

# Water Issue in Yemen...

## Resources or Management Crisis?

Specialists Express Doubt about Water Depletion Reports and Call to Update them

The Groundwater in Yemen: Total Deficit and Increased Random Use

Per Capita Share of Water in Yemen within the Range of Water Poverty



Sawt

# Al-Amal

VOICE OF HOPE

الأمل

Independent - Newspaper (Twice a Month) Published by Yemen Information Center  
1 / 7 / 2021

www.sawt-alamal.net

Issue  
11

Pages  
12

Price  
Free

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➤ **Water Availability: An Attractive Factor for Economic and Investment Activity**

Access to Water: Extra Suffering on the Shoulders of the Yemeni Women

# The Experience of Dams in the Balance of Assessment

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## Editorial

### Successful Management of Water Resources



M. Ahmed Saeed Al-Wahesh

Director of Yemen Information Center for Research and Media - Aden

Successful management is based on rules of appropriate regulations, laws, policies and plans that define the vision and the path and control any loosening of water decisions, since effective water management needs an appropriate ground of policies and plans and a strong and strict legal basis that guarantees adherence to them and protects the interests and rights of others. There are people with whom nothing works, appeals or awareness programs and they are not willing to abide by plans and programs, so they put their own interests above any others. Such people, only severity and control work with them, through a series of legal legislations.

Issuing water legislation is not intended to harm or abuse the rights of the users, but rather aims to prolong the life of water resources and secure the water needs of current and future generations through organizing, developing and rationalizing the exploitation of water resources and protecting them from depletion and pollution, raising the efficiency of transferring and distributing water re-

source uses and good maintenance and operation of its facilities, as well as involving the beneficiaries in managing the resources in the stages of their development, investment, protection and preservation.

The public interest requires the intervention with strong measures to protect this vital wealth, and this is not an innovation in Yemen. There are countries that implement water laws very strictly, reaching the point of defining water consumption methods at the home level. The material and moral temptations may not achieve their goal and are not responded to by everyone, which calls for the imposition of strict conditions on the manufacture or import of household appliances and equipment, which must be manufactured according to certain specifications that lead to high efficiency in water consumption, in addition to the necessity of maintaining water resources and internal networks and making optimal use of rainwater on the roofs of homes by making extensions to underground ponds.

With the first attempt to implement and apply

the decisions issued by the Council of Ministers in mid-2004 to control the random drilling process, the Ministry of Water and Environment and its concerned bodies faced many difficulties and challenges from stakeholders who took advantage of the lawlessness and weak application of previous laws, so they proceeded to work haphazardly in pursuit of achieving more profits at the expense of the groundwater reserve, the rate of decline in the water basin level has accelerated due to its excessive depletion and the withdrawal level of groundwater exceeds the amount of rainwater that feeds the water basins.

The main problem in the water crisis is not only in the scarcity of resources and not in the depletion of groundwater, but also in the non-economic exploitation of water. The waste is considered one of the most prominent problems related to the depletion and waste of water resources without benefiting from them. The number of losses in both the city of Sana'a and Taiz has reached about 50%, knowing that this large amount is lost through

water networks, in addition to random drilling of underground wells and depletion of water due to the spread of the number of rigs, which number up to more than 900 diggers owned by the influential private sector, who carry out random drilling and withdrawal and depletion of groundwater, and the laws do not apply on them.

All this led to a decrease in the water level in the basins reaching from 1-8 meters with a lack of rainfall, and thus the feeding rate of the ground basins is much less than the rate of excessive withdrawal from the water basins, where the amount of renewable water reached in 2005 2500 million cubic meters. The quantity of water withdrawn from the water basins in the same year is 3780 million cubic meters, and the percentage of the water deficit is 1280 million cubic meters.

Therefore, it is necessary to re-review the National Water Strategy 2025 and the poverty alleviation strategy, plans and programs, in line with the problems of the water sector, the water crisis and drought.



# An Overview of the Water Problem in Yemen

The water problem is one of the oldest problems and obstacles that Yemeni governments have been facing for decades. Despite this, the problem still exists and is exacerbated from time to time. Not all efforts have succeeded in finding sustainable solutions that are capable of addressing this file, although there is a possibility to implement integrated programs that guarantee at least the limitation of the problem aggravation and help in finding solutions in the medium and long term.

Specialists believe that one of the most important reasons for the failure of Yemeni governments in addressing the issue of water is the failure to give it enough attention and not to place it on its list of urgent priorities, as it has always been pushed back due to the number of problems that the country has been experiencing during the past periods.

The difficulty of placing water at the top of the agenda in a country that suffers from many problems is the essence of the issue and the key to the solu-

tion to this crisis. If there was a sincere intention and real will of the decision makers to put an end to this problem, the situation would be much better than it is today.

After the second millennium, some practical steps began to scientifically deal with the problem in a scientific way, specifically in the year 2002, which witnessed the issuance of the Water Law, and then some practical measures were taken, including the decision to decentralize the past basins by establish-

ing independent administrations for 14 water basins that included all the Yemeni lands.

In this issue, we address the issue of water from different angles, highlighting various aspects. In fact, we have tried, as much as possible, to explore its depths and come up with data that add to the previous efforts and correct some of them in order to contribute to the development of appropriate ways to deal with water commensurate with the current situation in Yemen.

## The Water Sector in Yemen, the Current Water Crisis, the Local Challenge, and the Future Vision of the International Community to Provide Water Security

**Dr. Ahmed Saeed Al-Wahish**

Director of the Yemen Information Center  
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Interest in the water issue has expanded since the second half of the twentieth century, after the phenomenon of this issue branched out. Scarcity, pollution, over-exhaustion, deterioration of the natural environment, and the emergence of fears of regional and internal conflicts, and competition between the different sectors in the same country over water, imposed that the water issue would take its course towards the forefront of the topics of economic, health, social, agricultural and environmental reports prepared by the organizations and authorities concerned with monitoring the manifestations of natural life in the world in general and Yemen in particular. And with the rapid progress witnessed by the world, it has become the responsibility of countries and even the international community as a whole to ensure the provision of clean water to every human. In addition, water has become one of the issues that falls within the missions and objectives of the international institutions and global bodies that take upon themselves the fulfillment of the basic human needs, especially clean, pollution-free drinkable water.

The United Nations put water at the top of its priorities, and considered it a basic human right. It linked the sustainable development to the extent of societies' interest in the water resources, and this topic was raised in many meetings, conferences and global summits. In addition, the United Nations managed at the Millennium Summit at the end of 2000 in New York to extract a pledge from the world countries achieving a number of goals to combat the poverty and improve the standard of human living (called the Millennium Development Goals). The issue of water and sanitation occupied a prominent place in those goals, as the countries pledged to reduce by the year 2020 the proportion of the population without clean drinkable water and sanitation services to half its proportion in the year 2000 and at this summit and the World Summit on Sustainable Development held after that in (Johannesburg in 2001), the donor countries pledged to provide aid and support to help the poor countries achieving these goals.

Yemen has attended and participated in many international events, and there is no doubt that such a presence is useful to it, especially when discussing the issue of supporting the water sectors in the developing countries. And this requires raising the efficiency of the negotiating method with the organizations and donor countries to persuade them to raise the level of support for this sector and to contribute to the development of the water resources and fight against poverty. Also entering into coordination with the international bodies and organizations in this regard is not a plea, but falls within the framework of commitments that are always affirmed by the decisions and recommendations of the international conferences and forums. At the Third World Water Forum held in 2002 in Kyoto, Japan, a number of the developed countries pledged 2 billion \$ for the purpose of improving the sustainable management of the fresh water resources

in the developing countries, including Yemen, under what is known as the Water for the Poor Initiative.

This pledge comes in support of the goals of the United Nations Millennium Declaration and the implementation plan approved at the Johannesburg conference, which seeks to halve the proportion of people who are unable to access the safe drinkable water and the proportion of the population without safe means of sanitation by half by 2015. At that conference, the delegates of 182 countries also agreed that the contribution at the level of the people is essential in bringing safe water and sanitation to all the world's population. More than one hundred pledges were made in that forum on water for example, UNESCO and the World Water Council pledged to help solving the problems related to shared water among countries or the transboundary water by providing technical experts, holding training courses, and facing challenges in the field of water and sanitation facilities.

Similar pledges were made by donor institutions and international organizations, including the Food and Agriculture Organization (FAO), the World Meteorological Organization (WMO), the United Nations Environment Programme, the United Nations Development Programme and the Water and Sanitation Program supervised by the World Bank to finance building national capacities for building projects and to monitor progress in achieving the Millennium Development Goals. Hence, the European Commission pledged to support countries' efforts to raise the efficiency of water use, while the final statement of the Kyoto Forum stressed the need to consider all the alternatives aimed at enhancing the available water supply, including increasing storage through the groundwater injection, storage and transformation dams, and adopting good practices on a large scale to avoid environmental and social costs, in addition to the past bad risks in water use.

The statement urged the need to adopt the integrated water management methodology, recalling in this regard that most countries are really facing a water crisis, which is an indication of the weakness of water management, as it requires good water control through effective political, social and administrative bodies subject to accountability and monitor that adopt an integrated method to manage water resources within a framework of community partnership to meet environmental and human needs. The forum also emphasized the need to build human and institutional capacities, the importance of awareness-raising, facilitating access to information and the role of all of this in enhancing the effectiveness of water management. The role of governments in financing the infrastructure of the water sector through public sector authorities has been asserted in addition to the contributions and foreign aid from the international financial institutions, commercial loans and private investment, given the close link among water security on the one hand and development and poverty alleviation on the other. In fact, public investment in the management of water resources has been seriously neglected, especially in light of chaos and political instability. According to some studies, the developing countries, including Ye-

men, and the countries in the process of economic transformation will need 180 billion\$ annually in order to achieve water security at the general level during the next twenty-five years. This will require an executive administration that possesses experience and vision, as well as efficient financial management.

At the World Summit on Sustainable Development, the United States pledged to work with the most water-poor countries, including Yemen, with governmental and non-governmental partners to achieve basic goals that are the following:

- Accessing clean water and sanitation services, improving management of rain swamps, and increasing water productivity.

In a report issued in 2000 entitled "A Water-Secured World: A Future Vision for Water and Environmental life", the World Water Council warned of the seriousness of the current water crisis, as the individual is not able to obtain the minimum amount of clean water and made a number of recommendations to achieve water security that provides every person, in the present and the future, with the possibility of obtaining safe drinkable water, sanitation, adequate food, and securing sufficient quantities of water to meet these needs in a harmonious and equal manner with nature. The recommendations included increasing the global water investment volume, which is estimated at 80 billion \$ annually to reach 180 billion \$ annually. This increase comes mostly from the private sector, which means that there is no increase in the government spending and the strengthening of the mechanisms governing the management of the water resources in a comprehensive and integrated manner at the level of the water basins and making the local communities the stakeholders with the final say in the matters related to the management of water resources and allowing the private sector to take over the operations of financing, management and ensuring the protection of the poor and the environment, as it is considered as one of the basic functions of the governments, in addition to pricing water according to its cost, in order to encourage the preservation of its sources, enable the maintenance of its facilities, stop its waste, and stimulate the adoption of appropriate technological methods in its use.

The World Water Council has estimated that the required increase in the investments will directly lead to the decline of the deprived groups of water and sanitation services by 75%, and if everyone realizes that addressing the water crisis is a national, regional and international responsibility, the United Nations urges to take practical measures to translate this orientation, as water is among the main elements that receive the attention of the FAO's Special Programme for Food Security, which was implemented in the period 1994-2000 in 55 countries, where the program provided assistance to low-income food-deficit countries to improve their security through achieving rapid increases in its production capacity and in its production of food crops, and reducing the variation in production levels from a year to other.

In this context, the technology that proves its feasibility is introduced, espe-

cially small systems for collecting water, irrigation and sewage. Perhaps such a trend has been seen in a number of projects implemented by specialized international organizations in Yemen a long time ago, including development projects in many governorates, then more specialized projects came, such as groundwater and soil conservation, flood irrigation, rural development, storage and transformation dams to recharge groundwater, biodiversity and climate adaptation projects.

However, it is not a secret to anyone that coordination between Yemen and international bodies in this regard is still limited in effectiveness due to the conflict of competencies and powers among more than one party, as there is not a single government agency specialized in water that possesses sufficient powers and authority to assume leadership, both with regard to the management of drinking water and irrigation water, since the interventions in the water sector are still manifold, in addition to the weakness of the competent departments based on the management of water and its sources.

Whereas from 1982 to 1992 the United Nations Development Programme sought to establish the Supreme Water Council, which yielded only modest technical results, while the Dutch provided the support for resource assessment studies through the General Department of Hydrology of the Ministry of Oil and Mineral Resources at that time, without directing any channel to connect with the integrated management. Other donors, such as Japan and Germany, have also funded specific projects far from the concept of the integrated management for water sector.

In 1995, the United Nations Development Programme, the Dutch government, the World Bank and the German side agreed to follow a coordinated approach on the issue of water through the multilateral group on water. When the Water Resources Authority was established in 1995, it was entrusted with the responsibility for planning and monitoring the management of water resources, setting legislation and public awareness, but that coordination remained missing, which made an urgent need to correct the structure of this sector.

In order to get out of this dispersion, the Yemeni government has since the mid-nineties adopted several reform programs for the water sector, and the German government has supported this approach through the technical secretariat for reforming the water and sanitation sector. This support was further strengthened after the establishment of the Ministry of Water and Environment, which was able to achieve a lot of coordination with the donors.

The proposed measures to solve the water crisis are based on the ideas that have been developed by the Multilateral Donor Group for the Yemen Water guided by the new water thought that frames policies and directs them towards efficient management of the water resources, the favored model by the World Bank and donors. Regarding the water management, the government must assume the task of the integrated management of water resources so that it is responsible for water policies, water allocation, regulations, controls and environmental aspects.

However, the donors understand the

nature of the geographical, social, technical and financial conditions of Yemen in light of the current conditions, as it is difficult for the government to carry out this integrated task alone without the participation of the community and without the support of donors. In this regard, the donors contributed by providing visions and ideas for solutions and options related to confronting the water problem in many Yemeni areas.

The World Bank presented its vision to confront the water crisis in Yemen through ideas for urgent solutions such as rationalizing the use of water, and using modern irrigation methods to reduce waste and depletion of groundwater for agricultural crops, and it has financed many projects in this field.

As for the future solutions, it is represented in the need to work on diversifying sources for obtaining water, such as constructing dams and diversionary barriers in the agricultural valleys, making maximum use of rain water by implementing rainwater collecting tanks, rehabilitating dams and archaeological ponds, and treating sewage water for reuse for specific purposes, in addition to searching for other sources of water away from the perimeter of cities and protecting water basins from pollution and random construction in them.

Similarly, the German government presented its vision in this matter through the Yemeni-German strategic draft in the field of the development cooperation, which is based on the following:

Managing the water resources with the aim of reducing the occurrence of the crisis and reducing losses by using water conservation technology, setting reasonable water tariffs, intensifying public awareness, ensuring the participation of the private sector and implementing policies to reform the sector, issuing and implementing the legal framework, supporting independent water and sanitation institutions and encouraging the participation of service beneficiaries and local decision-makers, as well as supporting local NGOs while creating effective coordination among the donors to support the sector reform program.

Many donor countries have provided support for water projects in a number of Yemeni governorates, and the policy of support is based on working with local authorities and people directly, following the method of supply and demand as a basis for providing services, and following fair criteria for selecting directorates, such as: percentage of the population supplied with clean water, mortality rate among children under the age of 5, and the percentage of girls enrolled in school.

Finally, we can say that Yemen can develop the water sector by raising the efficiency of the use of allocations and improving the management of water projects. Yemen's financial capabilities are limited in light of the current conflict and the pandemic of the emerging Corona Virus (Covid- 19) to face a problem the size of the water scarcity issue, but it can develop these capabilities through optimal utilization of the support provided by Arab funds and international organizations if this support is well exploited and cooperation with others is expanded in this field, which has many local and international justifications to support it with interest.

## Water and Economic Activity

# Water Availability: An Attractive Factor for Economic and Investment Activity

## 100,000 Wells across Yemen

By: Rajaa Mukred  
Sawt Al-Amal (Voice of Hope)-

“Citizens in most parts of Yemen suffer from the difficulty of obtaining clean drinking water, and many of them are forced to buy it every day for cooking and drinking purposes, whether from commercial water purification stations or by purchasing the loads of water tank truck, popularly known as (Wayt), which are witnessing an increasing rise in their prices because of the increase in the monthly demand as a result of the increase in use and population density.

In most of the Yemeni governorates, we see large gatherings that seem to be crowds seeking something at first. When approaching them, we discover that they are queues waiting for their turn in front of a water tank.

Fawzia Sultan (a citizen) tells about her struggle to get water. She says that she makes sure that she gets up early in the morning to fetch about 20 liters of water from the water standpipe (water tanks placed in the residential neighborhoods for free), and returns home early, saving the water very carefully for home use.

### Facts and Figures

There is a close relationship between water and economic activity. The economic activity is affected by water in terms of quantity and quality, as it is the basic building block for the economic development in the world as a whole. And there is a number of industries related to the economic activity based on the water, and even the largest factory owners and investors are looking for water-rich areas to practice their activities.

Abdul-Salam Al-Hakimi (Assistant Undersecretary at the Ministry of Water and Environment) presented to “Sawt Al-Amal” (Voice of Hope) newspaper statistics showing the number of the water basins in Yemen, which amounted to 14 basins, of which seven are in critical conditions (threatened by drought). He also indicated that the ministry's budget for the year



2018 AD was estimated at 168 million riyals. The statistics revealed that the amount of renewable water deficit exceeds one third annually.

The statistics also showed that the number of wells at the country level exceeded 100,000, of which 14,000 are in Sana'a, 8,000 of which are operating.

“The scarcity of oil derivatives prompted Yemeni farm and agricultural land owners to use the solar energy as an alternative to pumping water and irrigating agricultural crops. Thus, the results of the study recently published by the United Kingdom's (Water and Environment Monitor) in April 2021, concluded that the significant decrease in the groundwater since 2018 AD, is likely due to the use of the solar energy to irrigate the agricultural lands”. The study also indicated: “The areas of low groundwater level appear in western Yemen since the start of data recording via the satellite technology in 2002 AD”.

### The reasons

Regarding the impact of the solar energy on the groundwater, Al-Hakimi says, “The results of the study, which sees that the use of solar energy depletes groundwater, is illogical. In fact, the well that depends on diesel for 24 hours will only work on the sun for 12 hours, and six years ago, diesel began to totally run out because of the instability, so people are resorting to alternative solutions, such as the solar energy, where there are cities covered by 100% of the

solar energy, such as the governorate of Dhamar and Saada, in the field of water production and distribution, and there are areas where the percentage is still small, such as Sana'a governorate by about 15%”.

He added, “At the time when we used the solar energy, we hoped the state would encourage the local investments by manufacturing solar panels locally instead of importing them from abroad, as we can only import photons (material that he panels need), and the rest of the components are local, such as the glass and aluminum. In fact, Yemen is not the only country that experimented the renewable energy, but rather the United States of America where entire farms worked, they cover people's demands and reduce emissions of fuel energies”.

### Weak monitoring role

Fahed Al-Junaid (Director of Agricultural Information in the Ministry of Agriculture and Irrigation) says, “The reasons that led to the depletion of groundwater are the random drilling of surface and artesian wells, and in the irrigation process, where a misconception prevails among most of the farmers, as they believe that the flood irrigation has a positive return, as well as the spread and expansion of qat cultivation, which consumes most of the groundwater, as qat farmers were called “Water locust””.

He explained that the cultivation of qat has led to

the emergence of the phenomenon of random drilling of wells, which has greatly drained groundwater, to the point of depletion in some areas, and there are many valleys which wells have completely dried up, as a result of the weak monitoring role by the competent authorities, although there is a law regulating this. He added that the prevailing culture in the Yemeni society regards the water in its possession as lands and utilities (private ownership), and it has the right to dispose of it however and whenever he wants.

In an electronic poll conducted by “Sawt Al-Amal” (Voice of Hope) through a questionnaire in mid-May 2021 AD, it was found that the causes of the water deficit in Yemen are: 5.7% lack of awareness, 2.9% wastefulness, 5.7 % water pollution increase, 2.9% lack of water recycling, 2.9% scarcity of replenishment sources, and 80% all of the above.

### The processors

Assistant Undersecretary Abdul Salam Al-Hakimi believes that “if real budget plans are created, the Yemeni people will coexist with the water crisis, and we will live as our ancestors did more than 400 years ago, when they were dealing with the water scarcity issues with dams, caravans (drilling basins) and ponds. They lived in the highlands mountains and the development continued, and Yemen was one of the richest countries in the region”.

Al-Hakimi added, “Yemen has all the ingredients to rebuild a strong state that is somewhat satisfied with its resources, and that in the past, the Marib dam used to irrigate the areas from Marib to the outskirts of Hadhramaut”.

Abdullah Al-Hindi (Director of Public Relations in Al Reef Water) says, “The solution is to build dams, water barriers and tanks, in addition to rationalizing the consumption of drinking water and drip irrigation for agriculture”.

Hassan Al-Sheikh (Adviser to the Ministry of Water and Environment), said, “The experience of dams in Yemen may be useful in other regions. For example, in the coastal areas, the evaporation process is very high; water barriers and dams are not used, while the basins digging process is difficult because the water penetrates to the groundwater, and dams are useful in areas where there are valleys and surface water”.

## The Future of Water in Yemen... Where to?

# We Have not Seen any Real Benefit from the International Organizations Operating in the Water Sector

By: Rajaa Mukred  
Sawt Al-Amal (Voice of Hope)-

“Amid the decline in the water level indicators in Yemen, the scarcity of surface water that derives from rain, and the emergence of data indicating that 7 out of 14 water basins are threatened by drought, “Sawt Al-Amal” (Voice of Hope) newspaper met Engineer Yahya Al-Mahbashi (head of studies and planning sector at the National Water Resources Authority) to talk about the future of the water situation in Yemen in the next stages.

• Have you ever developed a study of how to invest water as an energy source?

There is no plan to invest water as energy. The energy system that is used to extract water does not exist with the Authority, the

Ministry, or the State at the present time. There is a deficit in the amount of water in the process of economic development and consumption, and this deficit is constantly escalating, so that it is not stable on a certain number, and every year the difference between consumption and income for the basin varies, which is constantly increasing, as well as the hot water (Thermal Water) is very deep and needs high technology that is not found in Yemen or in the Arab world. We have hot water that can be used to produce energy, but so far, its use is very limited, and the amount of water that can be used is not close to the ratio of the quantity of recharge water to the groundwater basins, and the quantity of demand for water is three times greater than the replenishment. If we have 2 billion cubic meters of the surface and ground water, the quantity of water demand is 5 billion cubic meters.

• How does water depletion affect economic and investment activities in the

country?

Most of the activities in the country are related to the water sector, and the most sector in need for special consideration in the use of water is the agriculture. It is necessary to have technicians in the use of water in relation to agriculture and modern techniques for the irrigation process and the selection of high-quality crops that do not consume a large amount of water and reduce qat cultivation. Yemen mainly suffers from random drilling and the conflicts it causes, and there are many violations with regard to the random drilling of wells at the governorate level, where the number of violations reached more than 500 violations annually.

In order to deal with violators, measures are being taken to pay fines, stop drilling rigs, and fill wells that were dug without licenses, especially in the governorate of (Dhamar and Taiz).

• Last year, the rainy season was heavy,

and Yemen witnessed cases of drowning and damage to the buildings, shops and others due to the abundance of water. How did the commission benefit from the experience of last year, and what solutions did it take?

The authority works on collecting systems about the amount of rainwater that came from the previous rainy season. These systems used water barriers (dams) to take advantage of this water. And because there is no budget, we often stop working on the projects. All of the work we do is with local and self-effort, and there are no organizations that support the construction of a dam, facility or water barriers.

• How do the international organizations contribute to solving the water problem in Yemen?

The ministry does not actually benefit from the international organizations, they only take their salaries and complete their reports according to their estimations. The organizations do not benefit from even 15%

of what is allocated from the donors to Yemen.

There are basins that can benefit from the industrial replenishment, and some basins such as Sana'a basin are difficult to benefit from in the process of industrial replenishment except by injection. As for leakage, it is not possible, and the organizations refer to the Authority only to take information that they benefit from in their reports.

• What are the latest activities carried out by the organizations towards water?

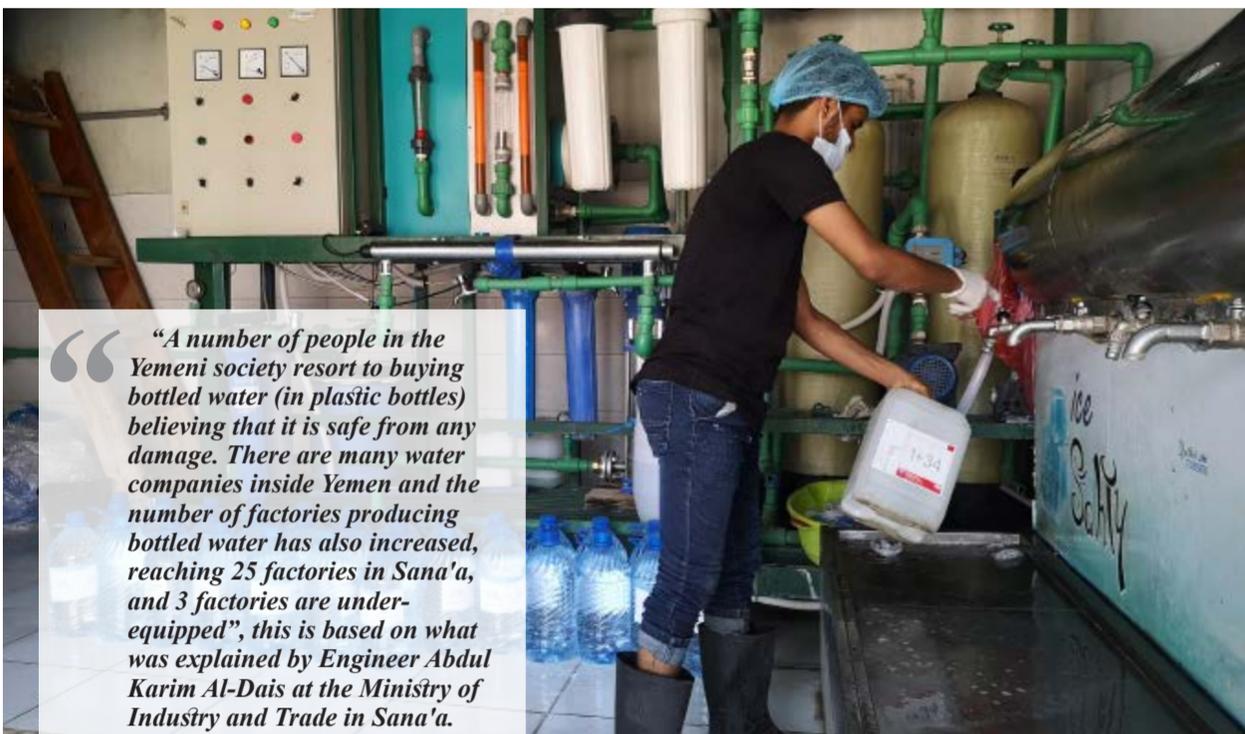
They only distribute chlorine pills to water tanks. The organizations limit their efforts to water quality, and do not interfere with the water conservation and dams.

• As part of the Authority's plans in advance, will wastewater be used by 2025 AD?

In terms of wastewater, there are old studies based on its utilization within the strategic plan to benefit from it in 2025 AD, now it is a bit of a burden to absorb.



# Bottled Water: A Mandatory Shelter to Access Drinkable Water



“A number of people in the Yemeni society resort to buying bottled water (in plastic bottles) believing that it is safe from any damage. There are many water companies inside Yemen and the number of factories producing bottled water has also increased, reaching 25 factories in Sana'a, and 3 factories are under-equipped”, this is based on what was explained by Engineer Abdul Karim Al-Dais at the Ministry of Industry and Trade in Sana'a.

By: Alia Muhammed  
Sawt Al-Amal (Voice of Hope)

The engineer told “Sawt Al-Amal” (Voice of Hope) that there is a large number of factories producing bottled water distributed over a number of Yemeni governorates. The old and well-known factories are characterized by a high production capacity, unlike what the modern factories produce today. The availability of machines used in water factories has also contributed to an increase in the number of factories throughout Yemen, and in return, no permit is given by the Ministry of Industry without the approval of the Yemeni Standardization and Metrology Organization.

For his part, Qasim Abdul Rahman (Director of Quality Assurance Department at the Yemen Standardization, Metrology and Quality Control Organization in Aden) confirms that “the authority supervises the factories for bottling completely treated water, and they are subject to the approved specifications and standards for the requirements of nutrition circulation and product specifications, in addition to subjecting them to the GMP and other good manufacturing systems. One of the technical regulations and systems approved by the authority, which is the legislative authority authorized in accordance with the

Standards and Metrology Law to issue special specifications for all the products and standards regulating the production of these products”.

#### Bottled drinkable water specifications

The standards set by the National Water Resources Authority focus on the quality of the water and the determination of the ratios of physical and chemical properties, toxic and radioactive substances and organic pollutants.

Alaa Al-Jawfi (a specialist and engineer in a water bottling factory) says,

“There are many general standards represented in the buildings, place of manufacture, storage, custody and infrastructure, while the special standards include the percentage of the total salts and mineral elements, each according to the size of the containers, the quality of plastic materials, processing methods and the percentage of the sterilization materials”.

#### Factories compliance with the standards

On the extent to which bottled water

factories comply with the quality standards and specifications, Al-Jawfi explained, “The stages and steps of treatment differ from one factory to another that tries as possible to reduce the cost of treatment”.

He added, “There are special filters that have a very important role in purifying water, but citizens cannot easily obtain them because of their high costs. As the filters absorb heavy metal elements that cause health damage, even if they are in a small percentage”.

He also indicated, “The old methods that used to sterilize and purify bottled water were most of the time the cause of the spread of kidney failure, but now factories are using modern methods for sterilization through the ozone, which is a gas that stays 24 hours inside the product and its effect disappears, and the water remains sterile for a year”.

#### Packing methods

Regarding the method of filling, Al-Jawfi pointed out that there is a large number of plants that call themselves factories, and there is a difference in the process of filling water among the plants and the factories, as the method of filling in the plants is done manually, while the big factories fill 100% automatically.

#### Confidence and doubt

People's opinions varied about their confidence and lack of confidence in what the bottled water factories offer. There is a group that considers it the most appropriate and safe, and another group believes that it is not subject to any control or inspection.

Mubarak Al-Yousifi says, “Unfortunately, most of the drinkable water that

is sold as mineral water is basically ordinary water, which is bottled in water stations or the so-called “Al-Kawthar water” and is not subject to any purification process, and therefore it is unhealthy water, especially for people who suffer from kidneys diseases, etc. It is tiring in the case of searching for original mineral water, and there are only three or four types left out of hundreds of types that are sold as mineral water in the market, which are the best”.

In the same context, Safaa Al-Faqih sees, “The bottled water is mostly heavy, contains a large amount of chlorine, and is almost salty”, Adding, “There is an increase in the manufacturers of bottled water in Yemen, and this confirms that there is a complete absence of the supervisory role and quality control”.

Sumaya Al-Ansi (an employee in a bottled water factory) disagrees, as she asserts that bottled water is subject to control and inspection and conforms to the standards and specifications. She says, “I did not trust bottled water like other people, but when I worked in the factory and watched the treatment and purification steps, I trusted it”.

Saeed Al-Qudsi asserted his confidence in bottled water is more than his trusts in station water, as a result of the characteristics it carries and standards that are subject to control and accountability, and there is a number of water products that have a good reputation and are still up to now.

#### One option and no other alternative

Abdul Razek Hamna believes that the bottled water is better than the station water, and it is better than other drinkable sources, and he says, “In general, the available and existing bottled water is an alternative to the rest of the other water sources that may be polluted and unfit for drinking because there is no interest by the specialists with the cleanliness of the sources compared to the factories for filling water, and we have no other choice”.

On the other hand, Sabah Al-Khishni asserts, “Mineral water does not comply with the specifications written on the sticker, but we are forced to consume and buy it, because there are no other qualified and reliable alternatives”.

As Hana Hassan clarified, “The large number of names for water bottles and their resemblance made the citizen lose confidence in them, and because there are no alternatives, but we try to focus on the well-known and widely circulated names”.



## Accessing Pure Water is

*Umm Fatima Ahmed (a 35-year-old woman from Aden governorate) gets up every morning and carries a 10-liter bottle of water on her head, and holds the other in her hand to go fetch water from “Abdul Qawi” well in Al-Mansoura district, which is half an hour away from her home uncaring about the safety of this water for drinking, after she lost hope of the water service return, as it was in the past, where the water comes one day and for an hour and disappears for days, and she cannot bear to buy a water tank.*

By: Manal Amin – Rajaa Mukred  
Sawt Al-Amal (Voice of Hope)

#### The average price of drinkable water is more than three thousand riyals

A report issued by the Food Security Technical Secretariat at the Ministry of Planning and International Cooperation for the month of February 2021 indicated that the average price of drinkable water amounted to 3,814 riyals per cubic meter, an increase of 22.4%. The highest price was 6708 in Taiz and the lowest price was 134 riyals per cubic meter in Seiyun.

Abdo Saleh (a teacher in Aden) reviews his suffering when fetching water, and says that he and his family of seven members live in a small house in the district of Al-Tawahi, which suffers from the lack of water for weeks and sometimes months, and with this difficult situation, the suffering exacerbated with each time he bought water from the “bozat” (water tank), as he consumed four tankers in a single month, the value of each tank being 6 thousand riyals, or approximately 24 thousand riyals per month, and this matter has become a great suffering, especially with the high prices of everything, so he resorted

to fetching water from water line tanks or from water pumps near the neighborhood.

Concerning the role of the concerned authorities with supervising water resources, and how to distribute them, the Ministry of Water and Environment's advisor, Najeeb Noaman explains to “Sawt Al-Amal” (Voice of Hope), “The role of the ministry lies in planning water resources and the process of distributing them in accordance with the water budget that is prepared annually, and it deals with the technology to preserve water resources, and it maintains water resources and supervises the performance of its various

institutions and bodies in the environment, rural and urban areas, as well as providing its services in accordance with its tasks and the decisions of its establishment and assignment”.

He pointed out that the water issue is one of the most complex and difficult issues in Yemen, and that the ministry and all its institutions have been put to the test in order to develop treatments that contribute to alleviating the problems that the water sector suffers from and is mainly linked to the economy, security, social peace and food security.

#### More than 100,000 wells in Yemen

With regard to the number of wells in Yemen, according to the Ministry of Water and Environment, their number exceeds 100,000 wells, 14,000 wells in Sana'a, of which only 8000 are operating.

In the same context, the counsellor Noaman explains, “The number of wells that

feed Aden is now approximately 114, feeding from three main fields located at the base of the Tuban Delta, and that there is a working system that includes statistics and data that explain everything related to the water resources and their sources, but the current conditions of the country have prevented without renewing that data, and contributed to the random waste of resources without regulation”.

And he added, “The indicators of water depletion in Yemen are very frightening, and the per capita share is decreasing annually, despite the fact that there is an increase in need, a lack of resources and poor behavior in the use of this natural wealth by 50% of the 14 water basins in Yemen, which condition is currently critical”.

On the solutions that contribute to mitigating the process of water depletion, Numan stresses, “The importance of managing and preserving resources for everyone, the citizen and the state, and promoting up-



# Water Scarcity: Continuous Suffering in the Yemen Rural

**(Uzlat of Hamata in Al-Mahwit, Mayfa'a villages in Hadhramaut as a "model")**

By: Alia Muhammed - Sawt Al-Amal (Voice of Hope)

“Rural Yemen suffers from many problems in light of the lack of the basic services in it for a long time, and the water supply crisis has compounded the suffering of the citizens in the rural areas, especially with the drying up of some wells and the difficulty of purchasing generators or water tanks and excavators due to their high prices.

In the high mountains of Yemen is a number of villages that suffer from a suffocating water crisis. The Hufash district, uzlat of Hamata in Al-Mahwit Governorate, is one of the Yemeni governorates that suffers from many problems related to the provision of water in it, which has increased in severity in recent periods. The governorate has raised red flags, and the lives of those residing in it has been threatened.

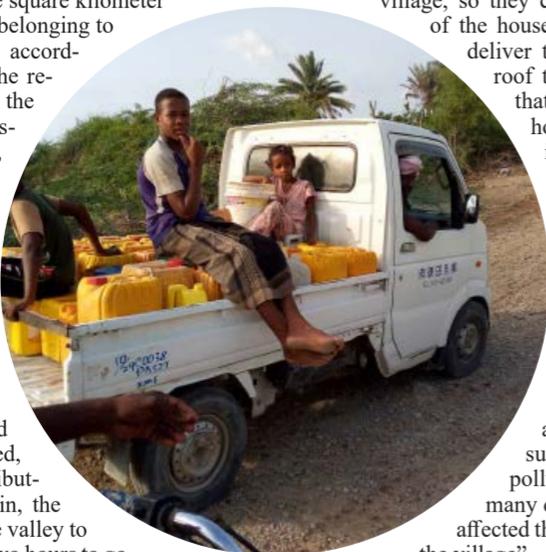
## One dam for three villages

A water tank "a dam project" was provided to the residents of the villages of uzlat Hamata (Al-Qal'a, Al-Ma'zab and Al-Qasr) 16 years ago, with the support of the Ministry of Works and the Social Fund for Development. The project was providing water for the people of the sub-district (uzlat) with ease. However, with time, there were no updates and repairs, which led to the suspension of the project and the deprivation of water for many of the sub-district people.

The dam is located one square kilometer away from every village belonging to the Hamata sub-district, according to the statement of the responsible for distributing the dam's water in the sub-district, Abdo Muhammad, who said, "Water is collected in the dam from rainwater and then it is distributed on the inhabitants of the village according to the amount of rain that it contains. So, if the amount is great, 20 plastic containers are distributed to each family per week, and if rainwater is not collected, eight containers are distributed. In the absence of rain, the villagers have to go to the valley to fetch water which takes two hours to go back and forth".

In front of the only dam, Muhammad Hassan (a resident of the village) complains, by saying, "We do not have clean water sources suitable for drinking or daily use other than this dam, as our dependence on it is great with its pollution and discoloration, but we have no other choice".

Nasser Muhammed (project manager) explains, "The dam currently needs a number of necessary repairs, as it depends on self-efforts made by the vil-



lagers to cover the requirements needed by the tank".

## Rainwater is a major source

The villages of uzlat Hamata in Al-Mahwit governorate mainly depend on rainwater for the increasing daily consumption of water as a result of the low level of the water wells and the deterioration of the dam's productivity. One of the girls of the uzlat, Samira Ali, states that the people of the uzlat depend on rainwater because it is the main source of drinking in the village, so they clean the "reem" (the roof of the house) and wait for the rain to deliver the water collected on the roof through hoses to the tanks that are used for drinking and household necessities, as it is a convenient and simple way that saves the trouble of going to wells and springs".

Regarding the damage caused by this method, Abdullah Ahmed (a resident of the village) says, "The lack of means to purify the water used for drinking and the reliance on water available on surfaces that are considered polluted, caused the spread of many diseases and epidemics that affected the residents and livestock in the village".

## Exorbitant costs

Muhammed Yahya (a resident of the village) says, "The cost of one tank reaches 70,000 riyals, due to the long distance from which water is fetched. Water is filled from a well that is far in a valley located in the "Beit Dahem" area, and a large number of residents cannot cover these costs due to the poor financial conditions".

Fetching water has become a daily suffering for the residents of al-Uzlat and it increases every day. Amna

Naji, an 11-year-old girl complains about her struggle to fetch water. She says, "We come here three or four times a day to take water in containers of up to 40 liters a day over our heads or on the backs of animals". She adds, "We have a dam in the village, from which we take water, and when it does not rain, we resort to a well located at the bottom of the village called "Al-Mawhouba", which is a long distance from us, and if it dries up, we have no choice but to go to the "Al Kadhiyah" area, which is another well that takes us around one hour to reach, which is a long time."

## Projects that Were Interrupted

In Al-uzlat, some projects may be expired. Abdul Rahman Mutair (one of the employees in the water project in Al-Mahwit Governorate) says, "In the year 2011, the first water project was implemented in the Hufash district, benefiting many families from the district, but because the project was out of service due to the start of the conflict, it has not been reactivated, and international organizations have not responded to the project".

On the most important needs of Al-uzlat, Ahmed Abdullah (a member of the local council in the governorate) said, "The three villages located in the sub-district of Hamata need development and construction projects, with regard to providing the water, by providing covered tanks to avoid the villagers from the damage of the polluted water".

## Mayfa villages in Brom district

The villages of Mayfa District, Brom District, Hadhramaut Governorate, have been witnessing con-

tinuous interruptions of the drinkable water since the middle of the last month of Ramadan until now.

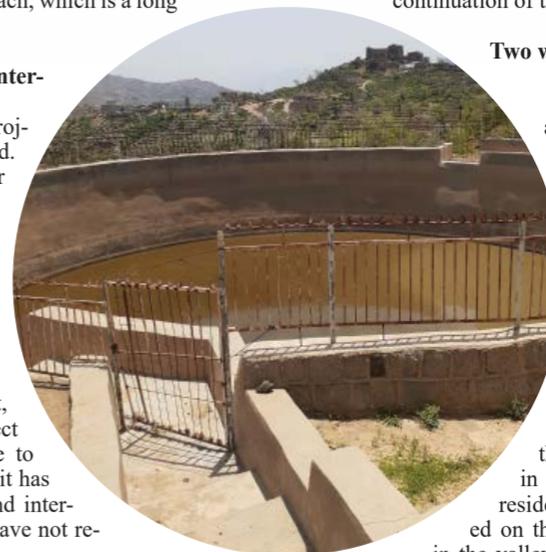
The Director-General of the Local Water and Sanitation Foundation in the coast of Hadhramaut, Engineer Wahib Ghanem, revealed the reasons for the continuous interruptions that led to two well fields being out of service in the Mayfa area. He said, "A malfunction in one of the engines caused a water cut in the villages of Brom District due to the presence of erosion on the outer bank which constituted an obstacle to the continuation of the pumping process".

## Two wells produce 40 liters per second

He indicated that the Mayfa areas depend on two main wells with a production quantity of approximately 40 liters per second, and the well is currently being rehabilitated and the system as well.

Regarding the main water sources in the Mayfa area in the Hadhramaut coast, he pointed out that before Mayfa region joined the scope of the local water corporation in the Hadhramaut coast, the residents of the areas depended on the sources of running water in the valley and transported it through livestock, and this was a danger to children and women as a result of the sudden torrential flow from the high Hajar area. The main source for these areas has now become a field that includes two main wells that are fed with clean groundwater, and reach the villages through underground networks and counters.

Regarding the institution's role in improving the service, Ghanem said, "Preparations are currently underway to dig two additional wells to strengthen the water system, maintain the old pumps, and sterilize the water by chlorine".



# a Permanent Suffering

right behavior and a culture of optimal use, people's sense of the scale of the problem, knowing and strengthening the tools of right and duty, and deterring anyone who abuses water networks and contributes to disrupting sources or their sabotage, all of these are considered treatments to alleviate the problem of the water sector".

## How to purify drinkable water

Engineer Hassan Omar (a specialist in groundwater at the Ministry of Water and Environment) explains to "Sawt Al-Amal" (Voice of Hope) how to purify drinkable water, saying, "The institutions affiliated with the Ministry work to purify water with chlorine, especially drinking water, as there are elements such as nitrite and iron in some wells, in addition to adding chlorine to the water works to absorb iron or the excess element in the water, but some elements exceed what is allowed by Yemeni standards and international

standards such as the World Health Organization, and here local purification of the well is carried out in general, and we find this in the wells of Sana'a and some areas such as Aden Governorate, especially in Bir Ahmed (reservoir). It contains heavy metals, which made most of the population of Yemen resort to drinking the water of factories".

He added, "The Water Resources Authority has strict control over the water stations called (Kawthar), and any station that does not comply with the standards set by the National Water Resources Authority is closed, and these stations depend on the basin water".

Asaad Saleh (owner of a drinkable water purification station in Sana'a) says, "The sources of drinking water that the station sells are the surface water (rainwater), which collects in the Sana'a basin. We fill from pumps and water tanks. The problems facing the stations is the lack of

water availability in the storages".

Alaa Muhammad (owner of White Water belonging to the Madina Water station in Aden), says, "The station works to fetch water from the wells or from the project (government water), and the treatment process is carried out by adding chlorine, using a filter, and filling water tanks in trucks for distribution to the consumers and the owners of the shops". He stressed that the problem of the high prices of oil derivatives is what sometimes hinders the station's work.

## Water resources

A report issued by the Food Security Technical Secretariat at the Ministry of Planning and International Cooperation mentioned the role of the agricultural sector in contributing to achieving food security, wheat cultivation and production in September 2020 AD. It stated that the water resources in Yemen include, first: rain-

water, with an estimated amount of about 68 billion cubic meters annually, while the general average of rainfall in Yemen does not exceed 157 mm/year.

Second: the surface water, which is divided into four main basins, including:

- The Red Sea Basin covers an area of 33,000 km<sup>2</sup>, the average precipitation is 431 mm/year, and the total annual flow is 741 million cubic meters.
- The Gulf of Aden Basin, which has an area of 46,680 square kilometers, with an average rainfall of 207 mm/year, and a total annual flow of 535 million cubic meters.
- The Rub' Al Khali Basin has an area of 90,900 square kilometers, average rainfall is 66.7 mm/year, and total annual flow is 67 million cubic meters.
- The Arabian Sea Basin, which is divided into the valleys of Ramlet Al-Sabaateen, with an area of 45,300 square km, Wadi Hadhramaut / Al-Masila Branches,

with an area of 46075 square km, and Al-Ghaydah Basin with an area of 115,375 square km.

Per capita quota less than 100 meters  
The head of the National Water Resources Authority, Eng. Khaled Belaidy, told "Sawt Al-Amal" (Voice of Hope) that the per capita share of water is less than 100 cubic meters/year, and this share will gradually decrease to reach 62.5 cubic meters per year in 2025 AD.

He continued, "There are currently more than 750 drilling machines, and because of the random drilling of wells and the use of backward agricultural patterns that depend on immersion in crops that may consume water such as (qat and bananas), and the introduction of solar energy technology in the agricultural sector without controls, and population and urban expansion, it all led to the depletion of groundwater in most of the basins to the point of final depletion".



## Water in Numbers

Yemen consists of three climatic zones: the dry, semi-arid and humid zone of the Yemen total area. The agricultural land constitutes of only 4-5%, while the average humidity is 80% in the coastal areas, and 15% in the rest of the regions, and the average humidity is considered a cofactor for the presence of water, formation of rain and stability of groundwater and dam water as well.

According to the Water Resources Authority, about 80% of the water uses are in agriculture, but the irrigation efficiency is low to 20%, while the remaining 20% is divided between domestic use, industrial purposes, and other uses.

The annual average rainfall is from 50 mm to 800 mm annually, and it is one of the highest rates in the Arabian Peninsula, as well as the renewable water is estimated at 2.5 billion cubic meters, of which 1.5 billion cubic meters is surface water, and one billion cubic meters is consumed from groundwater. Hence, the annual total consumption is 5100 million cubic meters and the annual deficit is estimated at 2600 million cubic meters. As for the per capita share of water in Yemen, it is 125 cubic meters annually and less, which is one of the lowest rates in the Middle East and North Africa, which is within the scope of the water poverty.

Rural residents represent 71%, 37% of them enjoy sustainable water services, 20% have reliable sanitation services, while urban residents represent 29% of the population, 58% of them enjoy sustainable water services, and 32% have sanitation services.

# Water: A Resource or a Management Crisis?

## Groundwater in Yemen: Perma

Prepared by: Abdul Aziz Ali – Hanin Ahmed  
Participated in the preparation: Rajaa Mukred

Yemen primarily relies on the rainwater as a main source of groundwater replenishment, which in turn is the country's only source to cover the needs in various Yemeni sectors and governorates.

A report issued by the Regional Water Resources Forum 2012 AD says, "The deficit between used and renewable water amounted to more than 1 billion meters / year, covered by the groundwater storage, and that 90% of the water goes to agriculture, while 8% goes for domestic services and 2% for industry".

While in 2010 AD, the volume of extraction was 3.5 billion cubic meters while the volume of renewable water was 2.1 billion cubic meters. The shortage of 1.4 billion cubic meters was covered by pumping water from aquifers according to the Water Stress Index (Falkenmark indicator), internationally recognized.

The report also reviewed the most important challenges facing the water sector in Yemen, represented by the limited current resources, especially groundwater in the mountainous highlands, the lack of the optimal utilization of the surface water and rainwater in the southern and western highlands, the lack of water collecting projects in a detailed study before implementation, as well as the qualitative deterioration of groundwater, and the overlap of sea water with fresh aquifers in coastal areas and the significant expansion of traffic areas that are dependent on groundwater.

On the other hand, Nuri Jamal (Head engineer and Geologist at the Ministry of Water and Environment) presented several reports regarding the general situation of water in Yemen, where he explained, "The tragic water conditions and the large and unregulated depletion of water sources have led to severe imbalances in large cities and a shortfall in access to drinkable water. As for the rural areas, the supply of safe drinkable water is only available to less than half

of the families residing there".

Engineer Nouri warned of a decrease in groundwater levels at a rate of 1-4 meters per year, in some areas of the country, and more than 10 meters near residential areas, such as Sana'a, which is threatened by water depletion in the next ten to twenty years, and the increasing depletion of water resources is accompanied by an increase in the deterioration of water quality.

### Water Conditions in Taiz

In a report prepared for the authority in 2020, Eng. Khalid Ali Al-Shuja'a (Director General of the National Water Resources Authority in Taiz) reviewed the general situation of water and the reasons that led to the so-called (water poverty) represented in the severe poverty in the exploited fields, in addition to the instability and limited productivity, where the per capita share in Yemen, in the best conditions, is 33 liters / day.

He added, "The actual need for water reached at least 100 m<sup>3</sup> / year, while the percentage set by the World Health Organization amounted to 1000 m<sup>3</sup> / year. The urbanization and the increase in the population annually, in turn, contributed to the scarcity of water resources in addition to the specific pollution in the water quality, whether in the city basin or other water basins.

He also said, "The water problem was present in the past and has worsened and is currently lacking, as Taiz was fed from six water fields for 65 wells distributed in different areas between (Al-Haymah, Al-Howban, Al-Dhabab, Al-Madina, Habeer, Dhi Sufal, Al-Howjalah and Al-Amiriya). Currently, five basins are outside the control of the Water Authority, which has stopped pumping water from fields outside the city to the city's residents since the conflict began.

He indicated that "the low productivity of wells and the drop in the water level from 7 liters / second to 1.5 liters / second, and the lack of oil derivatives continuously to operate the wells, in addition to connecting most of the wells

directly to the main network, and the increase in the water loss in the main network, which is estimated at approximately 45%, contributed to depriving the highlands of water and exacerbating the problem".

"About 20 wells, with a productivity similar to that of the Authority's wells, are being operated at different hours to relieve citizens in different neighborhoods and regions", this is what Al-Shuja'a confirmed about the authority's role in alleviating people's suffering.

He added, "It is necessary to activate and participate in international and humanitarian organizations and the private sectors to contribute to alleviating the water situation of the city's residents and provide the minimum needs in light of the current conditions that the country is going through.

### Digging 10 new wells

For his part, Sami Jamel (Director of the Water and Sanitation Authority in Al-Mudhaffar District) explained, "The authority currently depends on 20% of the water sources available, which represents 18 emergency wells that replenish the city, as 80% of the water sources are outside the city because of the difficult situation that the governorate is going through".

In the context of the search for urgent and sustainable solutions to the difficult water situation that the city of Taiz is going through, he indicated, "The Authority is working on continuous communication with the international organizations, to implement a number of projects related to the return of the production of water fields outside the city to the authority's control and benefit from them".

He also indicated that there is a project that will be implemented through the Estijabah Foundation for Humanitarian aid and relief and with the support of the State of Kuwait, which is to dig and rehabilitate 10 new wells inside the city to cover areas deprived of water, which include (Al-Dahi, Al-Judairi, Old City, Aqaqa, University Station).

## Water Resources Authority: Not all Water Basin Depletion Reports Are Accurate

# Al-Sufyani: We Call for Updating these International Reports Based on the Latest Updates

“Yemen is facing one of the most complex development problems, which is represented in the acute shortage of water resources and the depletion of groundwater, in light of the imbalance between renewal and the increasing consumption of water, which leads to the water depletion and the deterioration of its quality.

Here, "Sawt Al-Amal" (Voice of Hope) newspaper met Eng. Abdul Karim Al-Sufyani (Undersecretary of the National Water Resources Authority) and conducted this interview:

### • What are your main tasks in the Water Resources Authority?

Our goal in the Water Resources Authority is to face water-related problems, the most important of which is the scarcity of the water resources in parallel with the high rates of population growth and the depletion of groundwater, as well as working to provide clean drinkable water, manage water resources and plan their exploitation in the light of the Water Law.

### • Why do we find inconsistencies in the numbers and statistics on water?

There are many reasons, including: the different studies and surveys that produced these figures, the different periods of time and the circumstances during which they were conducted; There is no doubt that the studies conducted in the nineties, for example, which are currently relied upon in most

quarters is different from the studies conducted in the recent years, that are few for the main reason, which is the increase in population rates and industrial and commercial activities, and which were also greatly affected by the conditions experienced by the country in the recent years.

### • What is your assessment of the studies that evoked the drying up of some water basins at the country level, especially the Sana'a and Taiz basins?

Not all international reports are correct, and there are those who talk about what they do not know. For example, the Sana'a Basin has an annual consumption rate of about 300 million cubic meters, and an annual feeding rate of 100 million cubic meters (the only source of compensation is rain), and an annual deficit of 200 million cubic meters, which is being covered from the strategic water storage, due to the increasing rates of population and unplanned urban expansion in the outskirts of the city, as well as the expansion of the capital to include some small villages nearby, in addition to the increasing migration to the capital, especially during the recent years of conflict, as well as commercial and industrial activities. All these reasons led to the increasing consumption in the Sana'a Basin at a high rate.

Many studies have indicated that the Sana'a Basin is threatened with depletion, and that the groundwater will dry up by the period between 2020 AD -2025 AD, but most of these studies are hypotheses and not based on real data.

Climate variables and conditions in the past years proved the opposite of



what these reports expected. Very heavy rains greatly exceeded consumption and discharge rates, which led to compensating a great deal of the amount of depletion in the Sana'a Basin.

### • Do I understand from your words that you are calling for reconsidering those reports, or amending them, and conducting new studies?

The conclusion is that some of those reports that talked about the depletion of some basins are based on unreal data or have changed, and therefore there must be new studies that correspond to the recent variables, negatively or positively.

We also call for updating international reports based on recent developments, in terms of consumption or compensation, or in terms of consumption purposes and efficiency.

### • What are the most important measures taken by the Water Resources Authority in order to maintain the safe level of groundwater?

The authority has prepared a set of laws and procedures, the most important of which is the establishment of

special units to manage each basin separately, and the authority has taken a set of controls, such as limiting indiscriminate drilling, establishing water users' associations, rationalizing the usage, and controlling the quality and purposes of usage.

### • Random wells specially in the Sana'a basin, most of them are used for qat cultivation and irrigation. Do you have specific measures in this direction?

We are facing an old problem represented in the lack of public awareness of the importance of preserving water as a national wealth and the backbone of development. In the recent period, the importation of excavators has been permanently banned, and we have arrested violators and referred them to the Public Prosecution, and rulings have been issued to confiscate the violating excavators.

Regarding qat, it is unfortunate that its cultivation increases annually at a rate of 900 hectares, and spreads horizontally as a result of the absence of a clear agricultural policy, and the absence of agricultural marketing that gives the citizen a useful alternative to the cultivation of qat gradually.

### • What about the Taiz water basin?

The Taiz water basin is one of the most complex basins, as a result of the geographical and climatic nature, the most important of which is the low rate of rain in exchange for a large and increasing population density, the lack of watersheds to replenish it and maintenance of the torrents.

It was previously announced that the Taiz water basin is one of the crit-

ical basins, and the rate of water drop in the basin ranges between 6-7 meters annually. Therefore, urgent measures must be taken to reduce the depletion of groundwater in the Taiz Basin and to take advantage of the amount of rain that has recently fallen.

### • What about the water basins in the southern governorates?

The division of the 14 water basins at the level of the Republic was not carried out on geographical bases, and then there are basins that include many governorates from north and south of Yemen

### • What are the proposals that you think are appropriate to preserve the basin?

I think that the weakness of the legislative and regulatory aspects represents a gap in front of the optimal use of water, and the fragmentation of water responsibility between more than one official body has contributed to the weakness of the regulatory aspect, especially in the recent years as a result of the circumstances the country is going through.

I suggest finding clear implementation plans at the level of each basin and conducting projects to feed the basins and reduce the rates of depletion through public awareness. Also, there must be an agricultural policy based on encouraging crops with high economic returns and the use of modern methods of irrigating crops that guarantee 80% of the water allocated for irrigation. Finally, the need to be responsible towards this problem, that start with the head of the state and ends with the citizen, without forgetting the role of the media in raising awareness of the importance of the optimal use of water.

# Permanent Deficit and Increasing Random Use

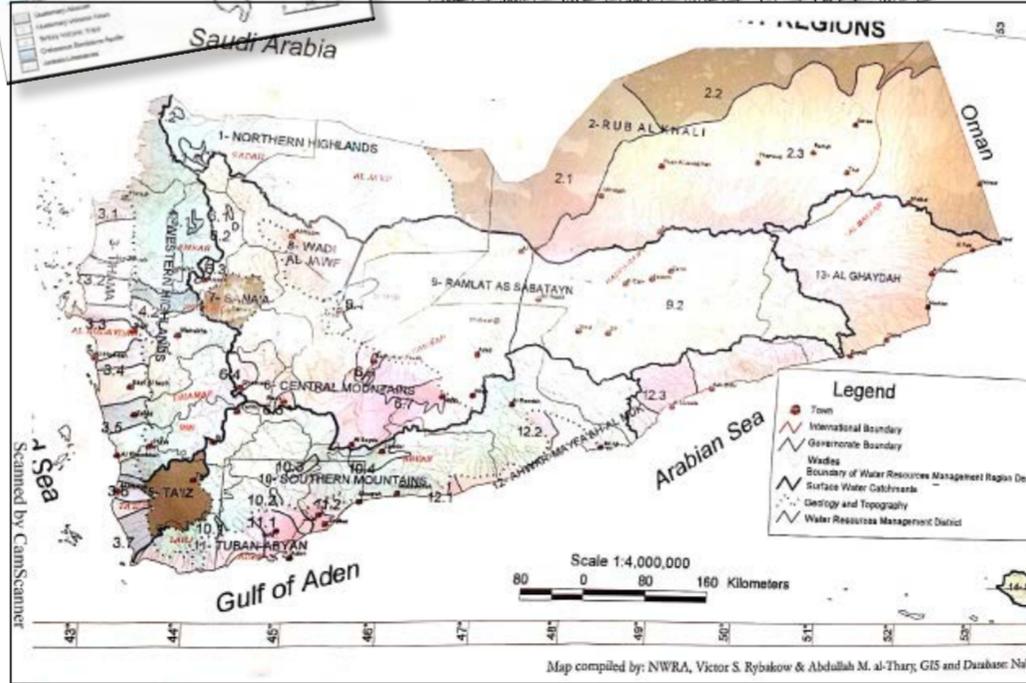
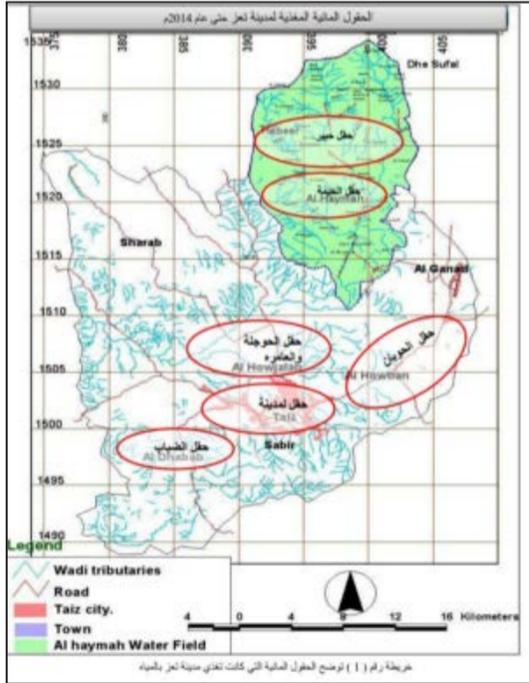


Table No. (17) Quantity and Percentage of Water Production and Consumption, Number of Subscribers, Sanitization of Water Basins Provided by Ministry of Water and Environment, and Average Share Per Capita from Consumed Water by Branch: 2017 - 2019

Branch	2017	2018	2019
Government	1,234,567	1,345,678	1,456,789
Private	2,345,678	2,456,789	2,567,890
Total	3,580,245	3,802,467	4,024,679

Table No. (18) Quantity and Percentage of Water Production and Consumption, Number of Subscribers, Sanitization of Water Basins Provided by Ministry of Water and Environment, and Average Share Per Capita from Consumed Water by Branch: 2017 - 2019

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affected by the random drilling of wells and others, according to the thorough studies that were carried out before, but we have not reached them in the required manner so far, not even the donors. The studies that were conducted to assess the water basins on terms of quality, quantity and uses show that there is no basin in every region. There aren't any basins in Taiz because the water basin has fixed standards and determinants of boundaries (thickness), as the thickness of water in the geological layer in the Republic of Yemen is divided by 14 aquifers, and these divisions are not geographically accurate, but administratively."

Meanwhile, Fahd Al-Junaid (a media specialist in the field of water) believes that the cultivation of qat is one of the most important reasons that led to the depletion of water basins because they consume a large proportion of groundwater.

### Using the water rationing process

Hassan Al-Sheikh (a groundwater expert) confirms, "Yemen's situation in water, especially groundwater, is very complicated, and the percentage of surface water, such as dams, is very small. Some believe that rainwater feeds the groundwater, but this is not true, as the groundwater is deep and rain water does not reach it".

He said, "The problem of groundwater is old since 1983 AD. Even in 1984 AD, drinkable water wells were closed in Aden which were 4 wells (in Sheikh Othman) due to increased depletion, and seawater overwhelmed the groundwater. These wells are still closed, including Ahmed well. The water problem was submitted, but no one responded".

Regarding the basins drought, he suggests, "Using the method of water rationing, especially in agriculture, and automated drip irrigation", stressing that the Ministry, through the Resources Authority, is making a great effort to protect the basins draining by following up on the random drilling process and preventing it, and developing plans to protect the basins and cover them industrially, and to introduce counters to ration the water, in particular the wells".

thority owns a number of underground wells and more than 800 monitoring stations for climatic and water monitoring stations, and due to the current conditions, the activity of collecting data from these stations has decreased, so it is currently seeking to restore the activity of the water monitoring network in the governorates, which prepares water budgets and studies related to the water levels in the wells. Regarding the fact that groundwater is depleting,

Al-Mahbashi says, "Groundwater estimations are not easy to obtain, and they need very detailed and accurate studies, including underground survey studies, water analysis and a synthetic geological study to know the type of layer and the extent of the water layers, and we emphasize that there are studies prepared, but the amount of groundwater is not determined". He also adds, "The Sana'a and Saada basins are the most

**Groundwater Estimates**  
 Engineer Yahya Al-Mahbashi (Head of Studies and Planning Sector at the National Water Resources Authority) says, "The Authority carries out a number of activities related to knowing the water quality and quantity in the water basins, and it has branches in a number of Yemeni governorates that review water quality and water subsidence estimations in underground wells. In addition, the Au-

## Al-Nozaily: The Need to Review the Dams Experience and Evaluate Reports (recession of the basins)

*"The water crisis has become deep-rooted in the Yemeni society, and the various chapters of their stories with the suffering vary from one governorate to another, with the continuation of the random drilling, pollution and irrational use in light of the ineffective presence of the concerned parties that should determine and plan water policies, and prioritize the water sector in Yemen to address the situation. Due to the importance of the role of the specialists in alleviating this crisis, the newspaper "Sawt Al-Amal" (Voice of Hope) conducted a press interview with the Vice Director of the Water and Environment Center for Graduate Studies, Prof. Dr. Fadhl Al-Nozaily, to learn about the problems that the water basins suffer from in Yemen and the way to improve the service:*

**• What are the most important problems that the water basins face in Yemen?**  
 There are basins that suffer from the pollution and indiscriminate use, which contributed to the beginning of the recession of some basins, as each basin suffers from a problem that somewhat differs from the rest of the basins. This matter contributes to the implementation of a successful idea (decentralizing of the management of the water basins) that led to a positive result.  
**• Does this mean that each administration has independent authorities regarding the central administration?**  
 Yes, in each branch, there is a com-

mittee called (Basin Management Committee) that is responsible for following up on the condition of the basin and any problem that may arise. For example, in the Sana'a Basin, our center is a member of the Basin Management Committee, and in the last meeting of the committee that took place last April, the procedures required to preserve the basin were discussed and a solution was addressed regarding pollution, as we work to stop random drilling, which is one of the most important causes of the groundwater depletion.  
**• What measures have been taken to prevent or legalize indiscriminate drilling?**  
 There is a number of decisions that we hope will be implemented on the ground, represented in stopping the importation of rigs and preventing their passage through the security points without a permit from the Basin Management Committee.  
**• How can rainwater be used to feed the water basins, as it is the most important water source in Yemen?**  
 In fact, rain and torrential water are the only source of groundwater, and in order to benefit from them, we must focus on preserving rainwater and conducting the necessary studies to provide sources to the groundwater replenishment. Unfortunately, until today, rainwater is only used to irrigate the crops, a large proportion goes to the sea, and a small percentage replenish the groundwater.  
 Procedures such as the use of water barriers with a depth of five to ten meters in the well field areas to inject groundwater have been implemented in specific geographically studied areas so that they are in appropriate layers for the discharge of injected water into the basin.  
 For example, in the old Sana'a region,



and because its wells are shallow (not deep), water replenishment easily takes place through the so-called "maqashem", a land designated for cultivating radishes and leeks, where rainwater is collected. This system, which the ancient Yemenis worked on, proved its worth in replenishing groundwater in the city of Sana'a.  
 • This leads us to the question about the dams' experience, do we consider it a successful experience to replenish groundwater?  
 Each experience has advantages and disadvantages, and one of the advantages of the dams' experience is that it contributed to impound rainwater and torrential rain before they go to the sea. Thus, the goal of impounding this water should first be determined. Is the goal replenishing agricultural areas, benefiting from it for drinking, or using it for industrial purposes, for example? The most important thing is to determine the appropriate place for building dams, through feasibility studies that take into account many criteria, including determining the area of rain. The dam must be located in an area where torrents flow. Here, the Meteorological Authority participates in

determining the locations of the dams, and also the use of the modern technology, such as the geographical information system known as GIS, and the use of the satellites as an indicator of the presence of water, by technical information means recognized by the specialists in this field. However, dams were built according to the positioning, but they were not successful as required, perhaps the goals were unclear.  
**• Do you call for a review regarding the issue of building dams?**  
 We need to reconsider the assessment of the past experience and use clear scientific methods based on pre-construction feasibility studies and determine their purpose with meaningful criteria for the country, not only on the agricultural level, but also in economic, social and educational aspects.  
**• There are multiple international reports that evoke the recession of groundwater in a number of water basins. What is your assessment of these reports, and are there really depleted basins?**  
 It is a very complicated issue to know the amount of water in the groundwater basins because they are unspecified underground forms, and you need modern geophysics and magnetic waves to reach correct results about the presence of water or not, and you also need to have exploratory wells up to two kilometers deep in different locations from the edges of the basin through the system (communicating vessels), so that it can determine the amount of water, and it is used as monthly or annual indicators in what is known as (water balance).  
 The process of monitoring and evaluating the water storage in the basins is supposed to be a permanent and continu-

ous process, and it is being dealt with as a standard for many long years.  
**• Do you mean that these reports need to be reviewed?**  
 These reports are based on foundations and criteria that have expired and changed due to the climatic changes that occurred during the subsequent periods. These reports need to investigate the accuracy of the data they were built on to be suitable for reliance on them in planning the measures that should be taken in the future to preserve the water basins and the safe water level in them.  
 At the present time, GIS technology should be used to determine the current status of water storage, and to train the Yemeni cadres in this field.  
**• What about the legal status of water at the moment?**  
 We have a valid law issued on 2002 AD, and from my point of view, it is sufficient to preserve water if it is fully implemented.  
**• Qat consumes 80% of groundwater, how can this problem be addressed?**  
 This problem needs an integrated solution system, but with regard to the water, I think that at least qat farmers should be obligated to use the drip irrigation method and avoid the immersion method because it drains the groundwater.  
**• What are your suggestions to improve the water situation in Yemen?**  
 First, involving all the local authorities in defining and planning the water policies, approving appropriate financial allocations and giving priority to addressing the problem. I also suggest focusing on encouraging the agriculture in the areas where there is an abundance of water and allocating the areas that suffer from water scarcity for drinking use only.



# The Irrigation Sector in Yemen, a Rich History and a Timid Reality

## The Total Stored Groundwater in Yemen is 10370 billion Cubic Meters

By: Manal Amin - Rajaa Mukred  
 Sawt Al-Amal (Voice of Hope)

“Yemen is one of the oldest countries in the world that has established multiple irrigation networks such as agricultural terraces, dams and tanks. It has been distinguished from the rest of the world in terms of ways of water transportation from its sources towards the agricultural lands”, this was confirmed by the Undersecretary of the Ministry of Agriculture and Irrigation for the irrigation sector, Eng. Ahmed Nasser Al-Zamki.

Al-Zamki reviewed for “Sawt Al-Amal” (Voice of Hope) the water sources available in Yemen in general, which are: rainwater, torrential rain, floods, springs, streams, groundwater (wells), and surface water that consists of four main basins consisting of a group of valleys and sub-surface water courses each. Its quantity is about 2.5 billion m<sup>3</sup>/year, in addition to wastewater (treated sewage water). Then he mentioned the types of irrigation used in the agriculture, which include (immersion irrigation) and this is represented by water runoff on the surface. The farmer also uses water directly from the wells and torrents and transfers it to the agricultural lands, using modern irrigation methods such as sprinkler, drip, bubble, sub-surface.

### Irrigation methods

“Irrigation methods are many and varied, and we find that environmental conditions and economic factors determine the method of irrigation that should be used, which are surface irrigation, localized irrigation (through water transfer by pipes), sprinkler irrigation, drip irrigation, bubbler irrigation”, and this is what was demonstrated in the book “Rationalizing Water Usage in Irrigation and Modern Irrigation Methods”, which was prepared by Dr. Ayoub Ahmed Al-Mohab, an irrigation consultant, in April 2011 AD.

On the importance of using modern irrigation networks in agricultural lands which total area is 2.5% of the area of Yemen as a whole, the Undersecretary of the Ministry of Agriculture said: “Modern irrigation methods are based on transferring water from its sources to agricultural lands in safe ways, to save water consumption and avoid the use of open channels that cause water to seep (leak) through the channel itself, resulting in a large loss in the amount of water”.

The Yemeni farmer has his own ways of consuming water for agricultural lands. Muhammad Al-Zawwar (owner of agricultural lands in Al-Hayma area in Sana'a) explains some of these methods, saying that he has a number of agricultural lands distributed over many areas, where the irrigation process differs as it depends on rain, manual wells and water tanks that are filled during the rainy season to irrigate qat farms, or seasonal agricultural lands in which corn, wheat and



sometimes maize are grown in the summer, autumn and spring seasons. There are lands near the stream or al-Majil (a pit that widens at the bottom and narrows gradually, rainwater is stored there), indicating that he uses the immersion method during the process of the irrigating agricultural lands.

### Groundwater depletion

A report issued by the Technical Secretariat for Food Security at the Ministry of Planning and International Cooperation mentioned the role of the agricultural sector in contributing to the achievement of food security, the wheat cultivation and production (September 2020). “Sawt Al-Amal” (Voice of Hope) newspaper obtained a copy of it, stating: “In Yemen, it is estimated at 10,370 billion cubic meters, of which 1,525 million cubic meters are renewable water, or 0.02% of the total, and in Mukalla, the area of the governorate + Ramlat As-Sab'atyn has a water reserve estimated at 10 thousand billion cubic meters, or 96.4% of the total groundwater”.

“Yemen is one of the Arab countries facing a stifling water crisis the most, as fresh water resources are dwindling due to the excessive pumping from groundwater. The demand for water is increasing due to high per capita consumption, poor management of water resources and rapid population growth, which is expected to double to 48 million by the year 2037”, according to the United Nations Population Division, World Population Prospects: 2010 Revision, Yemen.

Here, the Undersecretary of the Ministry of Agriculture for the irrigation sector reviews the most important problems that have caused the depletion of groundwater in Yemen. He revealed:

- The lack of supervision in the process of drilling water wells throughout the country, which led to randomness in the drilling process, and excessive use of water. This process has accumulated since the entry of excavators from the end of the eighties and nineties to the beginning of the millennium, which has become increasingly in-demand, with the absence of laws that determine how to import excavators, and give licenses.

- Indiscriminate drilling led to the depletion of groundwater, and this is what happened with the basin of Taiz governorate, which is completely depleted by 100%, followed by the Sana'a basin, which is



threatened with depletion due to the drilling process, which in some areas reached a thousand meters, where the wells in Sana'a did not exceed the drilling process in them between 50 to 100 meters in the last century. With the passage of time, the wells multiplied and increased the rate of drilling between 300-800 meters and above, which contributed to the depletion of groundwater in most areas.

- The qat plant takes up a large amount of groundwater consumption in the country.

The Ministry of Agriculture and Irrigation has a timid role in trying to reduce the consumption of groundwater for the agricultural lands. Al-Zamki said, “The irrigation sector in the past periods sought to reduce 90% of the groundwater consumption in agricultural lands, by providing modern irrigation networks, to reduce water consumption among the irrigation sector’s strategies under which the “National Irrigation Program Project” was established, then began distributing networks on agricultural lands in large quantities at the governorate level, which existed before 2015 AD by a fund from the Agricultural and Fishing Encouragement Fund, thus



because of the current situation the funding has stopped, and then the project.

### Water facilities and their importance

Yemen has water facilities and irrigation systems that have contributed, throughout the ages, to the conservation of water and its proper distribution on agricultural lands. Where Dr. Abdullah Abdul-Qadir Noaman (Faculty of Engineering, Sana'a University) and Dr. Muhammad Abdul-Bari Al-Qudsi (Faculty of Science, Sana'a University) dealt with in their book “Water Facilities and Irrigation Systems in the Ancient Yemeni Civilization” published on the website of the Arab Scientific Community Organization on October 2014 AD. They discussed examples of water facilities that were unique to Yemeni civilization and contributed to water conservation, the most famous of which are:

- The Marib Dam and Wadi Athana, which is called "Athana" in the ancient Yemeni inscriptions.

- Two tunnels of Baynoun to divert rainwater, which are currently located 54 km from Dhamar Governorate, and about 100 km from Sana'a (in the sub-district of Thawban in Al-Hada district), and they carry out the tasks of diverting the flood watersheds.

- The irrigation system in Shabwa, which depends on torrential rains arising from the southwestern monsoon, in the month of (April and August).

- The streams of Sana'a, which is one of the oldest historical evidence in Sana'a, dates back to (the second half of the second century AH).

- Aden cisterns and they depend on a system consisting of a group of tanks adjacent to each other in the form of a bridge that drains the rainwater flowing towards it in the form of waterfalls from the Shamsan Mountains.



On the importance of the dams in the irrigation process, Al-Zamki explained, “The storage dams are found in the upper and central highlands, and there are about 347 dams. The transfer dams are intended to regulate water in the valleys and divert it to canals to feed the agricultural lands. They are located in (Tihamah, Moore Dam, Zabid Dam, Tuban Delta, Abyan Delta, Mayfa Hajar Valley, and Al- Jaza'a Valley), and it also contributes to recharge the groundwater in those areas.

He pointed out that the dams in Yemen do not exceed a maximum height of 35 meters, and work to recharge the groundwater, irrigation and domestic uses, and the storage capacity of the Marib dam does not exceed 450 million cubic meters.

To improve the operation of the dams, Al-Zamki stressed that the Ministry of Agriculture has a plan of action regarding the utilization of the dam water, which will be implemented in the coming period, by creating a transmission network (dams' water) to the agricultural land areas, and supporting it with the solar energy while providing irrigation networks.

جدول رقم (2) توزيع المساحات وفقا لمصادر المياه 2019م

م	البيانات (التصنيف)	المساحة (هكتار)	%
1	أراضي تعتمد على الأمطار	526613	48.4
2	أراضي تعتمد على المياه الجوفية (آبار)	427597	39.3
3	أراضي تعتمد على مياه السيول	116980	10.8
4	أراضي تعتمد على مياه الغيول	16513	1.5
	الإجمالي	1087703	100

المصدر: كتاب الإحصاء الزراعي السنوي، 2019

## Rugged Terrain and Water Scarcity in Yemen

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Interruption of electricity supply and scarcity of operating expenses of the water bodies, which resulted in a neglect in the maintenance and repair of many water systems, resulting in a public emergency situation regarding the entire water system, sanitation and hygiene sector in Yemen. In addition to other factors, including the increasing population growth and the security and economic disturbances that made it more difficult to provide various services in general, and water and health services in particular, to various segments of society, as well as the critical situation, six years ago, due to the war and its repercussions, which led to the suspension of most of the infrastructure services in the most areas, including the water and sanitation.

Yemen is one of the countries where the water table is low, and it is also threatened by the aridity disaster. There are no permanent rivers in it, thus most of its areas face a difficult challenge, which is the rugged terrain and water scarcity. However, the people of Yemen have resorted to using rainwater to meet this difficult challenge instead of springs and streamflows. Many areas depend on rainwater that is

stored in ponds (saqayat), bunds or dams of varying sizes.

One of the most famous dams is the historic and great Ma'rib Dam. In this regard, one of the reports of the Arab Countries Water Utilities Association (ACWUA) concerning the water situation in Yemen indicated that there are about 1,000 water facilities with a storage capacity of approximately 80 million cubic meters, and its cost reaches approximately 16 billion riyals, i.e., with an average capacity of 80 thousand cubic meters per facility, and an average cost of 16 million Yemeni riyals at a cost of 200 riyals per cubic meter.

While water facilities store ponds and dams annually, approximately 50-60 billion cubic meters of rainwater, the nature of the rainy seasons in the summer limits the amounts of torrents that they generate, due to the lack of water barriers that work to store rainwater, which leads to the retention of most rainwater in the soil surface that is either directly depleted by plants or evaporates afterwards back in the air. Therefore, it is difficult for the number of torrents that flow in the plains to exceed 10% of these rains, i.e., from 3 to 6

billion cubic meters.

Al-Qabbaytah district is one of the districts that is famous for its ponds (saqayat). It possesses a beautiful and picturesque nature despite its rugged terrain. Its residents have used rainwater by building dams and covered ponds (the people of the region call them 'saqayat').

Including the 'saqaya' of one of the residents of Al-Qabbaytah in the Al-Arkaba region, which he built at the end of the eighties, and is considered the largest and deepest 'saqaya' in the region so far.

### (Saqaya of Al-Arkaba- Al-Qabbaytah)

He built it in a mountainous area far from the dwellings at that time so that its water coming from the mountains would be clean. And he paved some mountains to be crossings for torrents (water wheels) pouring into Al- Mishna' and then entering the "saqia" (water wheel), and he linked pipes to the village so that all the residents benefit from its water in particular in the summer every year in times of dry wells. Nowadays, most of the people built small private



# Water Scarcity:

## A New Suffering Added to Yemeni Women

*Yemen suffers from a suffocating water crisis that almost exhausts the life of the ordinary citizen, especially in these difficult circumstances that the country is going through. Perhaps women are the most affected groups of the society by the aggravation of this problem with every difficult stage that Yemen faces, to the extent that it has become deep-rooted in the Yemeni reality since long periods and until now.*

*Nouria Al-Humairi (a 40-year-old citizen from Taiz) reviews the many problems that Taiz city suffers from related to the water sector, and she says, "The city has long suffered from many problems that have contributed to the deterioration of the public life and the increase of the women suffering in particular, due to the ongoing conflict in the city".*

By: Manal Amin  
Sawt Al-Amal (Voice of Hope) -

### A double burden on women

In a voice tone that reveals a lot of pain, Al-Humairi, who lives in the mountainous Wadi Al-Qadi area, suffers from the absence of a head of household who has been working abroad for years, and whose situation is similar to many women in Taiz, says that every day, in the early morning, and for more than six years, she and her children hurry to go to an area far from her home where there is a water source to avoid crowds which make it easier for her to fill the water she needs that is barely enough for the daily use.

She says, "because of the general situation in the city, we are enduring the hardship of going to distant places up to a kilometer to search for a source where there is water, regardless of its validity, purity, or even its source, as there is no supervisory authority over these sources, which has caused the spread of many diseases due to the widespread pollution in some water sources, and we also suffer from high prices of the "Wayts" ("Bozat" or water tanks) due to the high prices of oil derivatives and their non-existence sometimes, which constituted a double burden on us".

### 1.4 billion meters, the total water deficit by 2025 AD

The National Water Resources Authority in Taiz explained to "Sawt Al-Amal" (Voice of Hope) that the reasons that led to the aggravation of the water problem in the city of Taiz are the annual increase in the



population and environmental pollution in the water resources existing in the city, the failure to benefit from all the wells owned by the city entirely, and the random use of resources. It also reviewed the treatments carried out by the local authority and Authority of Water to alleviate the suffering of the citizens, through direct communication with the international organizations to implement projects that contribute to the return of production of water fields outside the city to benefit from.

"The total of renewable fresh water in Yemen amounted to 2.53 billion cubic meters / year, the total current use of water amounted to 3970 million cubic meters / year, and the total deficit in used and renewable water reached more than 1.4 billion cubic meters / year, and is expected to reach 1.7 billion cubic meters / year in 2025 AD". This came in a special report of the National Water Resources Authority (Opportunities and Challenges) from Aden, November 2020 AD.

According to the report of the United Nations Development Programme 2020 published on their official website, "Only 22% of the rural population and 46% of the urban population are connected public water networks that operate partially, and less than 55% of the population has access to potable water". To ensure universal access to safe and affordable drinking water by 2030 AD, the report emphasized, "Increasing the investments in the infrastructure, providing sanitation facilities, encouraging hygiene at all levels, protecting and restoring water-related ecosystems in mountains, wetlands and rivers to mitigate water scarcity, in addition to supporting processing technologies in the long coastal areas of Yemen".

### Women's stories and their suffering

"The number of wells that feed the city of Aden is approximately 114 from three main fields, located at the base of the Tuban



delta, and little water comes from Abyan". This was confirmed by the director of the Authority of Water and Sanitation in Aden, Najeeb Mohammed Ahmed, to the newspaper "Sawt Al-Amal" (Voice of Hope), where he said, "There are water fields that are drained for agricultural purposes in random ways, and this has caused significant water stock tampering, in addition to ongoing attacks on these fields, by controlling the field campus (the cancerous construction), and this is one of the most difficult problems facing the water sector in the country at the present time".

Aden has not been spared the suffering of water scarcity, especially in the past few years, as it has been suffering from an increase in the population and the difficulty of delivering water to homes.

Umm Rami Ahmed (a 36-year-old woman from Alaidros area in Crater district) suffers a lot because of the water cuts for days and sometimes weeks. Water, even if found,

does not reach the house, due to the lack of electricity to operate the water intake generator (dynamo), which has become a necessity in every home.

She complained about her condition, and said, "I have five children and I do not have a generator to pump water. I have to collect, daily, all the containers I own in order to fill them from a well near our region to provide the water we need, especially since we consume a lot during this period due to the intense heat and to avoid infection with epidemics and diseases that are prevalent these days".

The situation of the displaced women is not much different from other Yemeni women in the various governorates, as the displaced Umm Muhammad (from Al-Hudaydah governorate, currently residing in Dar Saad camps) says, "The camp does not provide the amount of water we need on a daily basis, so we, the women of the camp, are forced to go to remote places where there are water ponds or watercourses to provide water by means of gallons (plastic containers) that we carry on our heads".

Umm Jumana, (a 36-year-old school-teacher from Sana'a), was also not spared from the women's suffering from a lack of water. "We are very frustrated because the current situation continues to deteriorate the basic services such as water and electricity", she says. She recounts what she is going through, saying, "I never thought about how to bring water to the house in the past period, but the difficult situation the country is going through made me, for more than five years, go to a water station near our homes in Marib Street daily to collect water to escape the high prices of 'Wayts'".

water wheels for their homes.

And the importance of the large water wheels remains as water barriers to water resources, and they are directly behind dams in terms of importance. In any case, Yemen relies on two main sources to meet the needs of the rural and urban population in terms of water:

- Groundwater: It is the water that has been stored for many years in ponds, dams and water barriers. It is a major source of water supply for urban areas, cities and other population centers. It suffers from severe pressure due to the misuse, especially in the cultivation and irrigation of some crops, such as the qat tree, which is one of the most important factors of wasting water, in addition to the random drilling of wells and basins, most of which suffer from a gap between renewable water and the water extracted from it.

Among the unconventional water resources in Yemen are treated sewage water, which is used in a limited and unregulated manner in the irrigation, in addition to the seawater desalination process, which is still untapped, although there was a project under implementation to desalinate seawater

in order to supply the cities of Taiz and Ibb with water because they are the most Yemeni regions prone to drought, but this project has not been finalized to this day.

- Flowing water: It is the overland flow of the valleys falls represented by streams and springs of water, in addition to water barriers. The amount of renewable water is 4,781 million cubic meters annually. Yemen has four ports: the Red Sea port, Rub' Al-Khali port, Arabian Sea port and the Gulf of Aden port.

The human, economic and social development depends on the sustainable management of the natural resources in light of the integration of fresh water resources and ecosystems related to the water and the environment. However, the climatic changes, population growth, qat cultivation, and pollution that estimations indicate that its continuation will lead to the deterioration of the natural environment, and the continued depletion of water resources in its current form, scarcity of energy sources and the failure to exploit natural energy sources to contribute to maintaining healthy ecosystems will inevitably lead to an environmental disaster.

Water is the basis of survival for all living creatures, and it is even life itself. It is a basic right for human survival, and an important element for the future of humanity.

Therefore, we must work on the advancement and participation of all members of the society to be able to manage water use. In fact, community participation in decision-making can achieve many benefits, and it is also necessary to provide better ways to measure the quality and effectiveness of this participation, and to be able to do so, decision-making bodies must pay attention to essential points, including:

- Meeting sanitation services for all segments of the society, which means increasing the efficiency of existing financial resources and mobilizing additional and innovative forms of local and international financing to enable the establishment of supportive water projects (water desalination, water purification, rationalization of water use).
- Developing the human capacity in techniques to meet

the challenges of the severe shortage of institutional capacity across the water sector.

- Focusing on the techniques of managing water resources safely, so that smart technology can be used, such as activating the use of water desalination technique, which has become a necessary matter for the concerned authorities to focus on, whether the governmental or civil society organizations.

- Preserving water sources (flowing water and groundwater) by spreading education on rationalizing water use in the agriculture, irrigation and other uses.

- Organizing the awareness campaigns and educational seminars on how to rationalize the use of water in a way that maintains the level of groundwater and flowing water storage, and to take advantage of dams to recharge groundwater reservoirs, and it is also possible to re-store the excess running water resulting from groundwater in the groundwater reservoir in order to increase the amount of water that can be saved and stored to support the recharge of groundwater wells.

## Civil Society Organizations:

# International: Big Projects on Paper and Little on the Field Local: A Limited Role and Efforts Lacking Support

By: Hanin Ahmed  
Sawt Al-Amal (Voice of Hope)

Many international organizations work through local institutions to alleviate, timidly, the water problem in Yemen, through quick and emergency interventions, according to the difficult situation that Yemen is going through at each stage, for a general goal that it always announced (to contribute to the coalition of water poverty).

### UNICEF 2020

International organizations have played an active role in providing aid and quick solutions to the problems related to the water sector in Yemen in this situation, as the UNICEF report (the humanitarian situation for the year 2020 in relation to its interventions in the water sector) stated that about 20.1 million Yemenis need humanitarian assistance to obtain safe water, and that the organization targeted 6.8 million people, or approximately 62%, who are in dire need of water, sanitation and environmental sanitation services in places at risk of cholera and malnutrition, and areas where there is a large number of displaced people, and campaigns have been launched to sterilize the water of homes with chlorine and treatment tablets were distributed, targeting more than 900,000 people.

During the same period, the organization carried out a process of monitoring and evaluating water quality through the existing water supply network in the urban and rural areas that are at risk of acute watery diarrhea (cholera), by testing the physical, chemical and microbiological conditions, and monitoring the chlorination process of drinkable water in tanks and water tanks.

### Social fund

The Social Fund for Development has supported more than 263,000 beneficiaries from various Yemeni governorates to obtain improved water sources with a storage capacity of 728,450 cubic meters, based on the Fund's annual report for the period from January to December 2019 AD.

The report stated that the number of individuals who benefited from the environ-



mental sanitation has tripled, with 390,917 people receiving adequate environmental sanitation, through the construction of 7,098 bathrooms.

### Projects and interventions

Khaled Al-Shumairi (water facility engineer) says, "The most important projects and interventions carried out by the international organizations in the field of water are: the rehabilitation of typical or feasible water projects according to the available water sources and the density of the target population, and the rehabilitation of dilapidated sewage networks in the small and medium urban cities. And sometimes parts of the sewage networks in the main cities, implementation of a network of cesspits and linking them with the main sewage networks".

He explains, "As for the local community organizations, they have contributed greatly and effectively to the rehabilitation of possible, stalled and obsolete water

projects due to the problems and conflicts according to the available capabilities, and the water of springs or streams was exploited and collected in the water collecting tanks, and used through manholes".

Regarding the difficulties, he points out, "The lack of water sources in general, whether surface or underground, and the random drilling of artesian wells, resulted in a deterioration in the sources of water replenishment, and an increase in the surface and ground water pollution, due to the increase in urban sprawl on torrents and

valleys, and a significant shortcoming in the removal of waste garbage, the use of cesspits, low implementation of sewage networks, and the inability to find suitable solutions for its disposal and treatment".

### The effective role of civil society organizations

Muhammad Abdul Hakim Mansour (field coordinator at the International Youth Council IYC) explains, "The role of local and international organizations is effective in relieving citizens, especially



in the city of Taiz, where they have contributed to the establishment of many programs and courses specialized in providing water and implementing many projects in more than one directorate, such as the Emergency Response Project in Water and Environmental Sanitation, and the Water Irrigation Project, which provided safe drinkable water for the citizens and alleviated their suffering".

He adds, "The projects have been implemented in many neighborhoods and districts in Taiz, and they have had a significant impact as the governorate suffers from a high population density and water scarcity".

"There are difficulties facing the team of organizations represented in the difficulty of accessing some places due to the continuation of the conflict, with people's need for water service in those areas, and some organizations are forced to target areas and neighborhoods that have been targeted before, to cover their plans in front of the donors".

### Youth initiatives

Nafisa Abdullah (head of the Rekaaz Initiative) says, "Within the framework of projects and programs, the initiative has provided reservoirs to some neighborhoods and regions that suffer from a scarcity of drinkable water, through the Water Irrigation Project, which provides water to neighborhoods on a weekly and monthly basis", indicating that there is often an obstacle between them and the beneficiaries, which is the high percentage of need, scarcity of available support, and disparity in the number of individuals in one family, which may make the consumption rate of one family higher than the other".

As for Ruqiyah Al-Najjar (head of The Gend Pulse Initiative - Taiz), she explains, "The initiative still contributes to providing weekly and sometimes daily through (Ways or water tanks), drinkable water and daily use in many districts that suffer from difficulty in providing water, such as Al-Harthy area, Sala district, Wadi Al-Qadi, Al-Noor city, through coordination with local authorities and supporters to cover the water needs in the area constantly.

# Wadi Maytam "Ibb" Is

*Ibb governorate in central Yemen is considered one of the most well-known agricultural governorates. It is characterized by its fertile agricultural valleys with scenic views, making it an attractive destination for internal and external tourism.*

*Wadi Maytam is one of the wonderful agricultural valleys of Ibb and is located in the sub-district of Maytam, which has a population of 18,311 people, according to the last population census in Yemen which results were announced in 2004 AD. It is expected that this number is expected to more than double within more than 16 years, and the uzlat (sub-district) is located 8 km east of Ibb city.*

By: Samah Imlaq  
Sawt Al-Amal (Voice of Hope)

Citizens' homes are distributed throughout and on the edges of Wadi Maytam, including the village of "Al Jahla" and "Al Nafesh" area, which is a picturesque natural resort in its pristine condition without any investment for its distinctive tourist properties.

And because Maytam area is one of

the most qualified areas for agriculture in Ibb in general, most of its residents subsist their livelihood from it and work as farmers there.

In a field visit by "Sawt Al-Amal" (Voice of Hope) to Wadi Maytam, we found the green color prevalent. Local sources from the residents there said, "This is the state of the valley throughout the year, even in the summer heat, for a number of reasons that we will review in this report.

### Irrigation with sewage water

With the deep knowledge of most farmers of the mistake they make in transferring the sewage water with generators to their farms, and their knowledge of the severe damages, they remain irrigating their farms through this source.

One of the farmers (reluctant to give his name) told "Sawt Al-Amal" (Voice of Hope), "I extract pure water from the sewage manholes, which do not cause great damage to the trees in my opinion, but we prepare them as a kind of fertilizer, and because of the necessity, I would not have resorted to waste water".

While Naji Obeid (farmer) comments, "It is the duty of the state to build dams to store water throughout the winter, which will contribute to avoid resorting to sewage and exploiting rainwater in the summer".

The sewage station is located in the extreme south of Wadi Maytam, where

its capacity is more than twice as low as the waste it receives, according to a previous statement by Engineer Abdul Aleem Khaled Seif, (Environmental Resources Assessment Adviser at the Regional Agricultural Research Station "Ibb, Taiz") to Althawrah newspaper in 2013 AD, in which he said, "The treatment is incorrect because the plant, since its establishment, was designed to treat about 5000 / cubic liters of water per day, while the percentage of water flowing into it in 2013 AD was from 10,000-12,000 / cubic liters of water. These quantities are doubled and exceed the station's capacity, which results in incorrect and incomplete treatment".

The amount of water flowing into the station during the year is about 4,500,000 cubic liters of water treated by primitive and incomplete methods, according to Engineer Abdul Aleem, which causes sewage to float and flow on the valley roads to flood agricultur-

al crops and affect the groundwater that supports clean drinkable water.

### With treatment

Many farmers believe that the use of sewage water for irrigation after treatment does not cause any damage, but rather contributes to the ripening of the fruit due to the waste, which they consider a kind of soil fertilizer, and they only acknowledge the catastrophe of watering the farms with the untreated water after passing by the sewage station.

The regional agricultural research station analyzed a quantity of sewage water entering the station that did not reach the treatment basins, and it was found through the analysis that the number of bacterial cells reached 210 cells per 100 ml liter, then another sample was taken after the passage of water and the sewage in the treatment basins from the treated water in the sterilization ba-

### Humanitarian organizations and businesses

“Yanabia Al-Khair Charity Foundation” is one of the institutions that played a major role in alleviating the suffering of poor and affected families. Ibrahim Al-Odainy (logistical officer of the foundation - Taiz) reviews the work of the Foundation, saying, “Two projects were implemented to alleviate the suffering of providing the water service to the citizens by providing water irrigation that targeted poor and damaged neighborhoods, and also contributed to the repair and maintenance of water wells to limit the spread of diseases and epidemics through polluted water”.

He asserts, “The organizations have an effective and real role in contributing, helping and alleviating the suffering of these individuals in cities or in the countryside, which have been exhausted by the ongoing conflicts that have destroyed many basic services”.

### Jannat Foundation

“Jannat Foundation” contributed to improving and providing safe water, distributing tanks and irrigating water, which helped a large number of poor and displaced families. This was expressed by Mazen Adnan (project coordinator at the foundation in Taiz).

Mazen stressed on the need for government and private agencies to work together to help improving the water situation for citizens and make it easy to be provided in various regions

### Targeted Opinions

Haitham Al-Dabaai (resident in Taiz) says, “The role of organizations in water projects does not cover even 35% of the basic needs of the citizens, and does not cover all the areas basically, and huge budgets are spent on projects that many do not benefit from. It was better for these organizations to maintain the network of the National Water Authority, and work to deliver water to all areas and neighborhoods on a periodic and continuous schedule. Also, the absence of monitoring from the donor organization makes these projects weak and vulnerable to conspiracies”.

Meanwhile, Amjad Muhammed confirmed that the organizations and initiatives have contributed greatly and effectively to providing water to various regions, as they were able to cover many of the needs of the families in the regions and directorates of Taiz city.

He added, “With the increase in the number of citizens in the city, in addition to the displaced and those affected by the conflict, the organizations have worked with great effort to implement many projects at the city and rural levels to alleviate suffering and facilitate access to water”.

### Drinkable water and qat

The people of Wadi Maytam complain about the sale and usage of the “Ways” drinkable water in the farms of the qat tree, where one of the female farmers says, “The qat is watered with drinkable water, which contributes to delaying the arrival of water to us, except after suffering, as she described it, and going to bring water in bowls from far away”.

This tree, which dominates Wadi Maytam, drains a lot of well water, in addition to the summer torrents, most of which goes to qat farms.

Due to its high price and returns, the farmers of Wadi Maytam water it with excessive irrigation, which drains the water of civil and governmental proj-

# Rationalizing Water Consumption through the Eyes of the Youth

By: Alia Muhammed  
Sawt Al-Amal (Voice of Hope)

*Managing water resources and rationalizing their consumption is one of the important and urgent issues in our Yemeni society, which suffers from a stifling water crisis in all the Yemeni governorates, and there needs to be awareness of the importance of water conservation by the community members.*

*Young people are among the most important segments of Yemeni society, which have an active role in the process of raising awareness of the means of water conservation and how to properly consume it, which contributes to maintaining the groundwater level in all the Yemeni governorates.*

*And a survey was conducted by “Sawt Al-Amal” (Voice of Hope) newspaper with a number of active youth in the society, to know the most important challenges facing the water sector and solutions that contribute to preserving this wealth with a youthful outlook and vision.*

Omran Misbah (a 26-year-old man from Mawiyah district in Taiz) says, “The district is one of the areas known for cultivating qat in Yemen. I see the amount of water that is still wasted in the process of irrigating agricultural lands, and this matter, in my opinion, is one of the most important reasons that lead to a major water crisis in Yemen, as well as the waste of water storages due to the random drilling of the wells, stressing that the tampering that is taking place in this aspect must be curbed, and there should be full awareness of the problem”.

### The importance of developing a strategic plan

On how to obtain sufficient quantities of water, Omran pointed to the importance of developing a comprehensive strategic plan, whether by relying on sea water desalination or by building dams and barriers that work to retain rainwater in places to benefit from it in order to replenish the wells and benefit the agricultural lands instead of leaving them to the torrents.

In the same context, Mayada Salam (a 25-year-old woman from Aden governorate) says, “The responsibility for preserving water is a collective responsibility that rests with the citizen and the state alike. The citizen does not have sufficient awareness of how to manage the used water resources, and therefore all the competent authorities should intensify efforts to conduct awareness campaigns to

rationalize water consumption, by displaying awareness messages through brochures and launching messages through the media”.

### The importance of water projects

On the other hand, Muhammed Al-Ariqi (a 27-year-old man from Sana’a Governorate) believes that awareness is required, especially for farmers in agricultural areas, where large amounts of water are drained on the agricultural lands. He adds, “Projects for organizing irrigation for farms must be implemented, as well as it is necessary to conserve water through irrigation systems management”.

Muhammed Al-Bajali (a 30-year-old man from Hudaydah Governorate) stresses on “The importance of water projects that are used in the process of irrigating agricultural lands, such as the establishment of purification and treatment plants for sewage, so that it can be reused in irrigation operations”.

Mona Al-Matari (a 27-year-old woman from Sana’a governorate) pointed out that “the wrong practices carried out by a number of members of the community had a role in wasting water. Some of those practices carried out by some people, for example, are flooding agricultural lands and draining huge amounts of water unconsciously”.

### Water conservation

“The necessity of community awareness on the importance of rationalizing water by pro-

viding awareness messages by mobile phone via communication networks, in addition to making awareness messages for children to educate children about rationalizing water consumption, and the focus should be on the role of schools in intensifying awareness of students in schools”. This was confirmed by Anoud Muhammad (a 20-year-old woman from Aden governorate).

Noor El-Din Saleh (a 27-year-old woman from Al-Mahwit Governorate) stressed on “the importance of organizing and distributing water, which ensures justice for all and reduces water waste”, adding: “There are areas where water reaches it randomly and areas where water is almost non-existent, which requires the Ministry of Water to create plans and strategies for organizing water distribution and access for all community members”.

Concerning the random construction, Afrah Qaid (a 25-year-old woman from Aden governorate) says, “The random construction is one of the most important reasons for water cuts, and it is almost the basis. It introduced a major change in the water distribution map in all Yemeni regions. The citizen bears the responsibility in the first place, as a result of the random construction that he set up and the absence of the competent authorities and their role in monitoring and preventing the spread of this phenomenon at the level of the Yemeni governorates”.

# Devoid of Clear Water

sin, as a last stage of treatment, it was analyzed, and found that the bacterial cells were 47 bacterial cells for the same amount of previous water.

### Wells and dams

There are more than six wells belonging to the Water Authority in Wadi Maytam, in addition to six farmers owning surface wells, and two others owning two artesian wells, based on a statistic provided by the Director of the Agriculture Branch in the Al-Mashnah District, Eng. Abdullah Saad Al-Kamel, who indicated that eight local wells were insufficient for farmers to irrigate, as the area of the valley extends from Mousalath Mowasalat to the southern outskirts of Wadi Maytam, including more than 15 hectares.

ects, and negatively affects the underground water supply in the valley. This portends a catastrophe of drought if the water authority in the governorate does not take any measures to reduce the scale of the disaster.

### Wells and dams

Al-Kamel adds to “Sawt Al-Amal” (Voice of Hope), “Among 150 farm-

ers in Wadi Maytam, 97% of them use untreated sewage water throughout the year, with the exception of the summer, when the valley pervades the crops of corn and maize irrigated by rainwater, and we have been searching very hard for a solution to the sanitation problem in Al Wadi for more than 10 years, but in vain”.

In the same context, Engineer Abdul Hakim Al-Mufti (Director of Agricultural Extension at the Agriculture and Irrigation Office) asserts, “There are three water barriers or small dams in Wadi Maytam to store summer rainwater for winter, but they are not enough for the farmers”.

He added, “The problem has been rampant for many years, and the source of sewage irrigation is the only solution that the valley farmers can find”.

He added, “Sewer irrigation is not a realistic solution, and we do not encourage it at all, and we are trying to develop

another solution by all security, health and environmental methods through interested organizations, the Ministry of Agriculture and Irrigation and the Public Health Office”.

### Solutions and alternatives

Engineer Abdul Hakim Al-Mufti says, “We excluded Wadi Maytam from the support of the modern irrigation system because its farmers did not leave us a solution, and did not realize the error of what they are doing in terms of irrational use of fresh or waste water in the valley. This exception is one of the damages of the farmers’ lack of sense of responsibility”.

He adds, “We previously supported farmers with special preventive tools against diseases through donor organizations and the Ministries of Agriculture and Health, and we tried to prevent them through the outlets from bringing their agricultural crops to the market,

especially leafy crops that touch the surface of the soil, and we implemented many awareness campaigns, and we found that the farmer is aware of the damage, but he wonders (How do I live?) Since the alternatives are difficult and unavailable from desalination and water purification due to the weak capabilities of the Agriculture Office, and the Authority of Water and Sanitation, the only solution remains to convince the farmers”, according to the Eng. Mufti.

On the available solutions, he says, “The optimal use of rainwater in the valley to reduce the use of sewage water through caravans, irrigation channels, and storage tanks, in addition to tightening sewage water outlets, and the coordination with the relevant authorities where each party must be doing its duty, and intensifying control campaigns on the markets, are the most important solutions to the problem”.

Accessing safe drinkable water and adequate sanitation facilities is a basic right for all members of the Yemeni society, but only one out of dozens of people has direct access to safe drinkable water in Yemen, and nearly one million people need some form of urgent humanitarian assistance to get access to water, sanitation and hygiene. Children make up about 52% of that, it is a right enshrined in the Convention on the Rights of the Child, United Nations resolutions and the Geneva Conventions, where the destruction of drinkable water, sanitation and hygiene infrastructure, poor resource management and rapid population growth contribute to the increasingly severe shortage of pure drinkable water and access to sanitation.

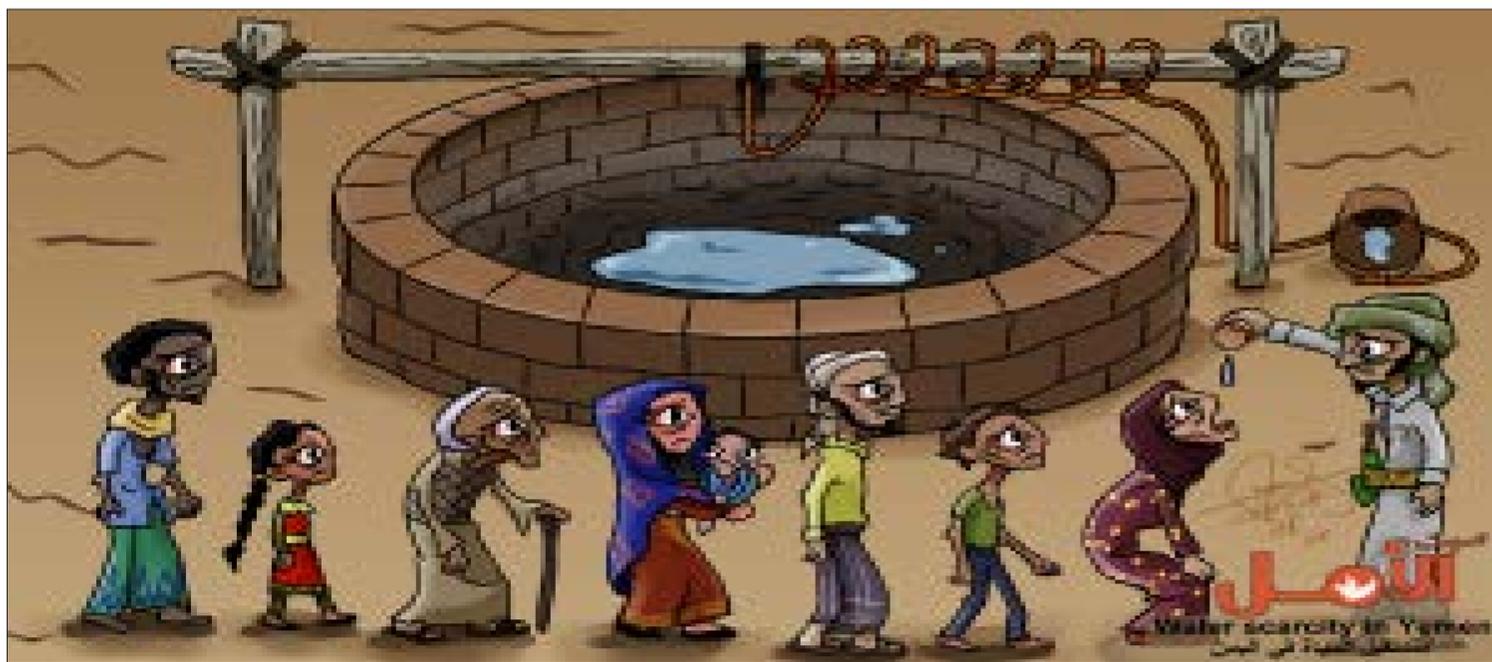
Hence, with the spread and increase of the population, especially the population displaced due to the conditions of the war in several geographical areas, investment in the infrastructure represented in water networks, to which only one third of the population of Yemen is connected, remains necessary and crucial to maintaining the health of children and the elderly.

Health water problems in Yemen contribute to the high health burden through the outbreak of many deadly diseases associated with highly contaminated water, which can transmit many diseases, the most important of which are diarrhea, cholera, dysentery, typhoid, polio and kidney failure diseases, where it is estimated that contaminated drinkable water causes 502 000 diarrhea deaths each year, with water and sanitation related diseases being among the leading causes of death among children under the age of five.

Some interventions can make a big difference to reduce the risks of water to human health, especially in the areas of population centers and displacement, by providing the citizens with clean water transported by trucks, installing water points and collective water tanks, building emergency latrines, distributing hygiene and care kits, and chlorine tablets for home water treatment.

Improving water, sanitation and hygiene services in homes and various service facilities, especially health facilities, are of critical importance to ensure the quality of care and reduce the risk of infection among community members, patients and their families, among the health workers, as well as to reduce deaths through access to clean water.

And in order to maintain uninterrupted access to water, ensure continued access to clean water and also increase the demand for water for hand washing, which is the best means of measures to limit the spread of the Covid-19 pandemic, this requires the stakeholders to work on supporting the policies and strategies that improve the infrastructure for water supply and sanitation in the cities, schools, camps for the displaced and at the community and family levels, as well as rehabilitation and construction of water and sanitation infrastructure, provision of basic water desalination and hygiene services, and finding innovative solutions to make the supply of drinkable water more sustainable and effective, at the level of the society, family and various service institutions.

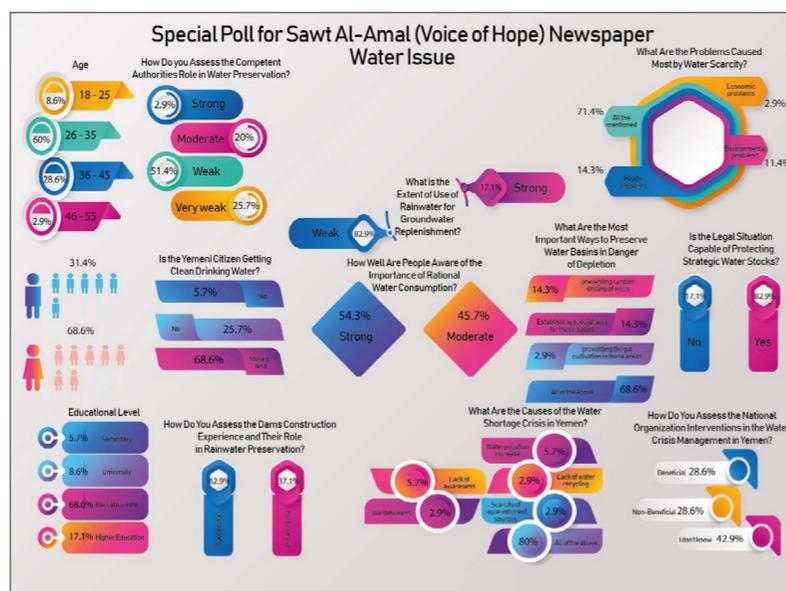


## 83% confirm that the Legal Situation in Yemen Is Incapable of Protecting the Water Storages

The results of a public opinion poll that was carried out by the Information and Public Opinion Survey Unit of the Yemen Information Center for Research and Media (YIC), on the general situation of the water sector in Yemen reviewed that 83% of the citizens assert that the legal situation in Yemen is unable to protect the strategic water storages from depletion.

Moreover, the survey, which targeted 68% of males and 31% of females, of different age groups and educational levels, showed that 80% refer to the most important reasons that led to the exacerbation of the water crisis in Yemen, which are the scarcity of food sources, increase in water pollution, waste and lack of awareness.

The poll for Sawt Al-Amal (Voice of Hope) newspaper added that 69% confirm the importance



of preventing random digging, setting laws to protect the water basins, and preventing the culti-

vation of qat in some areas that need water depletion. Also, 83% of those targeted believe that the

extent of benefit of the rainwater in replenishing the groundwater is weak and does not meet the required need. Despite this, 63% confirm that the experience of building dams and their role in rainwater conservation is successful and must be developed.

Finally, 68% of the citizens believe, to some extent, that they do not have access to clean drinkable water, while 26% confirm that they do not have access at all, and about the extent to which the society is aware of the importance of rationalizing water consumption correctly, 54% confirm that it is weak, and 43% do not know what is the impact of the interventions of the international organizations in the field of management water crisis on the ground, while 29% confirm that they are useful.

## Rugged Terrain and Water Scarcity in Yemen

By: Dr. Ahlam Al-Qubati  
Sawt Al-Amal (Voice of Hope)-

Water is an essential element for all forms of life, so human societies that provide their members with appropriate opportunities to obtain safe and adequate water needs and sanitation are likely to prosper socially, developmentally and economically.

The United Nations General Assembly in 2011 recognized in a resolution that water and sanitation services are a legitimate human right that must be provided, and the 2030 Agenda for Sustainable Development Goals focused on 17 goals aimed at implementing development advancement, and seeking for the individuals to ac-

cess their legitimate rights in a just and equal way for all, and all the 193 member states of the United Nations agreed on these goals.

These goals are set in an indivisible and integrative manner to achieve the balance among the various environmental, health, social, economic and political fields for sustainable development. What concerns us here is the sixth sustainable development goal 2030 related to ensuring the provision of clean water and sanitation services



for all. The interest in the field of water and sanitation has increased in the global political agenda. In fact, the 2030 Agenda for Sustainable Development indicates that one of the biggest challenges facing the development path is the climate change, depletion of the natural resources, environmental degradation, and seriousness of the scarcity of water reserves. As for Yemen, which is characterized by a unique and important geographical location,

overlooking the Red Sea in the west and the Arabian Sea in the south, its coastal strip is 2,500 km long, and overlooks the Bab Al-Mandeb strait, which is one of the most important waterways in the world. Despite all these advantages, it still faces many challenges in various fields, including the challenges of water resources depletion and the risks of recession, as Yemen is one of the world's poorest countries in water, according to the local and international reports in 2012. One of the rural water sector reports indicated that 30% of the water systems in Yemen are unable to provide their services, and this is justified by the depletion of water sources, *continue ....page8*