

# SWIM and Horizon 2020 Support Mechanism

Working for a Sustainable Mediterranean, Caring for our Future.

## Presentation of the findings of the assessment of past drought episodes and their management in Palestine

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# Importance of Drought Risk Management in Palestine

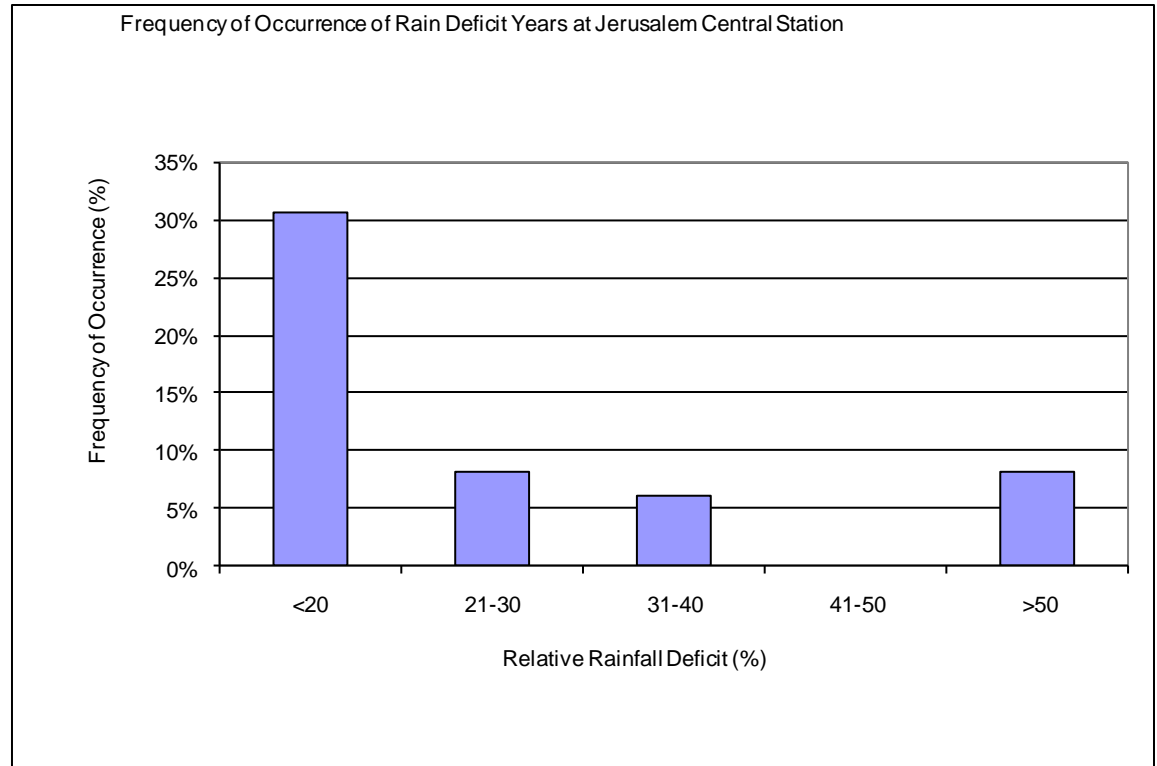
- **Drought phenomena can be witnessed over two or more consecutive years with equal probability,**
- **The sequence and severity of drought events have several natural, social and economic consequences. For example:**
  - It increases water scarcity and affect the quality of both surface and groundwater (e.g. increased salinity and lowering water levels)
  - It causes substantial livelihood and economic losses as happened during the 2007-08 drought in the West Bank where direct and indirect losses summed up to ~ 360 M US\$ (113 M US\$ of direct agricultural production losses; 250 M US\$ indirect) and more than 200,000 small ruminants were affected
- **Climate change is projected to increase drought frequency and intensity and will decrease its predictability. This will exacerbate water stress and make it more severe**
- **The current institutional setting and capacity is weak: scattered efforts, inadequate infrastructure to manage drought, no dedicated budget to disaster response**
- **The lack of a proper legal framework, clear mandates and coordination mechanisms impedes the implementation of coherent and proactive drought risk management**

# Drought Occurrence and Trends

The frequency and duration of drought (rainfall below long term average) in Palestine is not fixed over time.

The time between two occurrences of drought can be described as random variable.

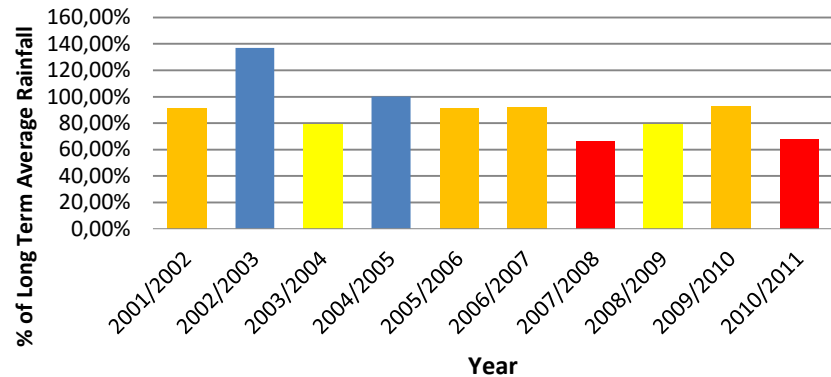
Drought has non-uniform return periods.



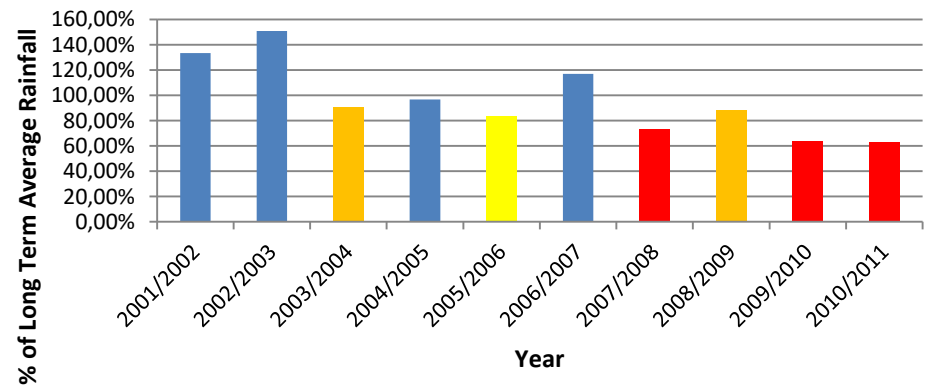
# Drought Occurrence and Trends

- Other than the extreme drought year of 1998/99, drought episodes occurred during the past decade was characterized as extreme to mild droughts with total annual rainfall ranging from 60 to nearly 100% of the long term average.
- Geographic extent of the drought varies within the country. A drought year in one part, could be wet in another, as can be noticed in 2001/02 and 2006/07 they are considered as moderate drought years in the West Bank and wet years in Gaza Strip

**Annual Rain as % of Long Term Average Rainfall - West Bank**



**Annual Rainfall as % of Long Term Average - in Gaza**



# Drought Episode Classification

- West Bank Drought Episodes

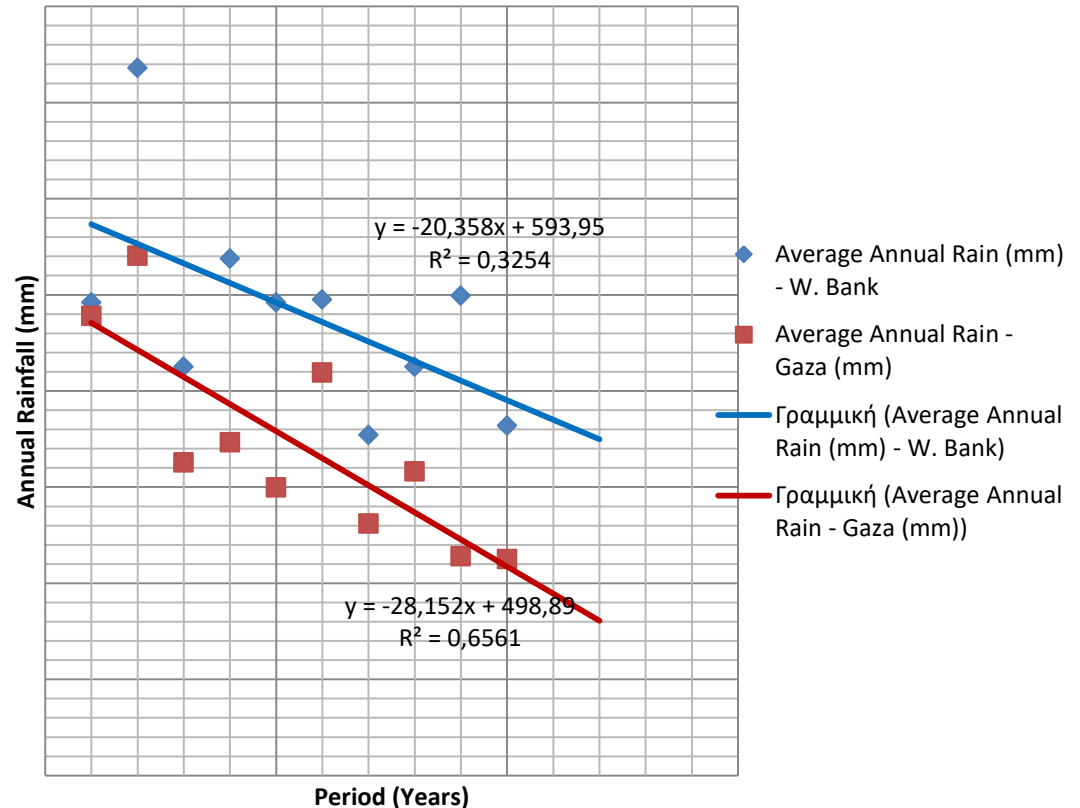
Extreme <70% of P	Severe 70 - 80% of P	Moderate 80 - 90% of P	Mild 90 – 100% of P
2007/2008	2003/2004	2001/2002	2009/2010
2010/2011	2008/2009	2005 /2006	2006/2007
		2006/2007	

- Gaza Drought Episodes

Extreme <70% of P	Severe 70 - 80% of P	Moderate 80 - 90% of P	Mild 90 – 100% of P
2009/2010	2007/2008	2003/2004	
2010/2011		2004/2005	
		2005/2006	
		2008/2009	

# Drought Occurrence and Trends

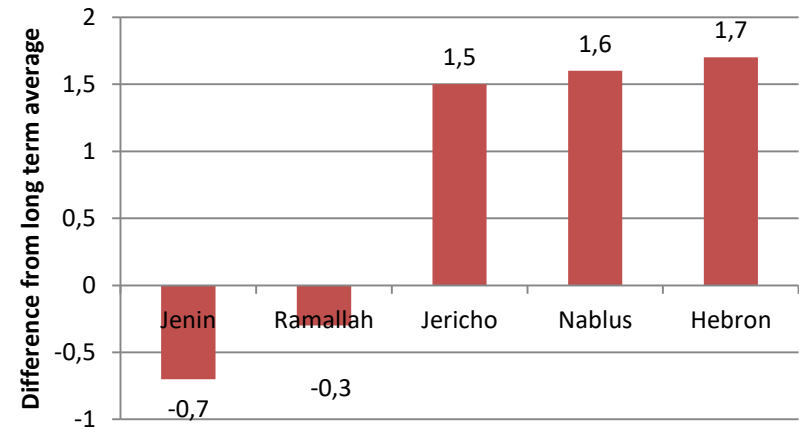
- Trend analysis of rainfall occurrence over the past ten years has shown a downward trend. This indicates that rainfall deficit years will more likely occur; i.e. the area will **witness more droughts**.
- However, the magnitude and the extent of the drought remains not fully predictable and random.



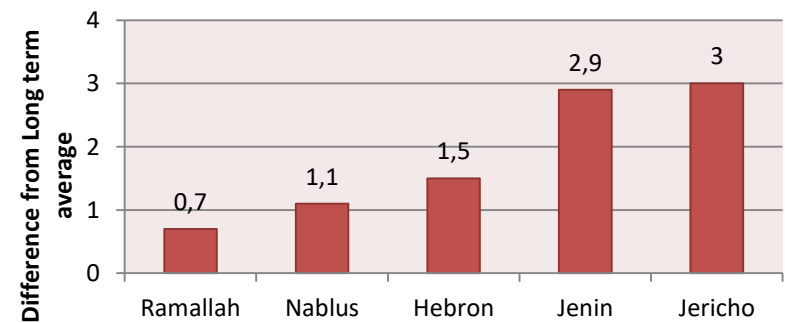
# Drivers

- **Climate Variability and Change**
  - shifts in precipitation patterns and rainy season
  - Reduction of rainfall percentage
  - Spatial and temporal variation of rainfall
  - Spatial and temporal variation in air temperature. Especially the increase in the minimum temperature of nearly 3 degrees in some areas in Palestine (Jericho followed by Jenin).
- **Population Growth and Development**
- **Urban Development**
- **Inadequate policies and regulation**
- **Insufficient budget allocation**
- **Limited Palestinian jurisdiction and weak authority over land and natural resources**

### Difference in Max. C° - (2013)



### Difference in Min. C° -(2103)



# Pressure

- Increased water scarcity
- Increased evapo-transpiration
- Reduced aquifer recharge
- Increased demand and increased water pumping
- Pollution of water, soil and air quality

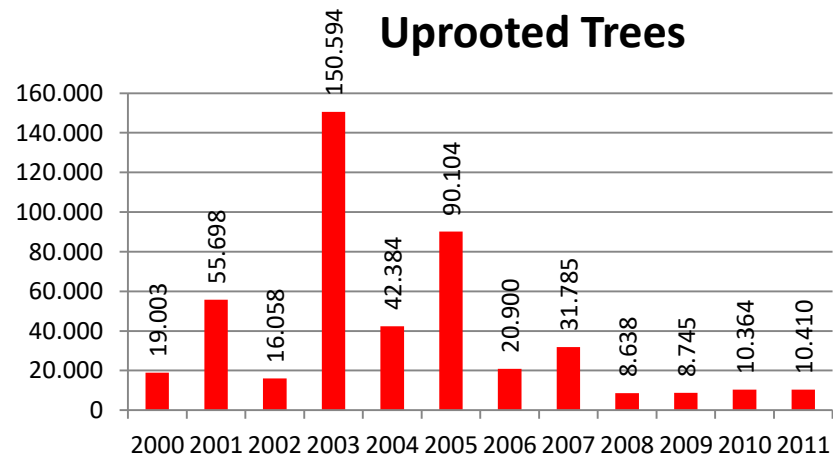
Year	Population (Million)	Projected Water Demand		
		Domestic and Industry (mcm/year)	Agriculture (mcm/year)	Total (mcm/year)
2010	4.05	192 <sup>1</sup>	301.5 <sup>2</sup>	493.5
2020	5.23	254 <sup>1</sup>	340.7 <sup>3</sup>	594.7
2040	9.4	445 <sup>1</sup>	587.3 <sup>2</sup>	1032.3



# Pressure

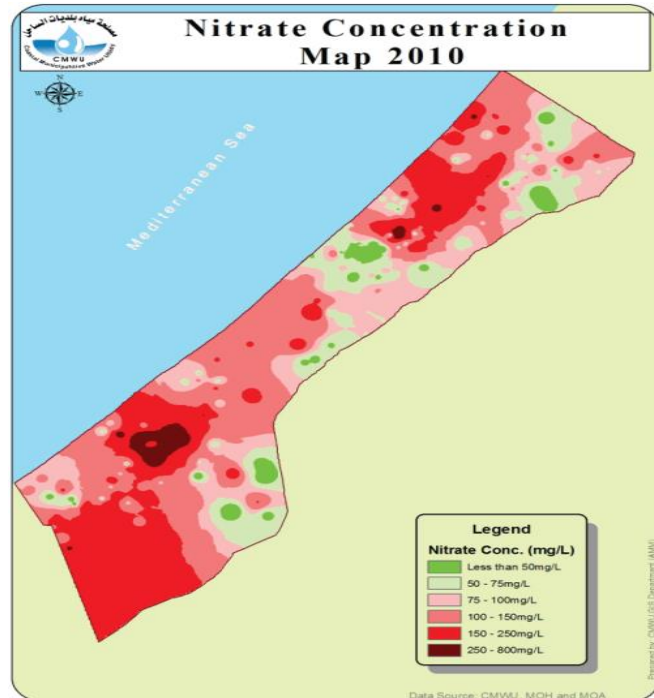
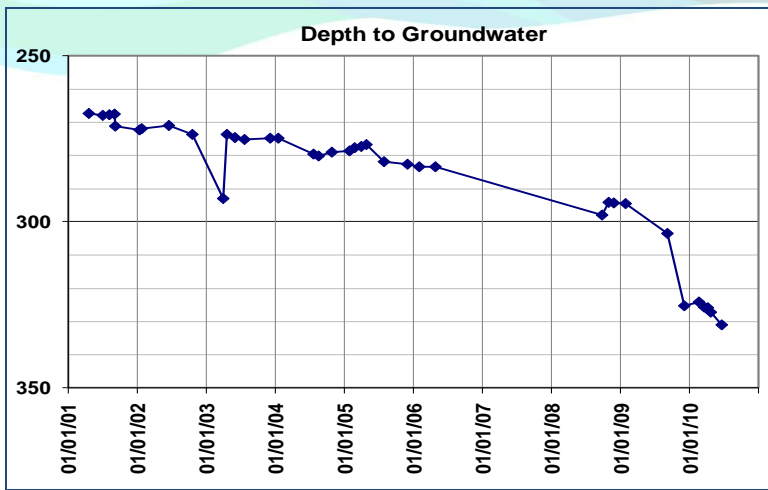
Changes in land use patterns  
(During the years 2006 to 2010, **63 km<sup>2</sup>** of the various agricultural areas decreased and **108.4 km<sup>2</sup>** of open space areas increased in West Bank)

- Reduced range land productivity
- Increased solid waste production and its associated collection and treatment cost
- More concentrated wastewater produced and higher treatment cost
- Nearly **465000** Trees uprooted between 2000 – 2011.



# Drought Impact

- Declined water levels
- Reduced spring discharge and some goes dry (Auja, Faria, etc)
- Deteriorated water quality and increased salinity
- Sea water intrusion in Gaza
- Loss of natural habitat and reduction of ecosystem services



# Drought Impact

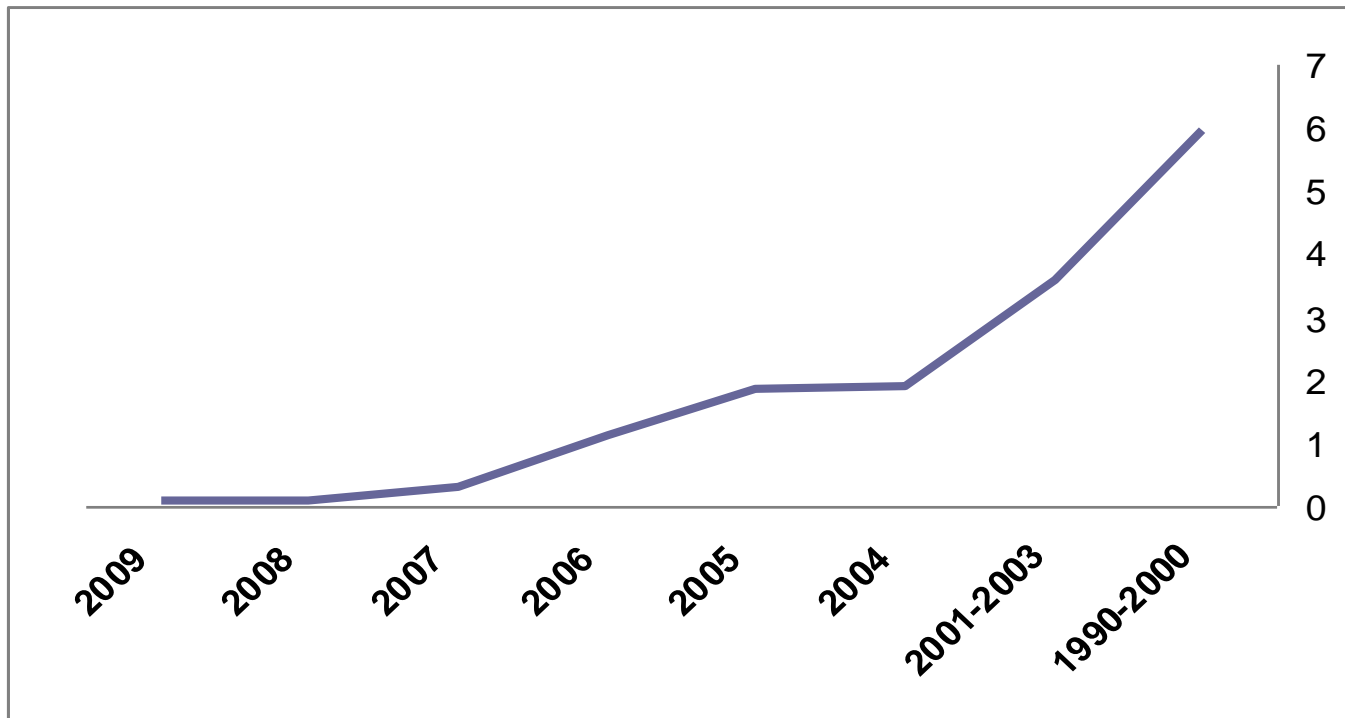
- **Increased crop water requirements**

	T	T+1	T+2	T+3
P-20%	1.104	1.685	2.285	2.881
P-10%	0.294	0.877	1.469	2.065
P	0.00	0.581	1.172	1.763
P+10%	-0.286	0.291	0.880	1.470
P+20%	-0.566	0.010	0.596	1.181

Figures are in MCM/year

# Drought Impact

- Deterioration and retrogression of rangeland productivity (southeastern part of west Bank – Eastern Slopes in Hebron)



# Range Land Deterioration

**The range land deterioration enhanced the unpalatable shrubs to dominate in the area**

**Lack of field crops seeds**

**Extinction for some grass species**

**Overgrazing**

**More purchase of animal feed**

# The impact of the successive drought

**Increased the Mortality rate of domestic animals with at least 10%**

**Decrease the quantities of the produced milk with 48%**

**Increase the demand of the water consumption since there's lack of the grass and relying in the grain feedings**

# The impact of the successive drought

**Delaying the breeding season for one month at least**

**Less water collected and Increased water costs ( Cost per m<sup>3</sup> is more than 7 Euros)**

**Internal Migration reaches 40% in some communities**

**Social instability**

**Reduction in the flock sizes in the area by 20 – 30%**

# Response

- **Manage irrigated areas to be in line with water availability per year**
- **Cultivate crops with low water requirement as well as salt tolerant plants**
- **Increase catchment areas to collect rain**
- **Manage rangeland properly, restrict grazing areas by dividing it into various zones some of which protected and left to be regenerated while some open for herders.**
- **Prevention of soil erosion and preserving soil moisture through building terraces**
- **Increasing the use of treated wastewater**



## Response - Policy Recommendations

- It is important to re-assess the potential water resources (ground and surface) and consider the new change in the precipitation and temperature.
- Adopt more appropriate plans to eliminate internal migration from the vulnerable areas, invest in infrastructure, health and education services as well as WATSAN services.
- Develop an alternative plan for both irrigated agriculture as well as dry land farming. More drought resisting varieties, less water requiring crops, etc.
- Develop plans to regenerate the grazing areas and to maintain the current pattern of land use in those areas.
- Develop appropriate means to increase the water availability and accessibility to the vulnerable areas, mainly storage of surface water.

# Institutional Setting, Policy and Legal Framework

- **Many institutions are involved in drought management / monitoring and response. They include:**
  - Ministry of Agriculture, Palestinian Water Authority, Palestine Meteorology Department, Environment Quality Authority, Non government Institutions
- **The main strategies that tackle drought indirectly are those of the Agriculture sector strategy, water sector strategy, Desertification strategy, Climate Change Adaptation strategy and its action program,**
- **Laws governing drought management are also those of water, environment and civil defense law.**

# Institutional Setting, Policy and Legal Framework

- It is clear that there are no specific laws or regulations as well as no distinct policies or strategies addressing drought issue clearly
- No clear mandate is given to any specific government agency to manage drought
- There is no clear provision in the existing relevant laws that allow for a more formal coordination among the various relevant agencies
- Available data is also scattered, and collected by different institutions without adequate coordination
- There is no central hub or 'clearing house' for climate information processing and analysis
- There is no proactive drought risk reduction strategy. All strategies and actions are rather reactive.
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# Response Policy – Legal - Institutional

- **Develop specific laws and regulations to address drought issue clearly**
- **Assign a clear mandate for a specific government agency to manage drought**
- **Provide a clear mechanism for more formal coordination among the various relevant agencies**
- **Create a central hub or ‘clearing house’ for climate information processing and analysis**
- **Develop a proactive drought risk reduction strategy rather than reactive.**
- **Build national institutional capacity to manage the drought**
- **Allocate sufficient budgets for drought management**
- **Build proper infrastructure for monitoring and assessment**

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Thank you for your attention.

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