

# Drought Impacts and Early Warning in the Caribbean:

The Drought of 2009-2010

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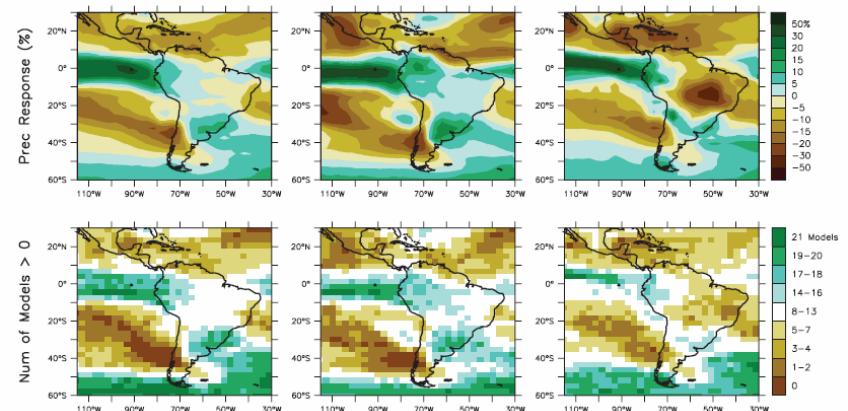
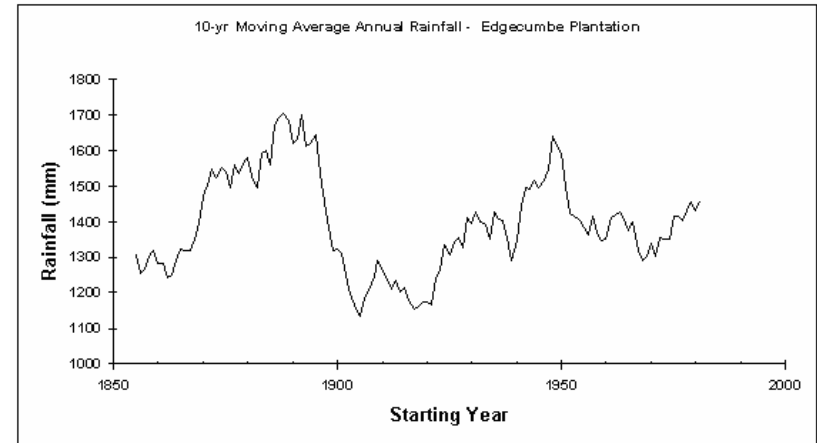
Caribbean Institute for Meteorology and Hydrology

Technical Cooperation Workshop for Development of the  
Caribbean Regional Cooperation Programme in  
Multi-Hazard Warning System  
2-5 November, 2010

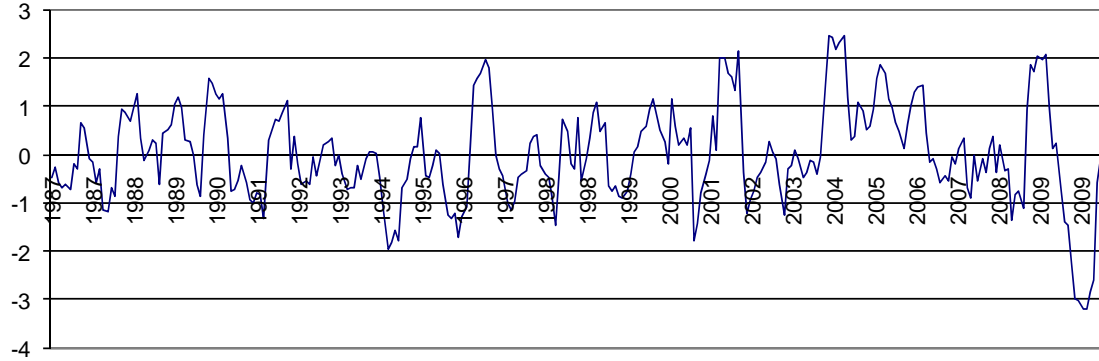
# Drought

## The present and future in the Caribbean context

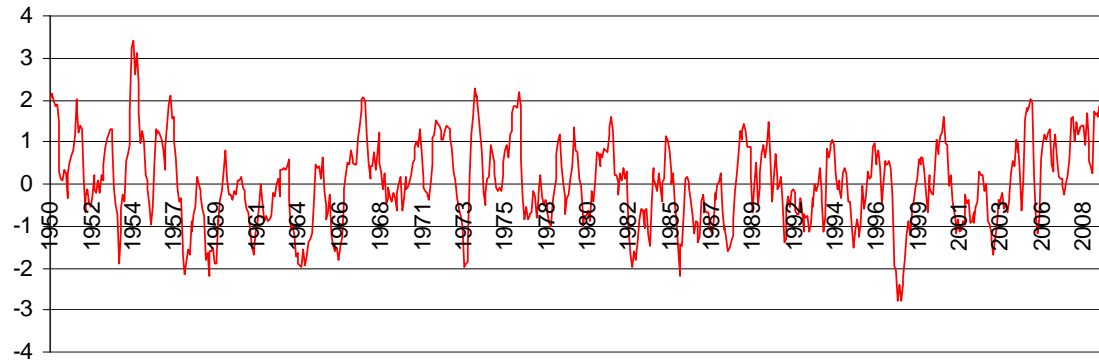
- History of drought and its impacts in the Caribbean
- Likely increase in frequency and intensity of drought episodes. Precipitation likely to decrease up to 15 to 20 %



**6-month SPI for Point Saline, Grenada**



**6-month SPI for Georgetown, Guyana**



# Drought Early Warning in the Caribbean

- Traditionally an analysis of rainfall totals and often reactive
- Caribbean Drought and Precipitation Monitoring Network (CDPMN) launched under CARIWIN in January 2009 expected to be fully operational by the end of 2010
- Goal of CARIWIN is to increase the capacity of the Caribbean countries to deliver equitable and sustainable IWRM by
- Implemented jointly by McGill University, CIMH and 3 partner countries (Grenada, Jamaica, Guyana)

# CDPMN on two scales

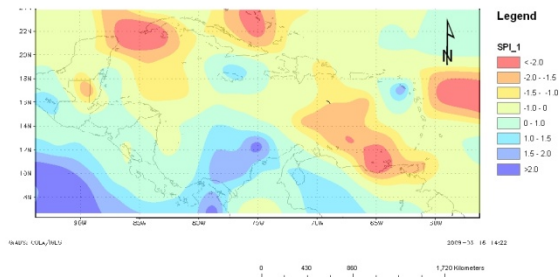
- Caribbean Basin Monitoring
- Country-level Monitoring

- **Precipitation status monitored** using a number of indices
- **Final precipitation status determined, by consensus**, by a network of persons from different sectors, institutions and communities embracing the diversity in definitions and impacts of drought
- **Short term and seasonal rainfall forecasts** to provide a projection of future drought (1 - 6 months possible)

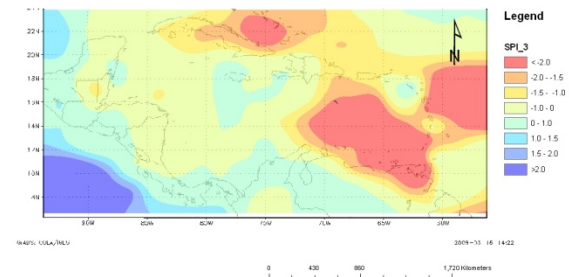
# Caribbean Basin Monitoring

## Caribbean SPI

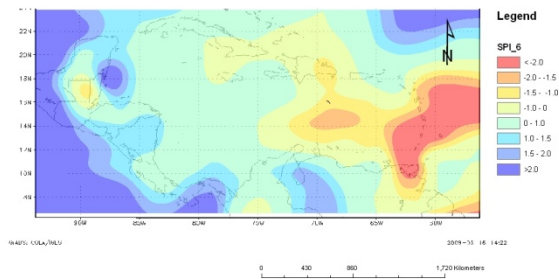
SPI for March 2010



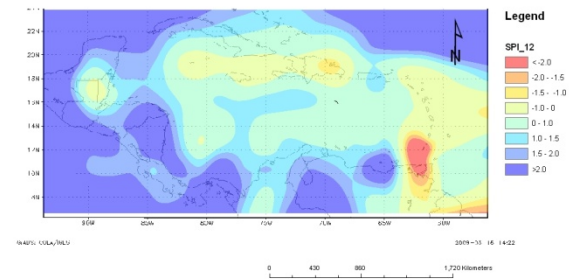
SPI for January to March 2010



SPI for October 2009 to March 2010



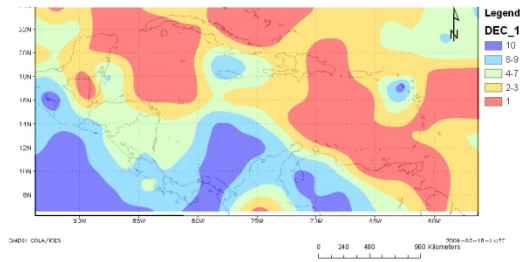
SPI for April 2009 to March 2010



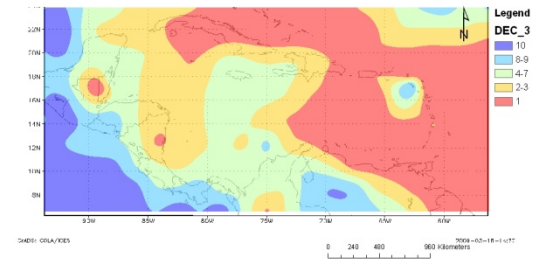
# Caribbean Basin Monitoring

## Caribbean Deciles

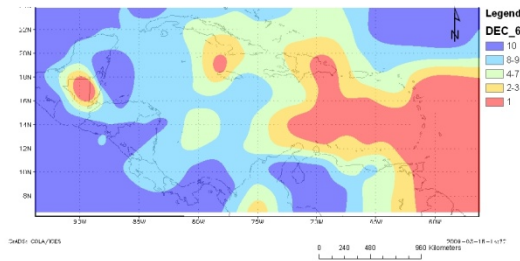
Deciles for March 2010



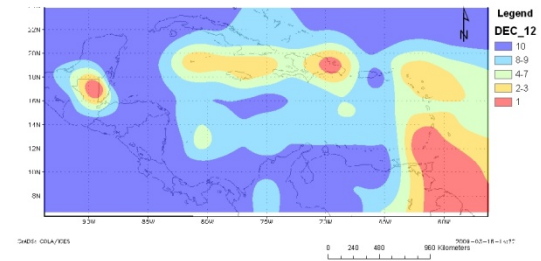
Deciles for January to March 2010



Deciles for October 2009 to March 2010



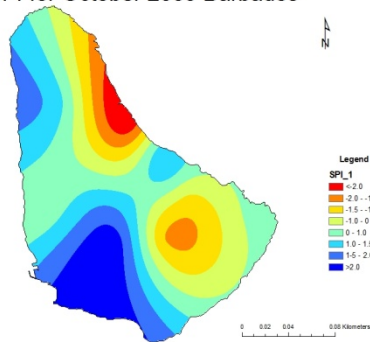
Deciles for April 2009 to March 2010



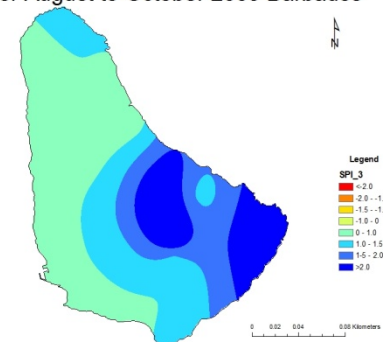


# Country Level Monitoring Example from Barbados

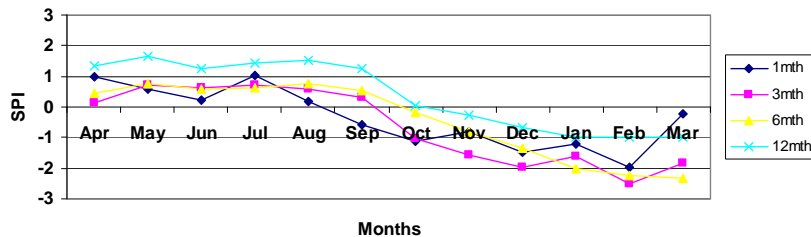
SPI for October 2009 Barbados



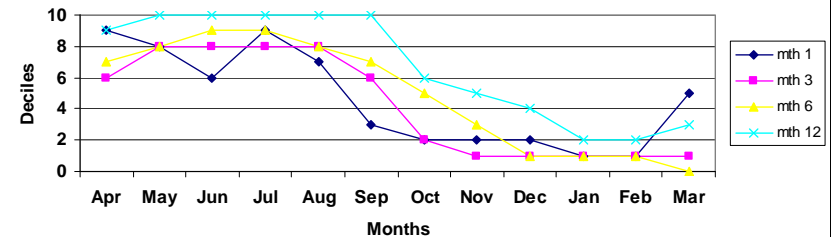
SPI for August to October 2009 Barbados



SPI values for March 2010,  
CIMH, St. James

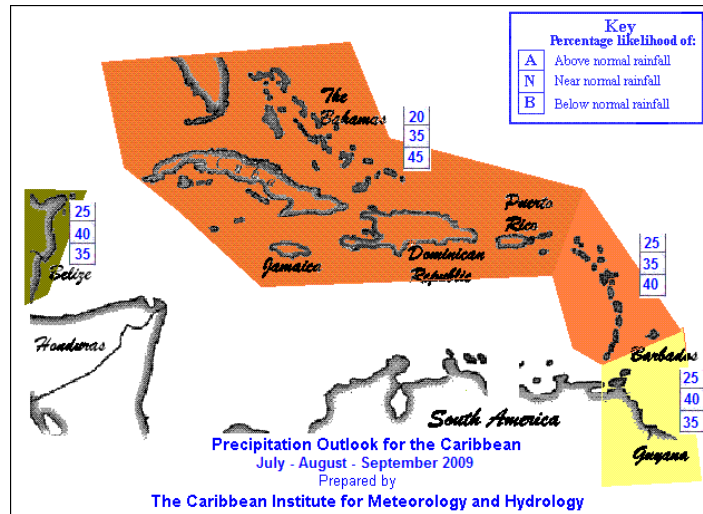


Decile values for March 2010,  
CIMH, St. James



Can now include agricultural and hydrological indices

# Prediction - Precipitation Outlook?



Drought prediction and alerts based on the final Monitor Index and the PO.

Future improvements through Numerical modelling and the re-establishment of the Caribbean RCOF

April, 2010

Station	1 mth	3 mth	6 mth	12 mth	Probability
VC Bird Antigua	0.42 - 2.15	-0.01 - 2.65	-0.73 - 1.14	-0.70 - 0.33	35
	-0.43 - 0.42	-1.10 - -0.01	-1.27 - -0.73	-0.95 - -0.70	40
	-1.64 - -0.43	-2.43 - -1.10	-1.76 - -1.27	-1.16 - -0.95	25
CIMH Barbados	0.39 - 1.72	-0.34 - 1.98	-1.64 - -0.13	-1.10 - -0.28	30
	-0.44 - 0.39	-1.59 - -0.34	-2.17 - -1.64	-1.35 - -1.10	45
	-2.04 - -0.44	-3.54 - -1.59	-2.65 - -2.17	-1.55 - -1.35	25
Point Saline Grenada	0.41 - 2.67	-0.32 - 2.54	-2.23 - -0.20	-3.04 - -1.92	30
	-0.43 - 0.41	-1.48 - -0.32	-2.59 - -2.23	-3.19 - -3.04	45
	-1.27 - -0.43	-2.74 - -1.48	-2.83 - -2.59	-3.28 - -3.19	25

# Outcomes of the CDPMN

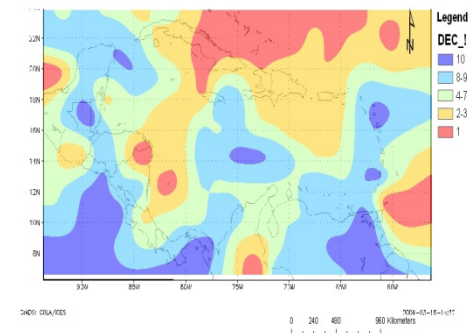
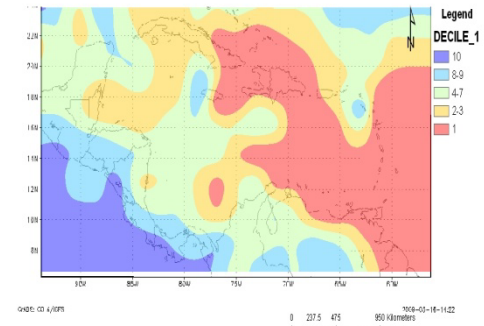
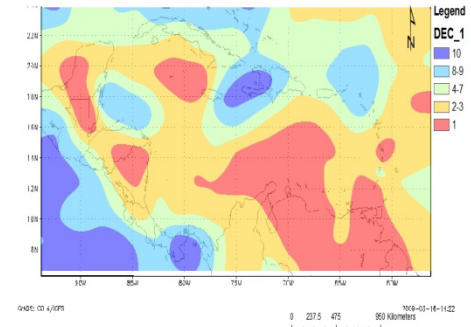
1. Through the hydrometric stations and sensor data, monitor hydrological indicators, climate indicators...
2. Trend analyses of rainfall and temperature
3. Projection of future status (using precipitation forecasts and drought indices)
4. Early warning information through CIMH website and networking with key agencies, governments
5. Build adaptation and response strategies to drought and flooding events – collaboration with a network of communities, researchers and decision makers
6. Developing robust drought and flood plans

**...All toward MANAGING RISK**



# 2009-2010 Drought

- Began during the 2009 rainy season (in particular the month of October)
- Stations in Trinidad, Grenada, St. Vincent, Barbados, St. Lucia, Dominica Jamaica, recorded their lowest ever February rainfall totals
- Stations in Anguilla, Grenada, Trinidad, Dominica and St. Vincent recorded their lowest ever 3 month (January to March)
- Stations recorded their lowest six month (October 2009 to March 2010) totals. These included stations in Tobago, Grenada, Barbados, St. Vincent, St. Lucia and Guyana
- Over 24 years of record at Point Saline Airport in Grenada, 2009 lowest annual total



## Press Release

### SEVERE DROUGHT CONDITIONS TO CONTINUE OVER GRENADA FOR THE NEXT THREE MONTHS

Severe drought conditions currently being experienced over Grenada are expected to persist over the next 3 months. This is the view of scientists from the Caribbean Drought and Precipitation Monitoring Network (CDPMN) based at the Caribbean Institute for Meteorology and Hydrology, Husbands St. James, Barbados, who have been analysing rainfall trends in the Caribbean since January 2009.

Analyses show that severe drought conditions were experienced in Grenada for the year 2009, with particularly, the last 3 to 6 months being extremely dry. This is believed to be responsible for an increased demand for irrigation water, a reduction in stream flow and a general depletion in water resources.

Forecast models currently indicate that for the period January to March 2009, below normal conditions will persist over the southern portion of the eastern Caribbean exacerbating the environmental impacts, and in particular extending drought conditions for a further 3 months.

For more information about the rainfall outlook and the CDPMN for Grenada and the region please visit <http://www.cimh.edu.bb/curprecip.htm> and <http://www.cimh.edu.bb/precipindex.html> respectively.

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# Other considerations and work

- More time intervals 2, 9, 24 months?
- Did recommended SPI, Decile classes really reflect the drought impacts? Need to modify classes?
- Include more land stations from the non-English speaking territories
- Other non-rainfall indicators
- Improvements through a rejuvenation effort of RCOF improve rainfall outlook products
- Impacts portal (drought and flood)

# 2009-10 Drought Impacts on Agriculture

	GDP (%)	Employment (%)	Agricultural Land (‘000 ha)	Irrigated Land (% of cropland)
Antigua/Barbuda	3.77	NA	14	NA
Barbados	4.47	4.6	19	29
Belize	16.65	27.5	152	3
Dominica	18.28	27.3	23	NA
Grenada	9.77	13.8	13	NA
Guyana	31.44	27.8	1740	29
Jamaica	5.49	20.4	513	9
St Kitts/ Nevis	3.03		10	NA
St Lucia	5.27	11.4	20	17
St Vincent/ Grenadines	8.76	15.4	16	7
Trinidad/Tobago	1.1	6.9	133	3

Compiled from World Development Indicators Online, World Bank (2007)



# 2009-10 Drought

## Impacts on Agriculture and Food

- **Crops and livestock**

- President of Guyana allocated US \$1.3 million to bring relief to farmers of Region 2, costing government US \$16,000.00 per day to operate pumps and conduct other works in this region.
- Farmers became so desperate that they were forced to pump salt water to about 150 acres of rice lands knowing the grave consequences of such actions
- Banana exports in Dominica was approximately 43% lower in first 11 weeks of 2010
- In St. Vincent and the Grenadines, agricultural production was reduced to 20% . The resilient farms were the ones that utilised greenhouse facilities and irrigation systems.
- In Antigua and Barbuda, where the 2010 onion crop was expected to be about 500,000 kg, 25 percent of it was lost, whilst about 30 percent of the Tomato crop which was estimated to total 250,000kg was lost
- in Trinidad disease of cattle

- **Food Prices**

- In St. Vincent and the Grenadines, prices of tomatoes were \$2.35 per pound in February. In March the prices rose to \$6.00 per pound.
- Trinidad and Tobago expressed concerns over rising inflation rates with a significant food prices component. Food prices increased 6.9 % in March compared with 6.3 % in February and 2.7 % in January. An increase in the price of fruit in March 2010 by 60.8 per cent
- an increase in the price of fruit in March 2010 by 60.8 per cent

- **Bush Fires** - the same scarce commodity – water – has then to be used to reduce the risks to limb and property

- In Dominica, attended to 160 fires (mainly bush fires) for the 1st quarter of 2010, which was more than for the entire year 2009, which was about 103
- 150% increase in the amount of bush fires reported
- In St. Vincent and the Grenadines, seven different farms reported the destruction of at least two acres of crops.

- **Land degradation** – flooding and landslides after drought, particularly where there was denudation of slopes from fires can be a concern



# 2009-10 Drought Impacts on Water Resources

# 2009-10 Drought

## Impacts on Water Resources

- Grenada

– In Carriacou the majority of the rainwater cisterns that supply bulk water to critical institutions and the public are now dry. Water was barged from Grenada to supply the residents.

PLANT	AVG. WET PRODUCTION (Gals./day (gpd))	AVG. PRODUCTION, 2009 Gals./day (gpd)	% REDUCTION
Annandale	2,000,000	1,600,000	20
Mardigras	167,000	100,000	40
Les Avocats	430,000	282,300	34
Mamma Cannes	310,000	240,000	23
Concord	300,000	298,000	-
Vendomme	450,000	240,000	47
Mt. Horne	210,000	210,000	-

# 2009-10 Drought

## Impacts on Water Resources

- Antigua
  - In February, the Antigua Public Utilities Authority (APUA) reports that the Potworks Reservoir, the major surface water storage reservoir with a 1,000 million gallon capacity that provides up to 20% of the total volume on Antigua will be dry by the start of March.
- Barbados
  - Stage 1 – water conservation encouraged

# 2009-10 Drought

## Impacts on Water Resources

- Guyana
  - The water level at the East Demerara Water Conservancy (EDWC) was 51.65 GD by February 2010. This is significantly below the designated safe level for irrigation – 53.50GD (known as the dead storage level)
  - Increased incidences of diarrhea attributable to use of unsafe water.
- Jamaica
  - Depletion of storage in the two largest surface water storage systems on the island Mona Reservoir (capacity of 3.67MCM or 808.5 million imperial gallons) and Hermitage Dam (capacity of 1.80 MCM or 395 million imperial gallons). As of February 22nd the Mona Reservoir was down to 40% of capacity while the Hermitage Dam was down to 34% of capacity.
  - Water restrictions since August 2009

# 2009-10 Drought

## Impacts on Water Resources

- **Trinidad & Tobago**
  - All of the Water and Sewerage Authority's (WASA) reservoirs well below normal levels and water was rationed in many parts of the country. In the south of Trinidad there has been some civil unrest over lack of water supply.
  - The government appointed Water Police in accordance with existing laws to enforce restrictions on the use of water.
- **St. Lucia**
  - On February 23rd the government through the National Emergency Management Organization (NEMO) declared a national water-related emergency in accordance with the Water and Sewerage Act of 2005.
  - The main reservoir that services the capital Castries and its environs to the north was reduced from 9 million gallons per day to 5 million gallons per day.

# 2009-10 Drought Energy?

- In St. Vincent and the Grenadines, hydro power contribution to total electricity production fell in Jan 2010 to 8.17%. In Jan 2009 it was 28.12% and Jan 2008 it was 17.35%. In February 2010 it fell to 12.01% from 28.69% in Feb 2009. In Feb 2008 it was 21.30%.
- The decline in hydro-electricity resulted in an increased use of diesel resulting in a higher fuel surcharge. However, this surcharge was significantly offset by lower diesel prices

# Unawareness of the drought

## What was missing?

- the capacity of the region to use the information
- whether the information is presented in a format which makes it easy to use by a broad range of stakeholders
- whether all stakeholders are aware of the availability of the products

# Drought forecasting and alerting

## Key features in establishing such systems

- scales requires a coordinated effort between multiple stakeholders
- understanding stakeholder needs and capacities
- timely data collection and dissemination by multiple stakeholders across multiple sectors
- human capacity to process and interpret data in a timely manner
- collaborative non-competitive environment between stakeholders
- regular and effective communications between technical personnel and decision-makers
- an effective system of protocols for issuing and communicating alerts to various stakeholders across multiple sectors.