



# UNDRR

UN Office for Disaster Risk Reduction



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**“Drought resilience in a changing climate:  
how to monitor the recurrence”.**

Mashauri Muliro, UNDRR


# Is this our new normal?

## Human-driven climate crisis fuelling Horn of Africa drought - study

Region is suffering its worst drought in 40 years after five consecutive years of below-average rainfall



[Home](#) > [World News](#) > [Drought In Northern Kenya Pushes Millions Towards Hunger](#)

 This Article is From Oct 15, 2021

## Drought In Northern Kenya Pushes Millions Towards Hunger

More than 465,000 children under five and over 93,000 pregnant and breastfeeding women are

 NDTV.com



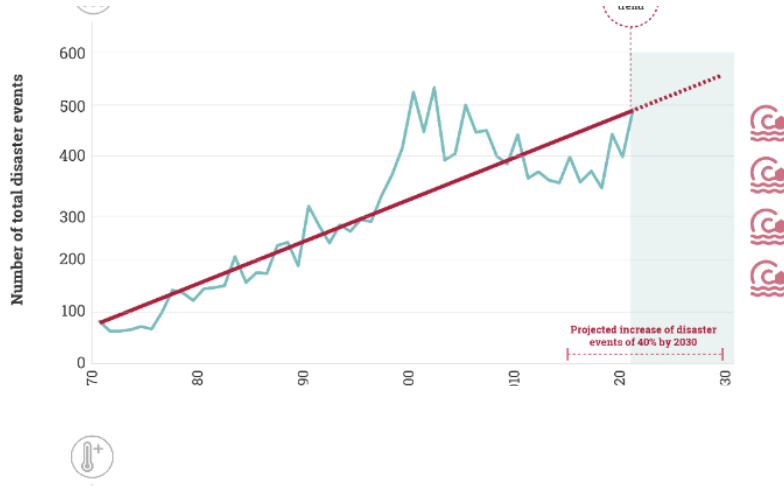
650 x 400

Drought In Northern Kenya Pushes Millions Towards Hunger

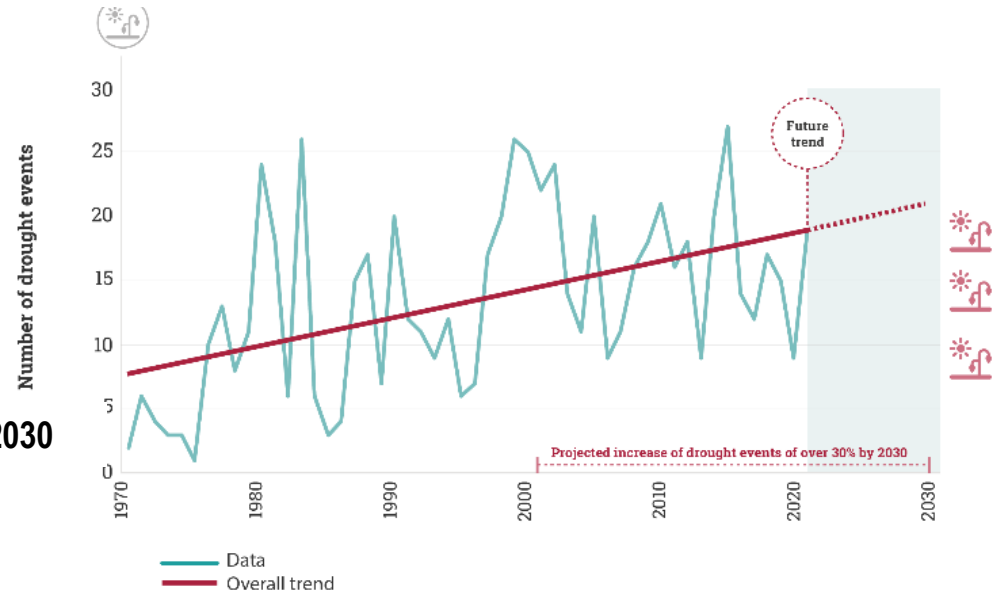
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# Climate change is rapidly altering our understanding of risk

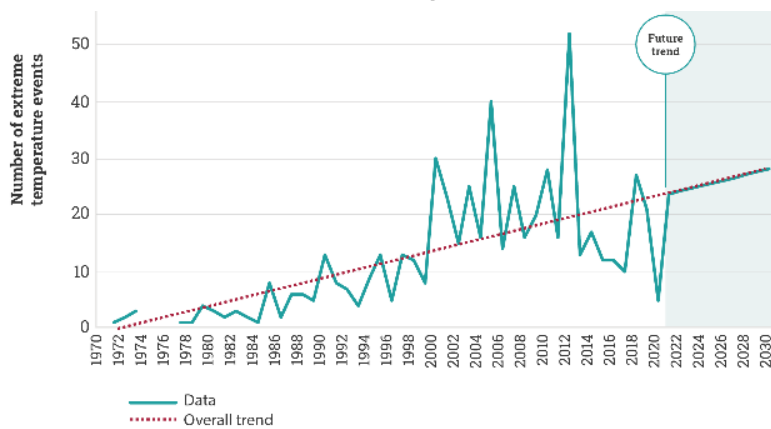
## Number of disasters per year globally may increase by 40% by 2030



## Droughts may increase by 30% between 2001 and 2030



## Extreme temperature events may triple between 2001 and 2030



- Increasing frequency and intensity of drought and other extreme events
- Changing nature of hazards

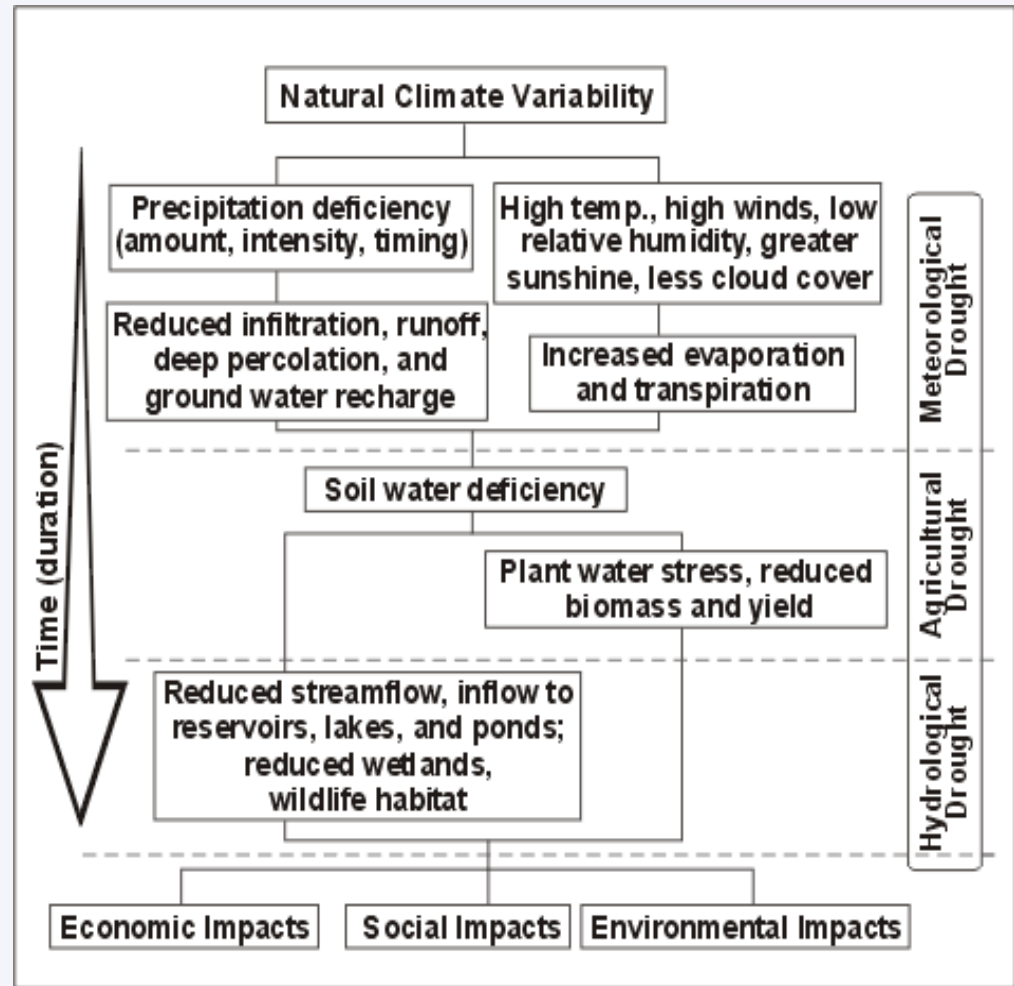
Source: UNDRR Global Assessment Report 2022

# Types of Drought

Common to all droughts is that they originate from a deficiency of precipitation that results in water shortage for some activities or for some group of people

3 types of drought

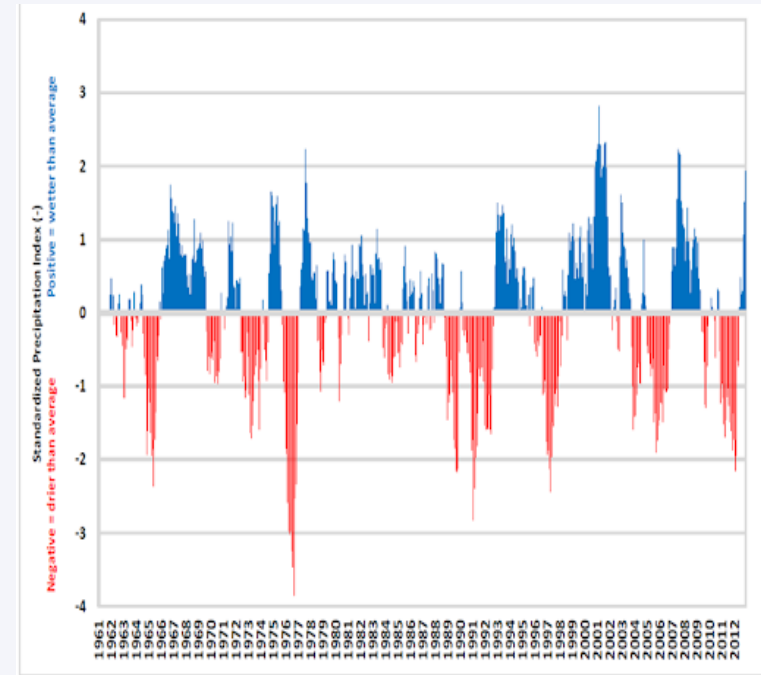
- Meteorological Drought
- Hydrological Drought
- Agricultural Drought



Source: National Drought Mitigation Center, University of Nebraska-Lincoln, U.S.A.

# 1. Meteorological Drought

- Defined solely on the basis of the degree of dryness (often in comparison to some normal or average amount) and the duration of the dry period” and must be region-specific.
- For some areas in the drylands, it has been suggested that meteorological drought be defined in terms of rainfall failure in two successive years.



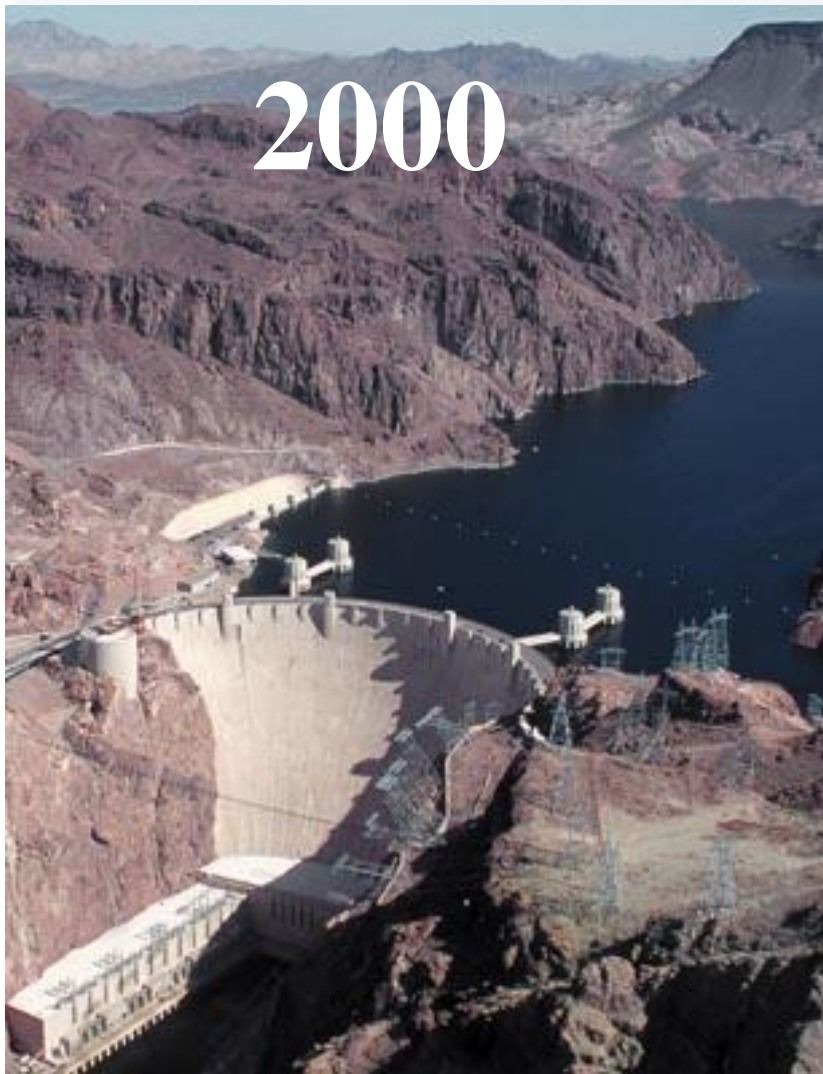
# 2. Agricultural Drought

- Agricultural drought focuses on factors such as differences between actual and potential evapo-transpiration and soil-water deficits,
- It is crop-specific and depend heavily on the timing of rain and dry periods relative to crop-cycles.
- Agricultural droughts can therefore occur in the absence of meteorological drought, and vice versa.



# 3. Hydrological Drought

2000



Drought in the Western United States



Hoover Dam and Lake Mead

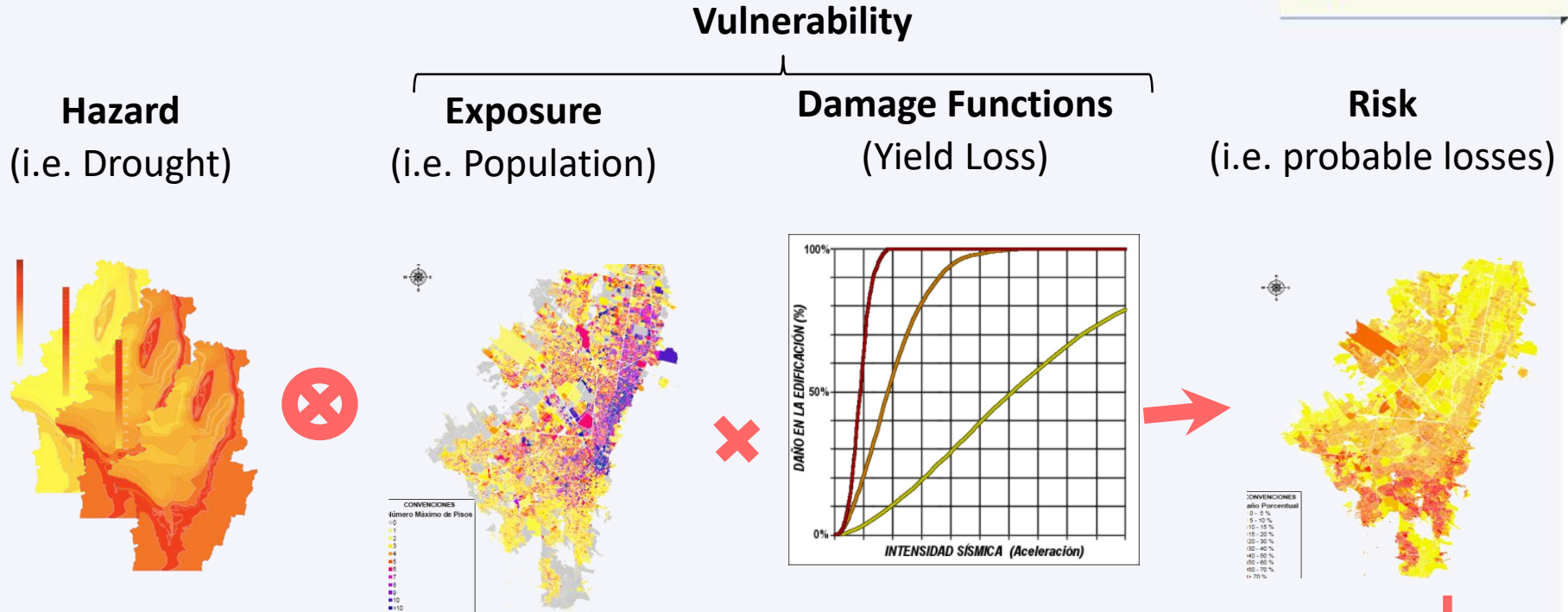
Hydrological Drought: The deficiencies in surface and sub-surface water supplies, leading to lack of water availability to meet normal and specific water demands.

# Drought indices

- **Standardized Precipitation Index (SPI)**
- Surface Water Supply Index (SWSI)
- Crop Moisture Index (CMI)
- Palmer Drought Severity Index (PDSI)
- **Water Requirement Satisfaction Index (WRSI)**
- etc



# Probabilistic Drought Risk Analysis



Disaster Impact Analysis  
- Scenario or Stochastic -



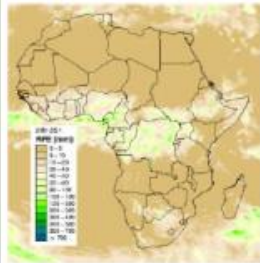
# Water Requirement Satisfaction Index

**WRSI - Water requirement satisfaction index (EOS)**

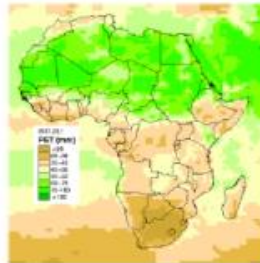
$$WRSI = f ( \text{ppt}, \text{pet}, \text{WHC}, \text{Crop Type}, \text{SOS}, \text{EOS}, \text{LGP} )$$

**GeoWRSI**

RFE2  
(NOAA)

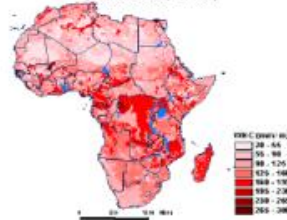


calculated from  
NOAA GDAS  
at EROS

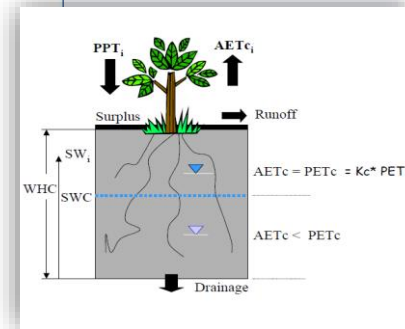
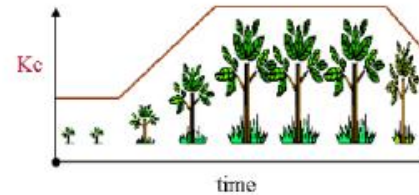


FAO soils map  
of the world

Soil Water Holding Capacity Distribution  
(FAO-UNESCO, 1971-41)



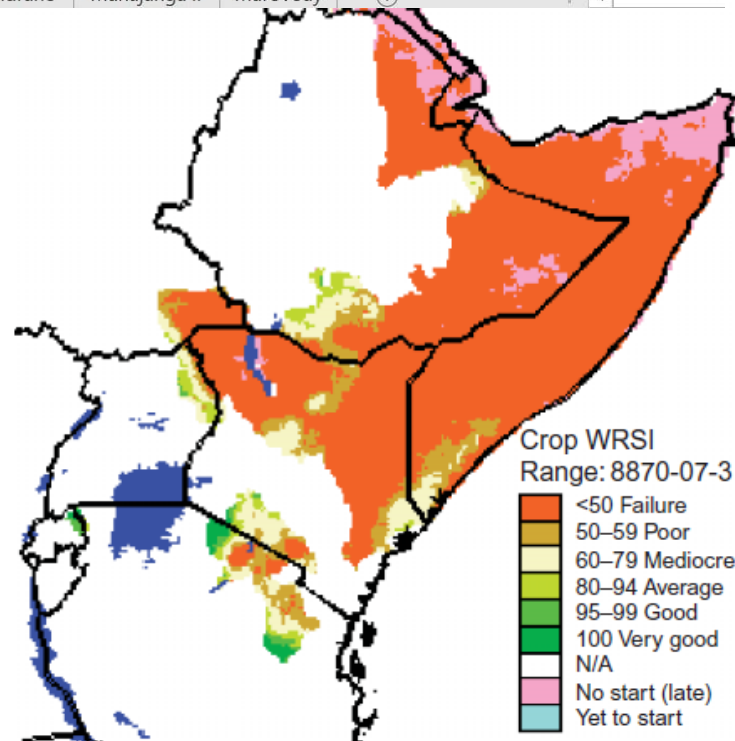
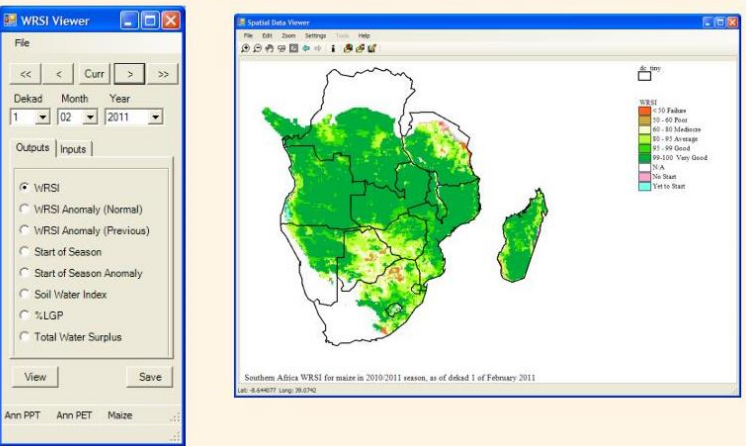
Kc (FAO)



# Historic Drought Records



Regions:	Alaotra-Mangoro				Atsimo-Atsinanana				Boeny			
Districts:	Ambatondra		Amparafaravola		Farafangana		Vangaindrano		Mahajanga II		Marovoay	
Years	WRSI	WRSI scale	WRSI	WRSI scale	WRSI	WRSI scale	WRSI	WRSI scale	WRSI	WRSI scale	WRSI	WRSI scale
2001	59	Severe	80	Legere	99	Bonne Saison	98	Bonne Saison	91	Legere	88	Legere
2002	70	Moderee	85	Legere	100	Bonne Saison	95	Bonne Saison	91	Legere	86	Legere
2003	56	Severe	71	Moderee	96	Bonne Saison	81	Legere	88	Legere	96	Bonne Saison
2004	71	Moderee	81	Legere	79	Moderee	90	Legere	87	Legere	87	Legere
2005	37	Extreme	56	Severe	82	Legere	67	Moderee	88	Legere	87	Legere
2006	56	Severe	79	Moderee	96	Bonne Saison	87	Legere	95	Bonne Saison	93	Legere
2007	54	Severe	64	Moderee	98	Bonne Saison	98	Bonne Saison	86	Legere	90	Legere
2008	50	Severe	56	Severe	79	Moderee	90	Legere	97	Bonne Saison	90	Legere
2009	58	Severe	68	Moderee	85	Legere	78	Moderee	76	Moderee	85	Legere
2010	36	Extreme	55	Severe	87	Legere	95	Bonne Saison	89	Legere	93	Legere
2011	69	Moderee	89	Legere	85	Legere	95	Bonne Saison	92	Legere	97	Bonne Saison
2012	43	Extreme	47	Extreme	65	Moderee	64	Moderee	71	Moderee	55	Severe
2013	49	Extreme	69	Moderee	66	Moderee	95	Bonne Saison	94	Legere	82	Legere
2014	82	Legere	81	Legere	84	Legere	88	Legere	75	Moderee	70	Moderee
2015	57	Severe	65	Moderee	86	Legere	96	Bonne Saison	88	Legere	83	Legere



	A	B	C	D	E	F
1	<b>Forecast-based Financing Monitoring Tool</b>					
2	Zone d'Intervention			Alaotra-Mangoro		
3	District			Amparafaravola		
4	Vulnerability			0.55		
5	Threshold			69.2		
6	<b>Mois</b>	<b>Decadale</b>	<b>WRSI</b>	<b>Impact</b>	<b>Distance from Threshold</b>	<b>Monitoring</b>
7	Octobre	1	95	47.75	21.45	Observation
8		2	90	50.5	18.7	Observation
9		3	90	50.5	18.7	Observation
10	Novembre	1	89	51.05	18.15	Observation
11		2	78	57.1	12.1	Observation
12		3	70	61.5	7.7	Observation
13	Decembre	1	60	67	2.2	warning
14		2	62	65.9	3.3	warning
15		3	63	65.35	3.85	warning
16	Janvier	1	60	67	2.2	warning
17		2	61	66.45	2.75	warning
18		3	61	66.45	2.75	warning
19		1	59	67.55	1.65	warning
20		2	63	65.35	3.85	warning
	Historical WRSI	Ambatondra	<b>Amparafaravola</b>	Farafangana	Vangaindrano	Mahajanga II

# Key Messages

- *It is imperative to increase the resilience to drought: drought Monitoring drought an effective way.*
- *Looking at drought holistically: Temperature, soil, agricultural practices, etc.*
- *Leverage programs, initiatives to improve data gap and to strengthen the modeling capacities for an effective monitoring.*



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**THANK  
YOU!**