Drought conditions and management strategies in Sultanate of Oman

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Background

The Sultanate of Oman is located at the south east corner of the Arabian Peninsula. Due to its geographical location at the arid and semi arid belt of the globe, it is classified as an arid country. Like most of the arid countries, it suffers from low rainfall and drought. In general, availability of water affected by natural factors, such as climatic factors, land topography, floods, high winds and rainfall intensity and by socio-economicdevelopment and human activities.

Rainfall plays a very important role in the development, and distribution of cultivated lands, but the variability and extremes of rainfall can lead to serious problems such as soil erosion, drought and salinity intrusions. Both high intensity and less precipitation might cause serious problems to agricultural lands in arid countries. The quality of the available water resources for the different uses is also a challenge that faces some partsof the arid countries. In Oman, rainfall is the main source of natural recharge to all groundwater aquifers. The groundwater aquifers are the main sources of water in the country; it represents 92% of the total consumed water for agricultural sector. During 2000 and 2013, Oman was subjected to below average rainfall, with exceptional rainfall amount recorded during the two cyclones: Gonu and Phet which hit Muscat and the Sharqiyah regions. These events were exceptional and extremely high.

Drought monitoring and early warning system

Oman, situated on the southeast corner of the Arabian Peninsula, it is classified among the driest regions in the world. Rainfall is limited and irregular over much of the country, the average annual rainfall is 100 mm. Mean annual rainfall in the coastal plains and internal desert areas is relatively low, less than 50mm, and highly sporadic.
In mountain areas, however, where rainfall is greater, up to 350mm, and relatively frequent. It provides a source of natural recharge to all groundwater aquifers. During the summer rain occurs as thunderstorms. Whilst in the south it occurs as results ofthe monsoon, which is a seasonal summer storm (June-September) and named locally as Khareef.
Mean annual temperatures are typically between 26 ^{o}C and 29 ^{o}C through the low land areas of the country, but maximum daily temperatures rise to above 40 ^{o}C during the summer months. High summer temperatures and low humidity in the interior create high evaporative conditions with mean daily evapotranspiration exceeding 12 mm.
The higher humidity in coastal regions, such as the Al Batinah and Salalah Plains

reduces mean evapotranspiration to less than 10 mm per day.
In Oman, reliable fresh water resources occur only as groundwater, typically in shallow alluvial unconfined aquifers of the wadi systems that drain the mountains. The annual total renewable groundwater reserve is estimated to be 970 million cubic meters, which is about 25% less than the water use. The main aquifer systems includealluvial aquifers, regional Quaternary aquifers, aquifers of the Hajar Super Group in northern Oman, aquifers of the Hadhramawt group and the aquifers of the Fars Group.
Land degradation is a pervasive problem, which needs immediate attention, as land isa finite resource . Rainfall intensity is one of the major factors of land degradation. High intensities can cause frequent floods and lead to soil erosion, while low rainfall leads to drought conditions in dry regions. There are some evidences ofland degradation in northern Oman, such as groundwater deterioration in both quantity and quality, dryness of aflaj and intrusion of saline seawater in Al Batinah coastal aquifers.

The Ministry of Regional Municipalities and water Resources , the Ministry of Environment and Climate Affairs , the Ministry of Agriculture and Fisheries , the CivilAviation Authority and other government and private entities play prominent role in securing adequate water and development in drought prone areas with limited resources of water , as well as to identify the climate changes .In addition they try to reduce its impact on water resources in Oman.[1]

Vulnerability assessment

The most Economic sector which are affected by the drought in Oman in Order are agriculture is the sector which affected by drought ,where the impact lies in the death of agricultural crops which leads directly to the farmers affected and the country'seconomy in general. After that arethe industrial sector and the tourism sector .

The increasing of the demand on water rescues.Draught has become a natural phenomenon .Which considers an obstacle to progress and development by its direct impact on human life , food product , the standard of living , the environment and biodiversity and the negative effects on the economic and the social aspects .

1- Aysha Mohammed Al Khatri, The Effects Of Low Rainfall On Water Availability (A Case Study In Northern Oman 1998-2010), Ministry of Regional Municipalities and Water Resources.

Emergency relief and drought response

The government has established the Public Authority for Stores and Food Reserve the Sultanate of Oman in order to set up warehouses for storage of commodities and stock at a minimum on an ongoing basis.
It also aims to prepare a plan for the distribution of the food commodities in emergency situations in various forms.
Although the Authority distributes food to the affected areas, but since the establishment of the Authority in the Sultanate of Oman did not occur intervention.
One of the roles of the Regional Municipalities and Water Resources is to provide healthy and potable water in the periods of drought.
We have divided the most affected areas by drought in the Sultanate of Oman during the period (2000-2010) as it :

- High vulnerability areas and its area is 0.21 million Hectares , constructing about 0.68 % of the area of the Sultanate of Oman.
- Medium vulnerability areas and its area is 0.83 million Hectares , constructing about 2.67 % of the area of the Sultanate of Oman.
- Light vulnerability areas and its area is 3.69 million Hectares , constructing about 11.92 % of the area of the Sultanate of Oman.
- Non affected regions and its area is about 26.22 million Hectares , constructing about 84.73 % of the area of the Sultanate of Oman.[(1)]

Practices to alleviate drought impacts

Oman is making efforts to face the drought represented in government agencies, the private sector the civil society instructions.
These are some efforts:

1- Prepare a national plan water resources in the Sultanate of Oman .
2- Prepare the national Plan combat Desertification .
3- Prepare the national sustainable development strategy for the agricultural sector.

4- The Ministry of Environment and Climate Affairs strategy .
5- Tourism Development Strategy .
6- Version of the legislation in order to conserve water and to reduce the desertification.

1- وزارة الزراعة والثروة السمكية بالتعاون من اكساد,مشروع إنشاء قاعدة بيانات متكاملة لمواقع الرعي الطبيعية في سلطنة عمان ,2010

7- The use of treated wastewater in agriculture especially to irrigate of forage crops and ornamental trees.
8- Encourage the use of modern irrigation systems .
9- The establishment of many of the air monitoring stations .
10-Support the program of dams construction especially the nutrition.
11- Create the rainmaking industrial project.
12-Awareness campaigns in the field of radiolocation of water use and conservation.
13-Fog catching Project in Dhofar Governorate.
14-In addition to a lot of projects that aims to reduce the drought phenomenon.

The need for Knowledge and skills on Drought management

- To setup the monitoring and early warning system for drought management.
- To develop forecasting and warning techniques, capacity building.
- To conduct drought risk assessment.
- To increase awareness on drought disaster at all level of community.
- To promote cooperation between all agencies and organizations for drought management.
- To encourage community plans of drought mitigation .

References

1- وزارة الزراعة والثروة السمكية بالتعاون من اكساد,مشروع إنشاء قاعدة بيانات متكاملة لمواقع الرعي الطبيعية في سلطنة عمان ,2010

2- Aysha Mohammed Al Khatri, The Effects Of Low Rainfall On Water Availability (A Case Study In Northern Oman 1998-2010), Ministry of Regional Municipalities and Water Resources.

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