Tanks	99
Digester Building	95
Administration Building	100
Gas Holder	100
Workshop Building	100
Sludge Dewatering Building	100
Water Tank	100
Grit and Grease Chamber	100
Return and Excess Sludge Pumping Station	100
Service Water Pumping Station	100
Flow Meter Chamber	100
Primary Clarifier Distribution Chamber	100
Bioreactor Distribution Chamber	100
Scum Pumping Station to Final Clarifiers	100
Grease Holding Tank	100
Electrical Room	99
Variation Order No. 1 – Retaining and Boundary Walls	100
Wadi Gaza Central Pumping Station Activates	100



Figure 26 Central WWTP and Central PS Wadi Gaza

Contract 2: Pressure Pipeline

The project consists of installing the ductile iron pressure pipeline of total length 4600 m (1200 m of diameter 400mm and the 3400m of diameter 1200mm) ,and procure and install 22kV cables and fibre-optic cables between the Wadi Gaza CPS and Buriej WWTP, and all components were accomplished during 2019.



Figure 26 Central WWTP Pressure line

Contract 3: Gravity Pipeline:

The project includes installing gravity pipelines, and fibre-optic cables between the Interception Chamber at Sheikh Ajleen WWTP and Wadi Gaza Central PS, and connecting the Central Communities Collector to Wadi Gaza CPS as detailed below:

- Construction of Gaza Gravity Collector (DN 1500), 5,700 m long from Sheikh Ajleen WWTP to Wadi Gaza CPS including all ancillary facilities;
- Construction of Central Communities Gravity Collector (DN 1000), 220 m long from Salah Deen Road to Wadi Gaza CPS including all ancillary facilities;
- Manholes;
- Construction of diversion chamber at EWWTP, including dealing with existing flows
- Connection to the inlet manhole at the Wadi Gaza CPS;
- Fibre Optic Cable (SCADA) between the Diversion Chamber at Sheikh Ajleen to Wadi Gaza CPS (5,700 m).
- Reinstatement works.

Percentage Completion: 97%

Pipes:

90% of the 1500mm Concrete Pipes were constructed

100% of the 1000 mm Concrete Pipes were Completed

Connect MoG pressure lines with the interceptor chamber is ongoing

Manholes:

90 % of the Concrete Manholes of 1500mm diameter were installed

100% of the Concrete Manholes of 1000mm diameter were installed

Interceptor chamber is under construction



Figure 27 Central WWTP Gravity Pipeline

Contract 4: PV – Solar Energy Source

The project includes the complete solar PV system to be installed within the boundary of the Buriej WWTP as detailed below:

- Design, procure, manufacture, ship and deliver to store all equipment and special materials to be imported for the project.
- Provide erection, installation and site testing details for all other items.
- Include civil and building construction, testing and commissioning

The contract awarded early 2019 and 90% of the installation of 3.5MWp were completed and 75% of the 1.2MWp for Sheikh Ejleen WWTP were completed



Figure 28 Solar Panels installation

Contract 6: Sheikh Ejleen Measures

The contract includes rehabilitation of GWWTP and repair electromechanical equipment to allow the plant continue operation through the first phase of the central wastewater treatment plant at east Buriej. The works include cleaning of ponds, rehabilitation of electrical panels, rehabilitation and replacement of mechanical equipment; 100 % of the activities of the project have been completed during 2019.



Figure 29 Parts of Shiekh Ejleen Measures

Wadi Gaza Measurers:

The project started August 2019 and is consisted of the following activities:

- Grading of and stabilizing/ securing the existing river channel to suit the defined design flows.
- Construction of 16 no. box type culverts for light traffic and pedestrians, replacing the existing culverts.
- Construction of 7 no. river bed sills/ weirs with stilling basins, partly in combination with new culverts.
- Removal of illegal waste dumps and various obstructions from Wadi Gaza valley.
- Installation of underground power cable lines between WWTP EL Buriej and several sewage pump stations, aligned along Wadi Gaza valley.



Figure 30 Part of Wadi Gaza measures

D.2 Khan Younis Wastewater Treatment Plant (KHWWTTP)

The permanent KHWWTTP is Implemented through two phases with capacity 26,656 m³/day for phase I and 44,948 m³/day for phase II; the project is financed by ISDB (KDF), JIKA and implemented by (UNDP and CMWU in cooperation with PWA), the tenders of the first phase has been launched by end of 2016 where the implementation started on ground early 2017, the project components were included in three separate tenders as follow:

1- Construction of Khan Younis Waste Water Treatment Plant and Buildings

The following process and technology is used for KY WWTP in order to achieve waste water treatment objectives,

- Pre-treatment including screening and de-greasing/de-gritting.
- Secondary treatment including nitrogen removal.
- Tertiary treatment.

The main activities of this package are:

- Effluent treatment:
- Pre-treatment including fine screening as well as grit and grease removal;
- Aeration tanks and clarification tanks;
- Tertiary treatment including sand filtration and UV disinfection;
- Treated effluent outlet pumping station.
- Sludge treatment.
- Gravity thickening;
- Sludge drying on open drying beds;
- Sludge composting.

All the construction activities here above were completed during the fourth quarter of 2019 and since that, the treatment plant is operated by the contractor for one year.



Figure 31 Khanyounis Central TP

2- Construction of Main Pressure Lines to the Sea and to the Infiltration Basins

The effluent main pressure pipeline constructed and used to pump the treated effluent from the effluent pumping station located at the KY WWTP site to the infiltration basins at Al Fokhari area and to the sea in emergency cases with a total length of around 18.6 kilometers.

The first 5.6 km of this effluent pipeline completed and used to convey the treated wastewater to Al Fokhari infiltration basins. An emergency pressure pipeline of 13 Km length is under construction to complement the effluent pipeline to discharge treated effluent into the sea and the progress is 97%

3- Construction of the Infiltration Basins in AL Fokhari

The site for the infiltration basins is located at Al Fokhari municipal area at the south eastern part of Khan Younis governorate. The site is located in agricultural land over an area of around 100,000 square meters with a trapezoidal shape. Infiltration basins are permeable earthen basins, designed and operated to treat and disperse municipal treated waste water. The works include excavation, shaping and backfilling with appropriate media for infiltration basins, supplying and installing pipelines with diameters ranging between 305-900 mm, gates, valves, fittings and accessories, manholes, constructing the administrative and service building, constructing the electrical and lighting system, landscaping, paving the access roads and constructing infiltration and monitoring wells. The infiltration basins and its boundary wall were completed 2019 and now it is used for infiltration the treated wastewater.



Figure 32 Infiltration Basin at Al Fokhari

- In addition, the CMWU in cooperation with UNDP through ISDB fund will upgrade the central pumping station 8 the tender documents were prepared 2019 and the bid documents are still under evaluation whereas extending the main carrier line from PS 8 to KHWWTTP is ongoing and proposed to be accomplished early 2020.

- During 2019, the CMWU in cooperation with UNDP through ISDB fund were completed the construction of the dedicated power supply line to the treatment plant. Bear in mind that UNDP prepare the TOR for design PV system of total capacity 7MW to operate the whole TP and there is allocated fund to implement 1.3 MW PV system as a first stage from Norwegian government and another EU fund of total 2.9 M Euro to implement 2.0 MW as a second stage. The two stages are 50% of the total energy load and enough to operate the first implemented stage of the treatment plan.

D.3 The Permanent Northern Treatment Plant (NGEST)

Since July 2018, the new wastewater treatment plant of daily capacity 35600m³/day was brought into full operation mode under two years' operation contract signed between PWA and Joint venture contractor (Thermomechanic &MACC), and the records showed that till the end of year 2019 more than 14 million cubic meters of raw sewage were pumped from terminal pumping station at Beit lahia lagoons site and treated at the new plant. The JV has withdrawn from the plant's operation during 2019; hence, NGEST has been operated by PWA-PMU dedicated staff.

In the construction agreement among PWA and WB (Multi donors fund); it is clearly mentioned that CMWU is the operator. An MOU has been drafted among PWA, CMWU and Northern Municipalities which abide the CMWU to operate the NGEST, it is under revision to be signed and CMWU should take over the operation; but CMWU wants some financial guarantees from PWA since the municipalities are not able to cover the whole operation cost

E. Storm Water Activities

Many storm water collection and pumping facilities constructed and upgraded during the past five years have become operational. This provide remarkable improvement and relief and reduce the risk of flooding at various areas of Gaza strip and positive impacts have been significantly recorded from various hot spots in the field. However, during 2019 no enough fund or support were allocated to support storm infrastructures and needs. Therefore, CMWU crew dealt with all commitment, responsibility, with professionalism and constructive in cooperation with all partners and municipalities in order to alleviate the situation in some hotspots areas through the following interventions:

- Disburse materials and spare parts for sewage and storm water pumping stations and associated systems from the main CMWU stores to the Municipalities as preparedness activities before the winter season.
- Provide mechanisms and workers to clean up rain water gullies and manholes along streets and districts of the Gaza Strip as per on going works projects during the rainy days.
- Manage annual maintenance and operational preparedness of mobile self-priming storm water trash pumping sets driven by Diesel engines and distribute it throughout various stations spread all over Gaza strip governorates with all associated pressure and intake hoses requirements and fuel needs.
- Cleaning, upgrading of water flows channels to cope, reduce and eliminate the risks of flooding such as construction of additional storm water gullies and pipes, cleaning infiltration basins and storm water lagoons collection systems and rehabilitation of storm water pumping stations.
- Supply all required safety and protective tools, clothes and equipment for technicians and labors working under the storm and flooding conditions. Winterization clothes distributed for labors throughout municipalities of Gaza strip.
- NRC in cooperation with CMWU has completed the construction of storm water pipeline in Al Aqsa street at Dair Al Balah, and no flooding event occurred during the rainy season of 2019.
- Also, NRC has supported and financed the preparedness & winterization activities for 2019-2020 winter season, the activities include but not limited to:
 - Tools and clothes supply,
 - Maintenance and cleaning of storm water basins, gullies and wet pits at the middle and southern governorates.
 - Hiring on call to intervene during emergencies.

An agreement between Emmar and IDB has been signed in order to construct Aslan infiltration basin in Beit Lahia. This basin will collect Storm water from 2 Km2 area and protect the downstream from yearly flood. The tender has been launched and awarded, the work started on site in November 2019 and still ongoing.



Figure 33 Storm water preparedness activities

F. Waste Water Activities

F.1 WW Networks

This section summarized the wastewater networks activities include the extension, repair and maintenance through different donations as follows;

1. Completed the construction of sewage network, pumping station and Household connection at Al Mawasi Area-Khan Younis, the project was implemented by AAH in cooperation with the CMWU.
2. Completed the Upgrading of Sewage Networks in Al Nusirat and Moghraqa Municipal areas. the project was implemented by GVC in cooperation with the CMWU
3. The CMWU in cooperation with TRC will launch in February 2020 the tender for upgrading the sewage networks at Rafah area.
4. Through KDF fund, MOLG has launched the RFP for consultancy service in December 2019 to update the master plan and to produce the detailed design for sewage system at the eastern villages of Khan Younis governorate, the tenders have been submitted and still under evaluation

F.2 Electromechanical Services for Waste Water & Storm Pumping and Treatment Facilities

During the period of this report from January to December 2019, several electromechanical maintenance and repair services and activities summarized here below have been carried out to safe guard the systems and reduce the possibilities of breakdown events and eliminate the risks of environmental contamination by wastewater flooding.

Meanwhile, most of wastewater and storm-water services and pumping facilities were continued to be severely overused and overloaded during the last storms events hit Gaza strip in the last year and create several emergency needs for repairs during flooding times. Therefore, CMWU has taken all possible initiatives to reduce the negative impacts of storm.

Several activities have been summarized here below and carried out to maintain, repair and improve wastewater and storm water systems

1. Manage and carry out comprehensive electromechanical maintenance and repair program for sewage pumps of wastewater pumping stations, the work includes rewinding electrical motors, changing the bearing sets (upper & Lower bearings), changing mechanical seals sets (Water & oil mechanical seals sets), changing wear rings, rubber rings, rubber repair kits, changing impellers, rotors, etc., and carry out all work shop requirement i.e. changing bolts, impeller balancing, sand blasting, painting, etc. Maintenance task orders exceeded 32 pumps during year 2019.
2. Manage and carry out comprehensive electromechanical maintenance and repair program for pressure manifolds of wastewater pumping stations, the work includes maintenance of gate valves,

non-return valves, changing flanged coupling, pipes sand blasting, painting, etc. Maintenance task orders were more than 22 tasks per year of 2019

- 3 Manage and carry out comprehensive electromechanical maintenance, replacement, repair program for automatic mechanical bar screens of wastewater pumping at 11 sewage pumping stations.
- 4 Manage and carry out comprehensive cleaning process for sewage pumping stations, cleaning process includes pump wet pit, bar screen chamber, inlet chamber, grit removal, pumping station yard. Cleaning process takes two times for each pumping stations, but for central pumping station may be per week, this is for huge sand quantities comes by influent wastewater coming to the sewage pumping stations, as well as this process may be after each storm. Cleaning process task orders were more than 32 sewage pumping station for year 2019.
- 5 Design and manufacture a new automatic basket screen at Jumaizet Sabeel PS with all associated works.



Figure 34 new automatic basket screen

- 6 Supply and install new mechanical bar screen at Al Basa sewage pumping station with all associated hooking up installations.
- 7 Comprehensive electromechanical repairs of terminal sewage pumping station of north Gaza governorate including bar screen repair, arrange for sand removal trailers, repairs of backup generators installation of VFD drives, pumps, etc.
- 8 Supply install new mechanical bar screen at Hesbit Al Samak PS with all associated electromechanical installations and builders works required to accommodate the new unit.



Figure 35 Installing mechanical Bar Screen at Hesbit Alsamak PS

- 9 Supply and install sand removal clam shell mechanism with all associated works and installations at Al Wafia sewage pumping station in Khanyounis.



Figure 36 Installing sand removal clam shell at Al Wafia PS

- 10 Replacement of sewage pumping access doors and covers for 4 sewage pumping stations.



Figure 37 Sewage PS repairs

- 14 Continue to manage and carry out heavy machineries annual maintenance and repair program ,and the works include engines overhauling, fabrication new sewage tanks, suction pumps maintenance, tires replacement, filters & oil replacement, body repairs, gear box, transmission system, drive shafts, disc clutches, engines, pins, buckets, lights, absorption dampers, steering joints, joints for all municipalities of the Gaza strip funded by ICRC.

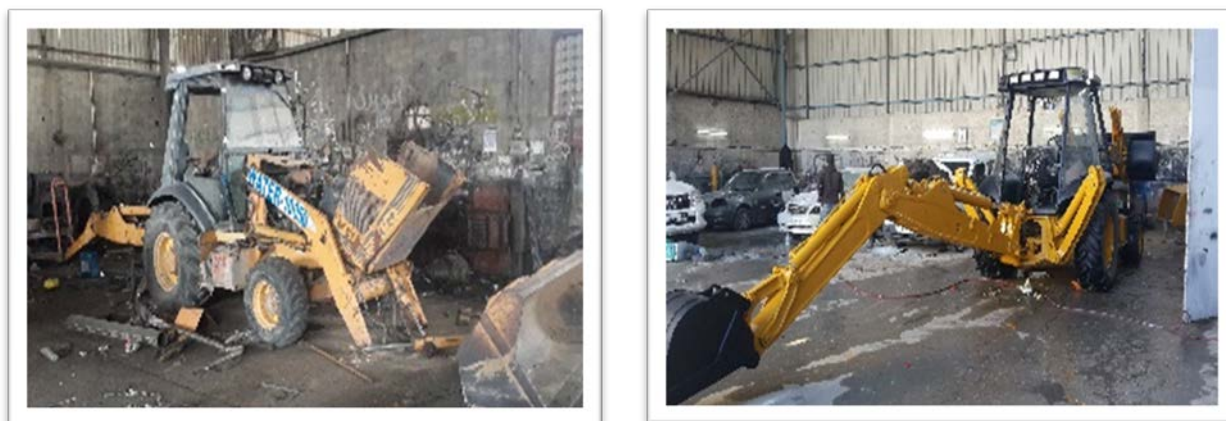


Figure 38 Heavy Machinery Repairs

Table 13 List of major rehabilitation and repair works/Wastewater and storm water facilities

Annual Sewage Works Report for - 2019				
SN	Municipality	Site/Facility	Date	Work Description
1	Rafah	WWTP-Rafah	17/03/2019	Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 55KW
2	Rafah	WWTP-Rafah	17/03/2019	Dismantling from Al Najily P.S, transfer and reinstall two 55kw ABS pumps in Rafah WWTP .
3	Khanuonis	Hamad P.S	17/03/2019	Repair unpredictable Defects of Bar Screen.
4	Bait Lahia	Amer P.S	05/03/2019	Supply and install upper bearings for 125KW
				Supply and install lower bearings for 125KW
				Supply and install set of mechanical seals for 125KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 125KW
5	Al Nussirat	Al Hassina P.S	06/03/2018	Rewinding the electrical motors for 54KW
				Supply and install upper bearings for 54KW
				Supply and install lower bearings for 54KW
				Supply and install set of mechanical seals for 54KW
				Supply and install Repair kit, rubber o-ring for 54KW
				Supply and install wear rings for 54KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 54KW

6	Bait Lahia	Al Siefia P.S	02/03/2019	Supply and install upper bearings for 7.5KW
				Supply and install lower bearings for 7.5KW
				Supply and install set of mechanical seals for 7.5KW
				Supply and install Repair kit, rubber o-ring for 7.5KW
				Supply and install wear rings for 7.5KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 7.5KW
7	Deir Al Balah	Al Bassa P.S	26/02/2019	Carry out complete workshop mechanical overhauling and repairs of 10 inches non return check valve
8	Bait Hanoun	Al Sultan Abdul Hamid P.S	21/02/2019	Cleaning the pumping stations, The work includes removing the garbage for Al Sultan Abdul Hamid P.S
9	Bait Lahia	Al Atatra P.S (Aslan 04)	20/02/2019	carry out complete workshop mechanical overhauling and repairs of 14 inches gate valve
10	North Area	BLWWTP	05/07/2018	Cleaning the pumping stations for Sewage multi-manufacturer pumps of (315) KW
11	Bait Lahia	Al Atatra P.S (Aslan 04)	20/02/2019	Rewinding the electrical motors for 54KW
				Supply and install upper bearings for 54KW
				Supply and install lower bearings for 54KW
				Supply and install set of mechanical seals for 54KW
				Supply and install Repair kit, rubber o-ring for 54KW
				Supply and install wear rings for 54KW
12	Deir Al Balah	Al Bassa P.S	20/02/2019	Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 54KW
				Rewinding the electrical motors for 54KW
				Supply and install upper bearings for 54KW
				Supply and install lower bearings for 54KW
				Supply and install set of mechanical seals for 54KW
				Supply and install Repair kit, rubber o-ring for 54KW
13	Khanuonis	Bani Suhila P.S	20/02/2019	Supply and install wear rings for 54KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 54KW
				Rewinding the electrical motors for 15KW
				Supply and install upper bearings for 15KW
				Supply and install lower bearings for 15KW
				Supply and install set of mechanical seals for 15KW
13	Khanuonis	Bani Suhila P.S	20/02/2019	Supply and install Repair kit, rubber O-ring for 15KW
				Supply and install Repair kit, rubber O-ring for 15KW

				Supply and install wear rings for 15KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 15KW
14	Jabalía	Mahader P.S	09/03/2019	Supply and install two 2" with minimum 2mm thick stainless steel 316L guide rails along the delivery pipe for each pump
15	Al Nussirat	Nussirat P.S (Wadi Qshash)	26/02/2019	Rewinding the electrical motors for 85KW
				Supply and install upper bearings for 85KW
				Supply and install lower bearings for 85KW
				Supply and install set of mechanical seals for 85KW
				Supply and install Repair kit, rubber o-ring for 85KW
				Supply and install wear rings for 85KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 85KW
16	Jabalía	Hawaber P.S	12/03/2019	Supply and install two 2" with minimum 2mm thick stainless steel 316L guide rails along the delivery pipe for each pump
17	Khanuonis	Al Wafia P.S	17/03/2019	Rewinding the electrical motors for KSB Pump of 210KW
				Supply and install upper bearings for KSB Pump of 210KW
				Supply and install lower bearings for KSB Pump of 210KW
				Supply and install set of mechanical seals for KSB Pump of 210KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for KSB Pump of 210KW
18	Jabalía	Hawaber P.S	06/03/2019	Rewinding the electrical motors for 78KW
				Supply and install upper bearings for 78KW
				Supply and install lower bearings for 78KW
				Supply and install set of mechanical seals for 78KW
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for 78KW
19	Bait Lahia	Hawaber Pressure Pipeline	19/06/2019	Emergency Repair of Hawaber Pressure Pipeline
20	CMWU	CMWU Stores		Emergency Repair of Forklift .
21	Deir Al balah	Al Berka	25/06/2019	General electrical & mechanical repairs of sewage multi-manufacture pumps repairs, pump electrical cables,...
22	Nussirate	Al Hassina'a P.S	25/08/2019	Supply and install I-beam profile 30cm (IPN/125) and bracing as grider beam to carry the moving electrical hoist above the pump unit

23	Al Moghragha	Al Moghragha PS	10/07/2019	General electrical & mechanical repairs of sewage multi-manufacture pumps repairs, pump electrical cables,...
24	Bait lahia	Al Hawaber Pressure line	11/07/2019	General electrical & mechanical repairs of sewage multi-manufacture pumps repairs, pump electrical cables,...
25	Jabalia	Al Hawaber Pressure line	11/07/2019	General electrical & mechanical repairs of sewage multi-manufacture pumps repairs, pump electrical cables,...
26	Um Al nasser	Um Al Nasser P.S	25/06/2019	:Checking and inspection for deteriorated at the site and workshop, the work include carry out all workshop requirement.
			25/06/2019	General electrical & mechanical repairs of sewage multi-manufacture pumps repairs, pump electrical cables,...
27	Rafah	P124 water well	23/06/2019	Supply and install B350
28	Nussirate	Hassina P.S	06/08/2019	Supply and install 3" with minimum 4mm thick stainless steel 316L guide rails
29	Bani Souhaila	Bani Souhaila Ps	23/09/2019	Modular self-priming diesel driven non clogging pump
30	Rafah	Al Nejali PS	26/09/2019	Supply and cast reinforced concrete (B350) Fair Face (F.F.)
31	Rafah	Block O	22/09/2019	Replacement, Supply and install a complete (4/6)" S.steel 316L. Manifolds
32	Rafah	Block O	22/09/2019	Supply and cast reinforced concrete (B350) Fair Face (F.F.)
33	Khanuonis	Baten Sameen	26/09/2019	Carry out Complete mechanical Overhauling and repair of sluice gate
34	Rafah	RWWTP	01/09/2019	General electrical and mechanical repairs for sewage multi-manufacturer pumps
35	Rafah	RWWTP	26/09/2019	Drying the winding 55KW
				Supply and install Upper bearing for 55kw , ABS
				Supply and install lower bearing for 55kw , ABS
				Supply and install mechanical seal for 55kw , ABS
				Supply and install repair kit for 55kw , ABS
				Supply and install wear-ring for 55kw , ABS
				Checking and inspection for deteriorated pump, 55 kw
36	Bani Souhaila	Bani Souhaila PS	24/09/2019	Supply and install , connect flygt pump 15KW
37	Rafah	Block O	09/10/2019	Supply, install heavy duty electrical chain hoist 1000Kg
38	Khanuonis	Al Wafia P.S	01/10/2019	Supply and install I beams
39				Supply , cast reinforcement B350
40	Bani Souhaila	Bani Souhaila PS	23/09/2019	Carry out complete mechanical overhauling and repair of sluice gate
				General electrical & mechanical repair (Maintenance of Bar screen)

41	North Area	Bait Lahia WWTP	13/10/2019	General & Mechanical repair of sewage pumps repairs
42	Nussirate	Al Hissina'a PS	09/10/2019	Supply and install heavy duty 3000 kg
43	Khanyounis	Al Wafia P.S	04/11/2019	Design locally manufacturer clamshell grab
			30/10/2019	Supply and install heavy duty 3000 kg
			31/10/2019	Supply and install 100*100 sluice Gate
44	Khanyounis	Hesbit Al Samak	30/10/2019	Supply and install heavy duty 5000 kg
				Supply and install I beam
			15/10/2019	Supply and install B350 FF
45	Khanyounis	Al Wafia P.S	15/10/2019	Supply and install B350 FF
46	Rafah	Jumizat Al Sabil P.S	21/10/2019	Supply and install basket screen
47	Bani Souhila'a	Bani Souhila'a PS		Supply , install and connect complete package for Flygt pump 15KW
48	Khanyounis	El Wafia PS		Supply and install B350 FF
49	Rafah	Jomizet Al sabeel	26/11/2019	Supply materials to cmwu stores.
50	Um Al Nasser	Um Al Nasser PS	20/11/2019	Maintenance for 27KW, KSB
51	Deair Al Balah	Al Basa sewage P.S		Auto mechanical rack Bar Screen: Design, Locally manufacture, fabricate, built, duplicate, test, commission and operate a Complete stainless steel 316 L Auto-mechanical rack bar screen
52	Khanyuonis	Hesbit Al Samak P.S		Auto mechanical rack Bar Screen: Design, Locally manufacture, fabricate, built, duplicate, test, commission and operate a Complete stainless steel 316 L Auto-mechanical rack bar screen
53	Khanyuonis	Hesbit Al Samak	27/11/2019	Supply and install upper bearings for two Sewage multi-manufacturer pumps, KSB 210 KW type
				Supply and install lower bearings for two Sewage multi-manufacturer pumps, KSB 210 KW type
				Supply and install set of mechanical seals for two Sewage multi-manufacturer pumps, KSB 210 KW type
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for two KSB 210 KW type.
54	Khanuonis	Al Wafia P.S	27/11/2019	Rewinding the electrical motors for KSB 210 KW type
				Supply and install upper bearings for Sewage multi-manufacturer pumps, KSB 210 KW type
				Supply and install lower bearings for Sewage multi-manufacturer pumps, KSB 210 KW type
				Supply and install set of mechanical seals for Sewage multi-manufacturer pumps, KSB 210 KW type

				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for KSB 210 KW type.
55	Khanuonis	Al Majadlh P.S	27/11/2019	Rewinding the electrical motors for Flygt 13.5 KW type.
				Supply and install upper bearings for Sewage multi-manufacturer pumps, Flygt 13.5 KW type
				Supply and install lower bearings for Sewage multi-manufacturer pumps, Flygt 13.5 KW type
				Supply and install set of mechanical seals for Sewage multi-manufacturer pumps, Flygt 13.5 KW type
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for Flygt 13.5 KW type
56	Khanuonis	Al Qatatwa P.S	27/11/2019	Rewinding the electrical motors for Flygt 7.5 KW type.
				Supply and install upper bearings for Sewage multi-manufacturer pumps, Flygt 7.5 KW type.
				Supply and install lower bearings for Sewage multi-manufacturer pumps, Flygt 7.5 KW type.
				Supply and install set of mechanical seals for Sewage multi-manufacturer pumps, Flygt 7.5 KW type.
				Checking and inspection for deteriorated pumps/parts at the site (P.S) and in the workshop for Flygt 7.5 KW type.

2- PROGRAM ACTIVITIES PROGRESS

2.1 Geographic Information System (GIS)

GIS department at the CMWU has established a comprehensive data base survey for all different water and waste water facilities in the southern and northern part of the Gaza Strip. All the collected data has been unified into one geo-database. CMWU has establish an internet web application that can provide the visitors with all relevant water and wastewater data through <http://gis.cmwu.ps>.

2.2 Environmental Management Plan (EMP)

CMWU has monitored and analyzed the water quality in the domestic water wells in the southern governorates (twice a year), in addition to wastewater collection and sampling for all WWTPs on a weekly basis.

3. OTHER ACTIVITIES

Other activities have been running to enhance the performance of CMWU as well as strengthen the relationship between CMWU and PWA through enhancing the management relationship between each other, as well as other activities between the CMWU and funding agencies through close follow up and transparent financial procedures.

The following activities illustrate the CMWU other activities;

3.1 Enhance the identity of the CMWU as fully functional service provider:

- CMWU Board of Directors has agreed on a decision that all municipalities who receive O&M services from the CMWU should pay 10 % of the O&M cost to the CMWU account. This step was applied for all the municipalities whereas some municipalities paid their dues on a monthly basis.
- Restructuring CMWU head quarter and regional offices for better performance.
- Expand the CMWU work activities to integrate extra municipalities in the utility system.
- Enhance the interface management between CMWU and PWA by regular meeting and close coordination.
- Forming a coordination committee with Municipality of Gaza in order to implement the Gaza sewerage Emergency Project financed by KFW, and to agree how to operate the GWWTP.
- Municipality of Gaza and Jabalia have re-joined the CMWU.
- CMWU in cooperation with the MoLG and the PWA finalized MOUs for the municipalities that will received desalinated water, and signed them
- TOR for consultancy service for a transfer plan was drafted and will be started mid-2020.
- CMWU will operate the 3 new WWTPs in accordance with the water law
- CMWU has drafted the O&M budgetary plan as a holistic view to operate and maintain the WASH systems including the strategic facilities

3.2 Coordinate with other entities:

As known since the establishment of CMWU, all the projects for either development or for emergency are funded from different donors until CMWU could stand alone for its facilities operation and maintenance as well as developmental projects. The following are the on-going activities in cooperation with PWA and other donors' agencies as;

IsDB: is still financing sea water desalination plant in Gaza city 10,000 m³/day. This plant is an important component of the STL program that started to improve the water supply quality for around 250,000 inhabitants in Gaza City

UNICEF: some projects during 2019 are in progress; like supply chemicals and chlorine for water facilities, supply spare parts and materials to the newly constructed emergency warehouses, Supply drinking water for schools, providing water & Wastewater facilities with PV solar system, and the second phase of STLV (SGDP) desalination plant.

ICRC: has financed different projects which aim to improve the operational schemes and assure continuity of water and wastewater services. The last projects supported by ICRC are Upgrading works for KHWWT and the terminal PS in the northern area, providing PV system for Canada water tank, maintenance works and providing the Second power line for wastewater facilities, maintenance of heavy machines,

KFW: has financed Gaza central WWTP, recently KFW has allocated 10M USD for water sector MIP (Multi sectorial program) the fund is allocated for Energy Management Program

EU: is financing the expansion of seawater desalination plant STLV at the southern governorate to reach 20,000 m³/day by adding additional 14,000m³/day desalination units. in addition to financing the NRW program for Rafah & Khan Younis, Besides the storm water project at Rafah and PV solar energy for some Wash facilities. Already the CMWU in cooperation with EU, PWA and MOF started the projects' preparation

Oxfam: in cooperation with CMWU, Oxfam has signed an agreement with CMWU through EU fund to rehabilitate and maintain of 16 RO desalination units through Gaza Strip, in addition to providing Al Shoka and maan water tank with PV solar system.

SC: in cooperation with CMWU, recently SC has signed an agreement with CMWU to equip 3 water wells with PV solar energy, in addition to another agreement for emergency intervention in Al Saftawy storm water basin.

AAH: in cooperation with CMWU constructed wastewater networks and treatment unit at Al Mawasi-Khanyounis, besides rehabilitation of 14 Ro units at the southern governorate and providing 10 Ro units with PV system, recently AAH is financing the maintenance and rehabilitation works for 3 water wells and sewage pumping stations at Khan Younis.

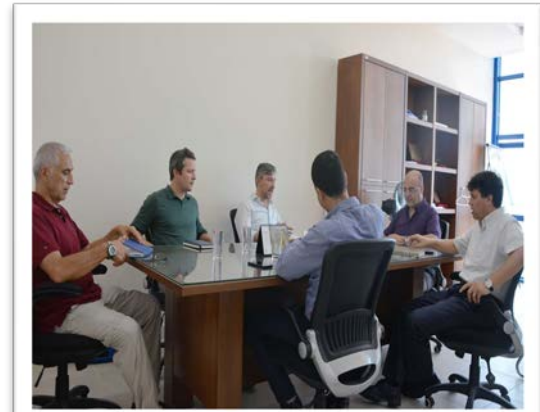
NRC: in cooperation with CMWU, through GIZ fund has constructed storm water pipeline at Al Aqsa street-Dair Al Balah, and recently NRC is financing preparedness and winterization activities at the middle and southern governorates.

Other Ngo's: CMWU has been keeping the communication with all NGO's that are working in the water sector in order to work within master plans and its defined projects and targets.

3.3 Donors and missions to visit the CMWU Facilities:

During the period of this report, many donors' agencies and diplomatic missions have visited CMWU and some facilities such as the sea water desalination plants, the WWTPs and some facilities that needs interventions to rehabilitate or upgrade, the following are part of those visits:

- On January 2019, a mission of the quartet office visited some facilities to have an overview on the O&M needs for water and wastewater sector in the Gaza Strip.
- On April 2019, EU- mission visited STLV site, Al Amal & Al Sattar reservoirs, and Al Saada DP in Kahnyounis.
- On May 2019, UNSCO mission visited CMWU HQ and had a meeting with the general director to discuss the W&WW sector strategy and needs.
- On May 2019 also, a KFW mission visited the central treatment plant east of AlBurij.
- On June 2019, opening ceremony for the PV project at RWWTP for water reuse funded by UNDP&JIKA
- On August 2019, ECHO mission visited CMWU and conducted a meeting with the CMWU team to discuss the W&WW needs.
- On September 2019 STLV, Energy assessment mission from KFW accompanied with PWA and CMWU had visited some facilities.
- Also On September 2019, A delegation from the British Consulate in Jerusalem visited the Southern Sea water desalination plant.



- On October 2019, the European Union delegation visited the desalination plant in the southern Gaza Strip
- On November 2019, A delegation from GIZ the German Foundation for International Cooperation visited the CMWU main laboratory in the HQ to see the progress on implementing PV solar panels for the Lab.
- On December 2019, many visits were conducted whereas the main are the PWA mission headed with H. E. the Minister Mr. Mazen Ghoneim from 2-4 December as detailed here below:
 - o On 2/12/2019 visited Gaza seawater desalination plant with the PWA team, and reviewed the operations needs of the plant with the CMWU.
 - o On 3/12/2019 visited the sewage treatment plant in Khan Yunis implemented by UNDP in cooperation with CMWU through the IsDB fund.
 - o On 4/12/2019 his excellency with Mr. Nikolai Miladinov, United Nations Coordinator for the Middle East Operation, Mr. Thomas Nicholson, Acting Ambassador of the European Union and CMWU senior staff, in the presence of many mayors and representatives of national and international institutions opened the second and third phases of the European Union-funded seawater desalination plant in the southern governorates, implemented by UNICEF.



Figure 34: CMWU Public Awareness Activities

3.4 Public awareness campaigns:

Public Awareness campaigns implemented during the last year relied on the methodology of raising the public awareness of water and desalination plants in the Gaza Strip and concentrated on the following issues:

- Importance of Seawater Desalination Plant
- Saving water
- Paying Water Bills
- Cleaning tanks
- Water situation

Parts of the implemented activities are mentioned here below:

1. Workshops: Media & awareness unit implemented **8** workshops in all the Gaza governorates.
2. Media & awareness unit implemented awareness session & competitions in **6** schools of Rafah governorate.
3. Ceremonies: 5 ceremonies.
4. Organizing some trips for students to visit some main facilities such as the south governorates seawater desalination plant and the wastewater treatment plant in the northern area.
5. Participate on exhibition for three days at Islamic University
6. Publishing CMWU news on social media and newspaper



Figure 39 CMWU Public Awareness Activities

MAIN OBSTACLES

One of the main and major obstacles towards accomplishing on-going contracts is the siege forced on the Gaza commercial borders towards importing the necessary goods to finish the works. Added to that; the cost of materials which becomes higher than its regular price due to difficulties in obtaining those materials to implement the projects. Some of the contractors have succeeded to import their materials with higher prices in which affect the engineering estimation for the projects' supply materials.

During the first half of the year 2019, Gaza strip was suffering from catastrophic shortages and unreliability of electricity power supply that has severely and adversely affected the whole pumping and treatment systems of water and wastewater services. Also, standby electricity Diesel generators located at various sites were heavily and in somehow harmfully affected with long term operating schemes to keep and protect the services provided to the people of Gaza.

The operational electrical demand for the water and wastewater facilities is 45 MW, which will rise to around 75 MW in the coming years once the desalination plants and WWTP are constructed.

Fuel, abuse of the generators, besides the fluctuated electrical current are the reasons behind the high operation and maintenance costs.

Depreciation of the economic situation affects negatively the collection efficiency during the year, besides the inherited tariff, which is low in comparison to the actual services costs.

Operation of strategic facilities like WWTPs, STLVs and reservoirs has put an extra financial burden on the CMWU.

SUCCESS STORY**(Al-Aqsa street yearly flood in Dair El Balah)**

Al Aqsa street in Dair El Balah is considered one of the major streets in Dair El Balah and middle area as whole especially there is five school in the street, Al Aqsa hospital which is the central hospital in the middle area, civil defence center, Al Awqaf office, police station, some governmental institutions and 6000 people lives in the area.

The topography of this street is depression zones in the middle. Unfortunately; During the winter season; the storm water was accumulated in the street since there is no exit to the storm water and reaches 1m height in the middle of the street. Due to lack of storm water infrastructure; CMWU used to evacuate the storm water using mobile pumps and drain it to the existing sewage network making additional stress on the sewage system which is already exhausted and deteriorated. The evacuation takes 2-3 days every storm, whereas during this period the schools are closed and the students could not able to go to their schools. Also, the entrance of the hospital is closed and the people enter the hospitals in difficulties, Ambulances enter the hospital from the emergency exit. OCHA has classified the street as one of highest hotspots locations under threat of flooding.

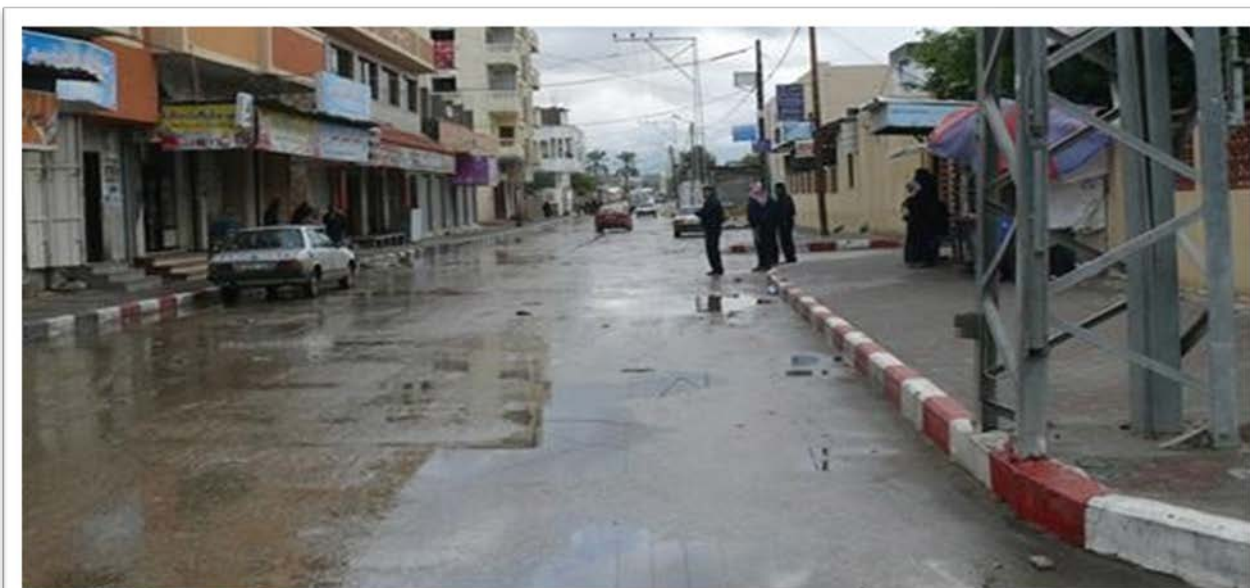
Since year 2012; CMWU has prepared the Plan to solve the problem and initiated the proposal for fund. Moreover; the project is considered a top priority to be implemented in CMWU master plan. On the first of 2019; CMWU has succeed to get the fund from GIZ through NRC, Hence the tender is launch and the physical work is started on September 2019, all efforts have been exerted to finish the project before the winter whereas the project activities have been completed by the mid of October.

During the 2019 winter; no flood was recorded and all of activities were implemented as planned, CMWU has met some of beneficiaries. All of them were happy from the impact of the project;

Dr. Kamal khatab (General director of the hospital, Ministry of health) said” the situation was so difficult before the construction of the storm water project, we faced a lot of problem. But after operating the new project; the storm water service improved in the whole area and it is easy to enter the hospital during the rainy days. Finally, he thanks Municipality of Dair El Balah, CMWU, PWA, NRC, GIZ and the people for their Patience till the storm water infrastructure constructed”.



Before



After

CONCLUSION

In order to fulfil the National Water Plan in the reuse of wastewater, construction of desalination plants, management of the aquifer water, and increasing the efficiency of the distribution networks. PWA developed a strategy that is called CSO-G (Comparative Study of Options for Gaza). The aim of this strategy is to identify a rolling program of interventions that will represent a Palestinian consensus for addressing the current problems in the water sector in Gaza through list of interventions where the main are:

1. Short-term low-volume [STLV] desalination.
2. Improving the domestic water distribution network.
3. A Water and Health Monitoring Project.
4. Increased water imports from Israel.
5. Regional [high-volume] desalination.
6. Pilot wastewater treatment and reuse projects.
7. Large-scale wastewater and reuse programmes, after the treatment plants are completed.

In the meantime, to provide a new fresh water resources to the system, PWA in cooperation with CMWU has been looking for financing large projects especially large scale seawater desalination plants and waste water treatment plants even the current political situation is not stable in order to:

1. Bridge the gap between the water supply demand and the available quantities.
2. Improve the quality of the supplied water which will lead to mitigate the health hazards, especially for the poor people.
3. Relief the stress on the coastal aquifer of Gaza Strip and upgrade its reserve of water for the next generations.

CMWU shall keep looking for self-dependency specially to cover the operation cost for such chemical, biological lab creation and vehicles workshop.

CMWU shall expand and improve water bill issuance and collection efficiency in order to be able to recover most of its operational expenses.

CMWU shall follow up the staff transfer from the municipalities to the CMWU and follow up a clear business plan in order to reach the sustainability by 2025.

END

Annex 1

CMWU Implemented PV projects Data base

SN	Facility Location Data				Donor	PV system	Modules		
	Governorate	Municipality	Facility type PV Location	Served Facility			Total installed Modules Capacity KWp	Module Wp (Watts)	No. of Modules
1	Gaza	El Zahra	CMWU main Office	CMWU main Office	Unicef	Off-Grid	5.12	320	16
2	Gaza	El Zahra	CMWU main Office	CMWU main Office	GIZ	Off-Grid	12.15	405	30
3	Middle	Deir El Balah	Sea Water Desalination Plant	Sea Water Desalination Plant	Unicef	On-Grid	560.3	325	1740
4	Khan Younis	Khan Younis	Sewage Treatment Plant	Aerators-Khan Younis Temporary W.water Lagoons	Unicef	On-Grid	250	330	760
5	Khan Younis	Khan Younis	Sewage Treatment Plant	Service building-Khan Younis Temporary W.water Lagoons	Unicef	On-Grid	0.0	0.0	0.0
6	Middle	Deir El Balah	Sea Water Desalination Plant	USAID - Bassa D.P	USAID	On-Grid	235.6	325	724
7	Middle	Nusairat	Sewage Pump Station	Abu Mhadi (Maala)	PHG	On-Grid	23.1	330	70
8	Middle	El Zahra	Sewage Pump Station	El Zahra Sewage P.S	PHG	On-Grid	33	330	100
9	Middle	El Zahra	Water Well	G-57 Well	Unicef	On-Grid	50	330	152

10	Gaza	Wadi Gaza	Sewage Pump Station	Wado Gaza Sewage P.S	PHG	On-Grid	26.4	330	80
11	Khan Younis	Khan Younis	Sewage Pump Station	Al Batn El Sameen Sewage P.S	PHG	On-Grid	26.4	330	80
12	Rafah	Rafah	Sewage Pump Station	Undp P.S	PHG	On-Grid	26.4	330	80
13	North	Om El Naser	Sewage Pump Station	Om El Naser Sewage P.S	PHG	On-Grid	26.4	330	80
14	Khan Younis	Khan Younis	Rerservoir & Pump Station	Maan Wells	Oxfam	Solar Pump	150.66	405	372
15	Middle	Moghraqa	Rerservoir & Pump Station	Kawther Water Well	Muslim Hands	Solar Pump	51.03	405	126
16	Gaza	Gaza	Rerservoir & Pump Station	Civil Defence reservoir	Unicef	On-Grid	80	405	196
17	Gaza	Gaza	Rerservoir & Pump Station	Al Montar Well	Unicef	On-Grid	80	405	196
18	Gaza	Gaza	Rerservoir & Pump Station	Sheikh Radwan Res.	Unicef	On-Grid	150	405	371
19	Gaza	Gaza	Rerservoir & Pump Station	Al Safa Res.	Unicef	On-Grid	150	405	371
20	Rafah	Al Shoka	Rerservoir & Pump Station	Qatar Res. Des.Plant	Oxfam	Off-Grid	30	405	75
21	Rafah	Rafah	Rerservoir & Pump Station	P144 well & P.S	ICRC	On-Grid	206	405	508

22	North	Beit Lahia	Sea Water Desalination Plant	Gaza 10000m3 Desalination plant - Servic Building	ISDB	Off-Grid	7.26	330	22
23	Middle	Deir El Balah	Sea Water Desalination Plant	Sea Water Desalination Plant	Unicef	On-Grid	126	315	404
24	Khan Younis	Abasan El Kabira	Rerservoir & Pump Station	Rerservoir & Pump Station	WB	Off-Grid	5	320	20
25	Khan Younis	Khzaa	Rerservoir & Pump Station	Rerservoir & Pump Station	WB	Off-Grid	2.4	300	8
26	Khan Younis	Khan Younis	CMWU Central Warehouse	CMWU Central Warehouse	WB	Off-Grid	4.8	300	16
27	Gaza	El Zahra	CMWU main Office	CMWU main Office	WB	Off-Grid	5.12	320	16
28	Middle	Deir El Balah	Sea Water Desalination Plant	Service building	Unicef	Off-Grid	7	250	28
Total KWp							2,330.1		

Annex 2

Average Wastewater Quantities and Treatment Efficiency for the WWTPs during 2019

Facility	Total Quantity 2019	BOD (mg/l)	COD (mg/l)	TSS (mg/l)	PH	EC	BOD (mg/l)	COD (mg/l)	TSS (mg/l)	PH	EC	Av. Treatment Efficiency
RWWTP	4,498,099	538	1203	576	8	5333	129	283	103	8	5276	77%
KhaTWWTP	4,954,596	436	961	474	8	4824	117	255	94	8	4962	73%
Gaza	20,431,959	371	824	409	8	4863	121	276	94	8	4964	75%
NGEST	12,097,404	348	768	383	8	2904	28	81	20	8	2547	92%
Total Quantities	41,982,058											
Avg. Treatment efficiency for all		80%										

Annex 3

ملخص تقرير الانجاز السنوي لمصلحة مياه بلديات الساحل لسنة 2019

اولا: الإنجازات الفنية:

يمكن تلخيص أهم المنجزات الفنية لمصلحة المياه خلال سنة 2019 بما يلي:

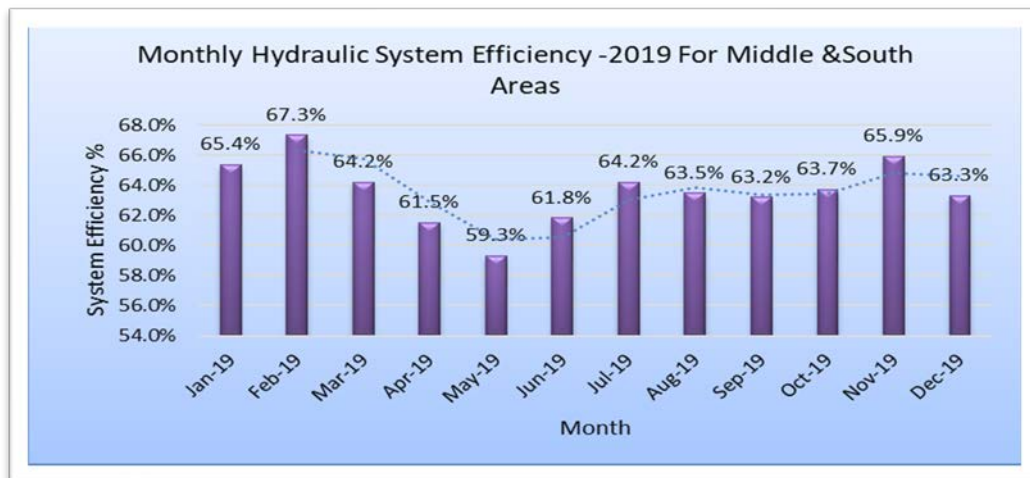
1- العمل على تحسين كميات المياه وذلك من خلال:

العمل على تقليل الفاقد في نظام التوزيع وتحسين كفاءة الشبكة: بالرغم من التحديات الكبيرة التي تواجه المصلحة وذلك من خلال:

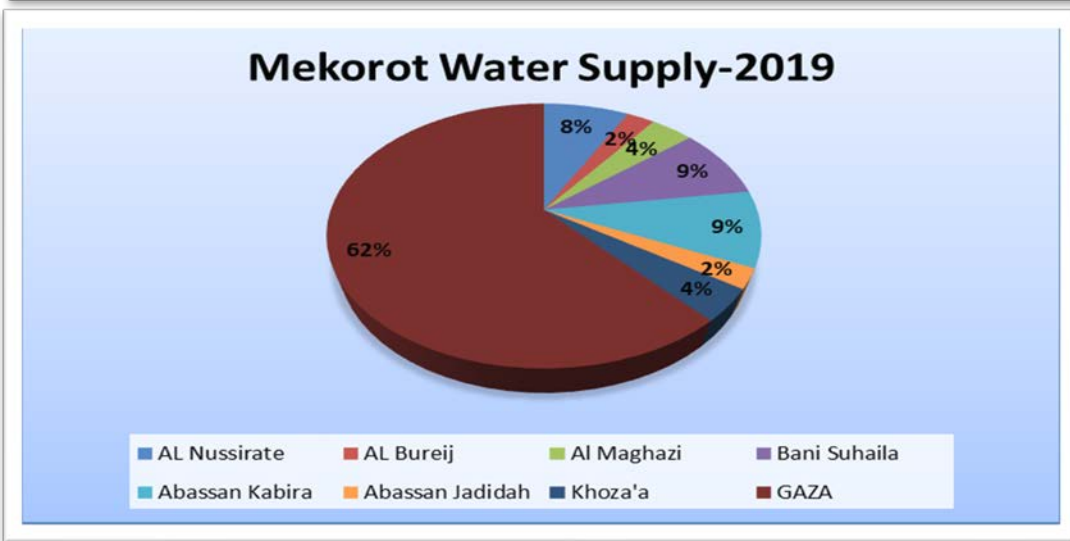
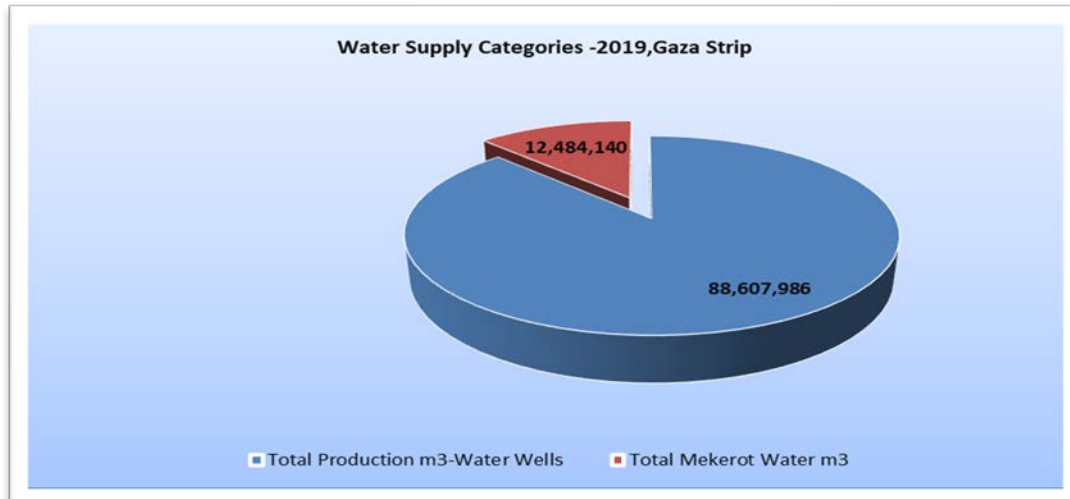
1. دعم برامج الصيانة لشبكات المياه من خلال توفير قطع الصيانة والدعم الفني
2. متابعة قراءات عدادات انتاج المياه وجمع ومراجعة بيانات تحققات الجباية
3. تغيير العدادات العطلانة المحافظة على نسبة فاقد إجمالي في قطاع غزة لا تتجاوز 36%

المحافظة على تشغيل مرافق المياه بأعلى كفاءة وأفضل إنتاجية وذلك من خلال:

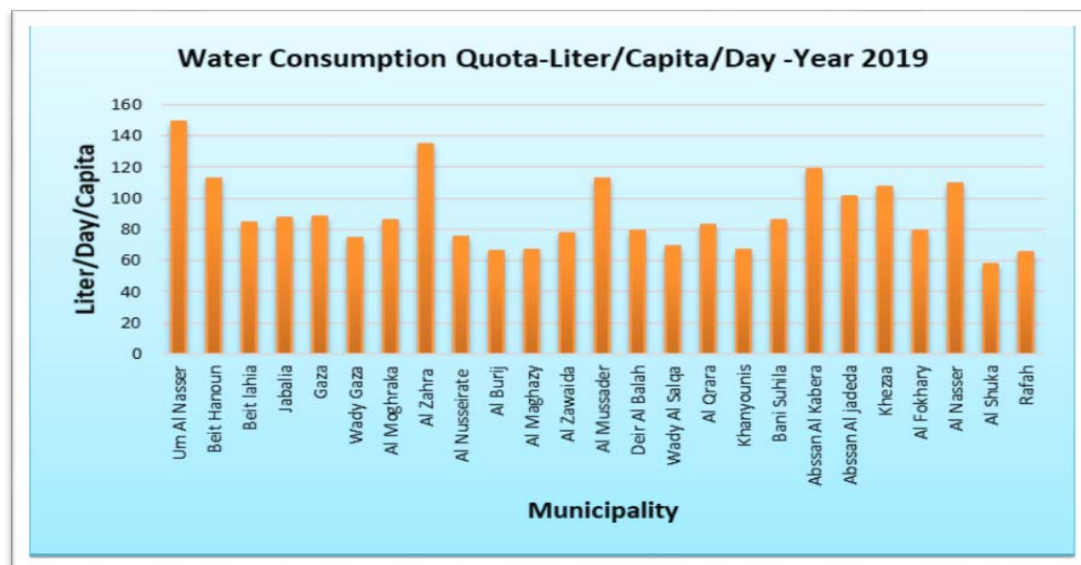
1. إجراء الإصلاحات والصيانة اللازمة للآبار ومحطات الضخ وتوصيل الكهرباء لبعض الآبار إضافة الى حفر آبار جديدة.
 2. التدخل المستمر لورشة الصيانة المتنقلة للقيام بأعمال الصيانة المهمة في الشبكات والمرافق
 3. تشغيل بعض الآبار باستخدام نظام التحكم والمراقبة الآلي (SCADA)
 4. توفير الوقود اللازم لتشغيل المولدات حسب الكميات المتوفرة
 5. تركيب وحدات طاقة شمسية لبعض المرافق ووصل مرافق حيوية بخطوط تغذية كهرباء بديلة
 6. تحسين معدل استهلاك الطاقة في إنتاج وضخ المياه من خلال حيث وصل الى 0.439 كيلووات/متر مكعب
- وبلغت كميات المياه المنتجة من الآبار في قطاع غزة في سنة (2019) 88.61 مليون متر مكعب، كما بلغت كميات المياه المستوردة من مكروت 12.48 مليون متر مكعب وبلغ متوسط نسبة كفاءة تشغيل آبار المياه 98% في سنة 2019 في حين وصل معدل حصة الفرد من المياه المستهلكة 79 لتر /يوم .



معدلات كفاءة شبكة المياه في محافظات الوسطى وخان يونس ورفح



كمية المياه المنتجة والمستهلكة و نسب توزيع كميات مياه مكروت لكل بلدية خلال عام 2019



معدل حصة الفرد من المياه المستهلكة في كل بلدية

2- العمل على تحسين جودة المياه وذلك من خلال:

2.1 تطهير المياه:

- يتم التطهير باستخدام محلول الكلور (صوديوم هيبوكلورايت) الذي يتم توزيعه على الآبار ومحطات الضخ في كل مناطق القطاع. حيث تم توزيع 820 متر مكعب من محلول الكلور (تركيز 10-12%) في عام 2019
- تقوم المصلحة بتطبيق نظام المراقبة لكفاءة نظام التطهير في جميع المناطق وجمع تقارير نتائج فحوصات الكلور الحر في المصدر وفي نقاط محددة في شبكة التوزيع.
- تقدم المصلحة الدعم الفني لطواقم التشغيل من خلال إصلاح مضخات حقن الكلور وتركيب مضخات جديدة وتوفير أجهزة فحص الكلور الحر.
- تدريب طواقم التشغيل العاملة في تطهير المياه لرفع كفاءتهم ولاتباع إجراءات الوقاية والسلامة.
- وصلت كفاءة التطهير في شبكة المياه إلى 98.9% لسنة 2018

2.2 إنشاء محطات تحلية المياه:

- توسيع محطة تحلية مياه البحر القائمة بدير البلح (البصة) لتصبح طاقتها الانتاجية 6000 متر مكعب/ يوم
- تشغيل محطة تحلية مياه البحر على شاطئ دير البلح بتمويل EU بطاقة انتاجية 6000 متر مكعب/ يوم لخدمة كل من رفح وخان يونس وجاري العمل لتوسيع المحطة لتصبح طاقتها الانتاجية 20,000 متر مكعب/ يوم
- تم تشغيل محطة تحلية مياه البحر في السودانية لخدمة مدينة غزة بطاقة انتاجية 10,000 متر مكعب/ يوم بتمويل البنك الاسلامي للتنمية. ويتم خلطها بمياه الآبار في الخزانات وتخدم أكثر من 250,000 نسمة من سكان غرب مدينة غزة.
- إنشاء محطة تحلية مياه آبار مالحه في مدينة عيسان الكبيرة بقدرة إنتاجية 50م3/اليوم

2.3 تشغيل وصيانة محطات التحلية القائمة:

- تزويد محطات تحلية مياه الآبار المالحة (48 محطة) بالمواد الكيميائية اللازمة لتشغيلها مثل الصودا الكاوية وحمض الهيدروكلوريك.
- المساعدة في صيانة وإعادة تأهيل هذه المحطات وتقديم قطع الغيار اللازمة للصيانة.
- تركيب نظام طاقة شمسية لمعظم محطات تحلية المياه المالحة القائمة.

2.4 صيانة واستبدال شبكات المياه القديمة:

حيث بلغ طول شبكات المياه التي تم إنشاؤها أو استبدالها حوالي 65 كم حتى نهاية 2019

2.5 إنشاء خزانات المياه:

وتهدف الى تحسين جودة المياه من خلال خلط المياه الجيدة أو المحلاة مع مياه الآبار في الخزانات لتحقيق العدالة في جودة المياه لأكثر عدد ممكن من المستفيدين.

- تم إنشاء خزاني مياه في خان يونس (السطر والأمل) سعة كل منها 5000 متر مكعب بتمويل EU
- تم تشغيل خزاني مياه في كل من الفخاري والشوكة سعة كل منها 2000 متر مكعب بتمويل USAID
- إعادة تأهيل محطة الضخ في تل السلطان برفح وجاري العمل في تركيب نظام طاقة شمسية لمحطة ضخ خزان كندا برفح بتمويل الصليب الأحمر.

3- تحسين جودة مياه الصرف الصحي:

3.1 محطات معالجة الصرف الصحي:

3.1.1 تشغيل المحطات القائمة: يوجد في قطاع غزة خمس محطات معالجة ثلاث منها تعمل على المدى المتوسط وهي محطة بيت لاهيا، ومحطة غزة ومحطة رفح. كما يوجد محطتان تعملان بشكل مؤقت في غرب وادي غزة وغرب مدينة خان يونس. وتقوم مصلحة المياه بمتابعة أعمال الصيانة والتطوير والتشغيل في هذه المحطات للمحافظة على أدائها لحين انتهاء دورها.

نظراً لصعوبة تأمين الكهرباء في محطات المعالجة على مدى الساعة وعدم كفاية وقود لتشغيل المولدات فإن عملية المعالجة تتأثر بشكل سلبي يؤثر على كفاءة المحطات. حيث بلغت كفاءة المعالجة 80% في سنة 2019

3.1.2 محطات المعالجة الجديدة:

- I. مشروع إنشاء محطة معالجة غزة المركزية بتمويل من KFW ويشمل:
 1. محطة المعالجة المركزية شرق البريج ومحطة الضخ المركزية بوادي غزة، وبلغت نسبة الإنجاز ما يزيد عن 98 % وبصدد البدء بالتشغيل التجريبي.
 2. إنشاء خط الضغط الرئيسي من وادي غزة وحتى موقع المحطة وتم الانتهاء منه خلال عام 2019
 3. إنشاء خط تجميع الصرف الصحي الرئيسي من محطة الشيخ عجلين وحتى موقع محطة الضخ المركزية بوادي غزة، جاري العمل بالمشروع ومتوقع الانتهاء منه مطلع عام 2020.
 4. إنشاء محطة توليد طاقة كهربائية بالخلايا الشمسية والمشروع قيد التنفيذ.
 5. تطوير محطة الشيخ عجلين ويشمل تنظيف الاحواض وصيانة لوحات كهربية وصيانة واستبدال بعض المعدات وقد تم الانتهاء من اعمال التطوير خلال عام 2019
 6. اعمال إعادة تأهيل مجرى وادي غزة وهي قيد التنفيذ.

II. مشروع إنشاء محطة معالجة خان يونس: بتمويل مجموعة من المانحين (ISDB (KDF), JIKA) وينفذ عن طريق UNDP ومصلحة المياه بالتعاون مع سلطة المياه. ويشمل المشروع:

- إنشاء محطة المعالجة
- إنشاء أحواض الترشيح شرق الفخاري
- إنشاء خطوط الضغط الرئيسي (من المحطة الى احواض الترشيح وخط الطوارئ الى البحر)
- بالإضافة الى إعادة تأهيل محطة ضخ 8 والخط الناقل الرئيسي

خلال عام 2019 ، تم الانتهاء من إنشاء خط إمدادات الطاقة المخصص لمحطة المعالجة. وجاري التحضير من UNDP لإعداد TOR لتصميم النظام الكهروضوئي بسعة إجمالية تبلغ 7 ميغاوات لتشغيل محطة توليد الطاقة بالكامل وهناك تمويل مخصص لتنفيذ نظام PV 1.3 ميغاوات كمرحلة أولى من الحكومة النرويجية وصندوق آخر للاتحاد الأوروبي يبلغ إجماليه 2.9 مليون يورو لتنفيذ 2.0 ميغاواط كمرحلة ثانية. تمثل المرحلتان 50% من إجمالي حمل الطاقة وكافية لتشغيل المرحلة الأولى المنفذة.

III. محطة معالجة الشمال (NGEST) بتمويل مجموعة مؤسسات مانحة والبنك الدولي وهي جاهزة للتشغيل حيث تم توقيع عقد مع الشركة المنفذة (Thermomechanic & MACC) لتشغيل المحطة مرحلياً. وهناك اتفاق مبدئي بين سلطة المياه والبنك الدولي أن تقوم مصلحة المياه بتشغيل المحطة حال انتهاء عقد الشركة. ولكن مصلحة المياه تريد ضمانات الدعم المالي للتشغيل حيث أن البلديات غير قادرة على تغطية هذه النفقات.

3.2 تصريف مياه الأمطار

تم الانتهاء من تنفيذ العديد من مشاريع تصريف مياه الأمطار أهمها:

- إنشاء أحواض تجميع مياه الأمطار برفح مع قناة تجميع رئيسية ومحطة ضخ، تمويل USAID عن طريق اليونيسيف. هذا المشروع حل مشكلة فيضان مياه الأمطار في المنطقة الغربية بشكل جذري.
- إنشاء أحواض تجميع مياه الأمطار في منطقة القرارة.
- تنظيف مجرى وادي السلخا.

- تزويد 8 محطات ضخ بخط كهرباء إضافي لضمان تشغيلها في أوقات الطوارئ.
- تم توقيع اتفاقية تعاون مع مؤسسة NRC لإنشاء خط تصريف مياه الأمطار في شارع الأقصى بدير البلح.
- إنجاز الخطة الشاملة لمياه الأمطار في مدينة خان يونس

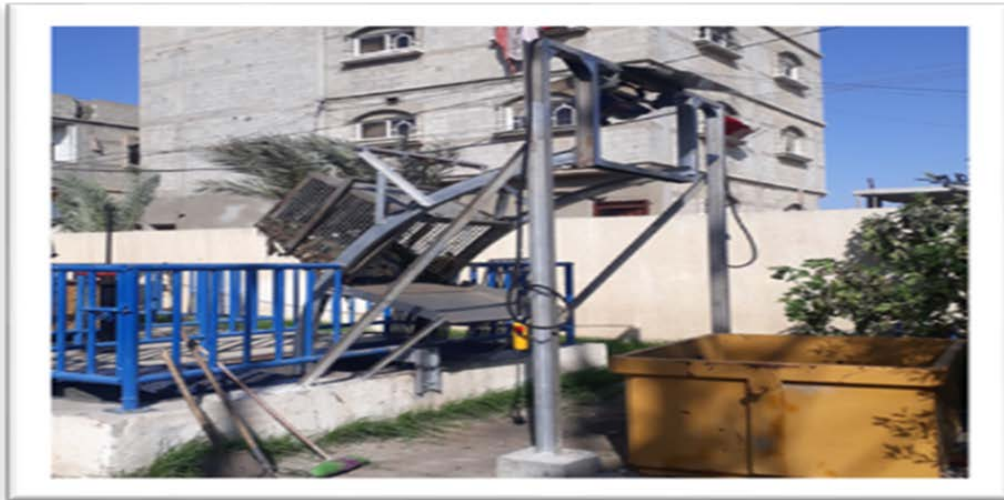
3.3 الصرف الصحي:

تطوير شبكات الصرف الصحي

- إنشاء شبكة تجميع الصرف الصحي بمنطقة المواصي بخان يونس بتمويل ACF
- تطوير شبكات الصرف الصحي في النصيرات والمغراقة بتمويل GVC
- تجهيز وثائق العطاء لمشروع إنشاء شبكات صرف صحي في مدينة رفح بتمويل من الهلال الأحمر التركي.

أعمال الصيانة الالكتروميكانيكية لمحطات ضخ الصرف الصحي ومياه الأمطار:

- تم القيام بأعمال الصيانة الالكتروميكانيكية للعديد من محطات تجميع وضخ الصرف الصحي ومنها صيانة ما يزيد عن 32 مضخة، واستبدال ما يزيد عن 22 محبس و 11 بارسكرين وغيرها الكثير.
- أعمال التنظيف لأكثر من 32 محطة في عام 2019.
- تصميم وتنفيذ نظام اوتوماتيكي جديد لتنظيف محطة جميزة السبيل (Automatic basket screen)



- تجهيز عدد من المضخات المتنقلة العاملة بالديزل وتوزيعها لمختلف المناطق.
- الاستمرار في صيانة الآليات الثقيلة التي تخدم قطاع الصرف الصحي والأمطار.

ثانياً : إنجازات البرامج الأخرى:

- 1- نظم المعلومات الجغرافية:
يتم تطوير قاعدة بيانات المعلومات الجغرافية التي تم إنشاؤها من خلال جمع البيانات وتدقيقها ومن ثم نشرها على موقع المصلحة الخاص بدائرة نظم المعلومات الجغرافية.
- 2- خطة المراقبة البيئية:
وذلك من خلال القيام بفحص دوري لمياه آبار المياه ومحطات معالجة مياه الصرف الصحي.

ثالثاً : نشاطات أخرى:

- 1- تعزيز دور المصلحة كمقدم للخدمة: وذلك من خلال تعزيز مساهمة البلديات في دعم المصلحة في أعمال الصيانة.
- 2- جاري العمل لإعادة الهيكلة الادارية لمقر المصلحة الرئيسي والمقرات الفرعية
- 3- العمل على جذب بلديات أخرى للانضمام للمصلحة ماليا وخصوصا بعد إعادة إنضمام غزة وجباليا للمصلحة.
- 4- تحديث الخطة الاستراتيجية للمصلحة للفترة 2018-2023
- 5- تعزيز العلاقة والتعاون مع المؤسسات المانحة
- 6- الاستمرار في برامج التوعية الجماهيرية لزيادة الوعي لدى الجمهور حول الوضع المائي وأهمية مشاريع التحلية وترشيد المياه وأهمية دفع فاتورة المياه.

المعوقات: أهم المعوقات التي واجهت المصلحة:

- الحصار المفروض على القطاع.
- العجز الكبير في الطاقة الكهربائية
- التراجع الكبير في الوضع الاقتصادي مما أثر كثيراً على نسبة التحصيل