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Vulnerability of water resource to El Niño Southern Oscillation (ENSO) in the Philippines: The 2007-2008 La Niña and 2009- 2010 El Niño impacts on Angat Dam

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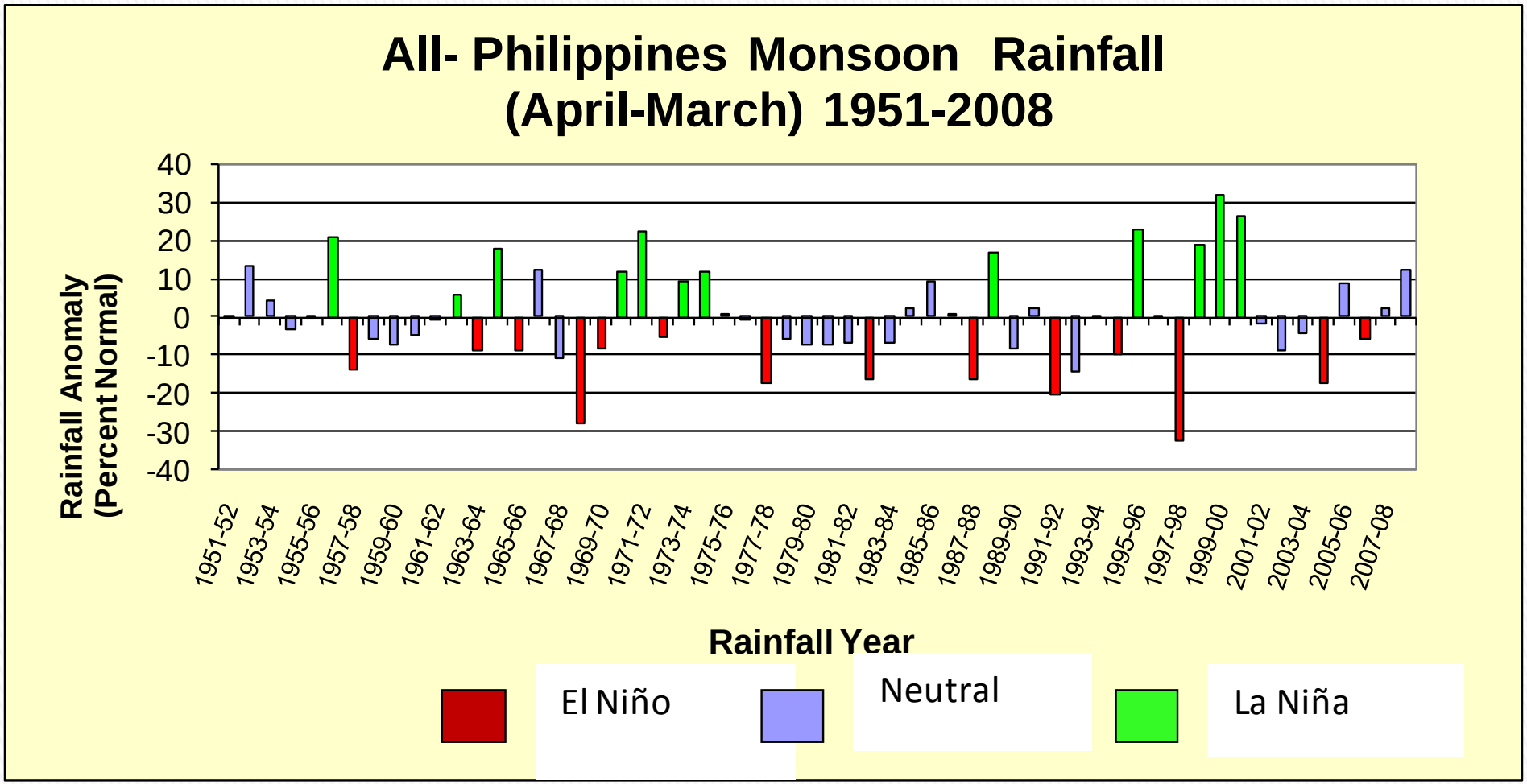
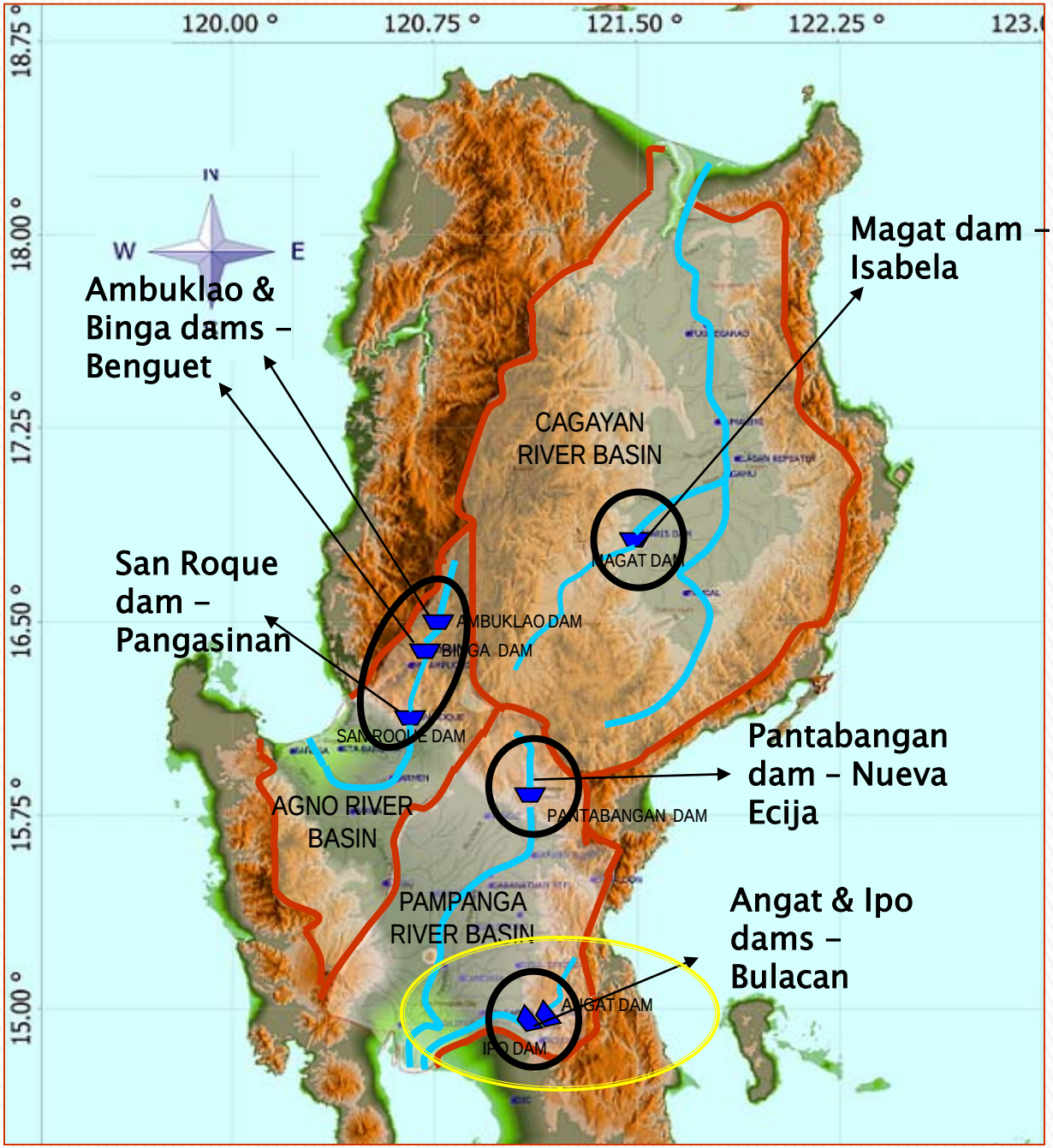
Presentation Outline

- Overview on the Philippine climate
- Background of the Angat Dam multipurpose reservoir
- Vulnerability of Angat Dam to climate variability and severe weather events.

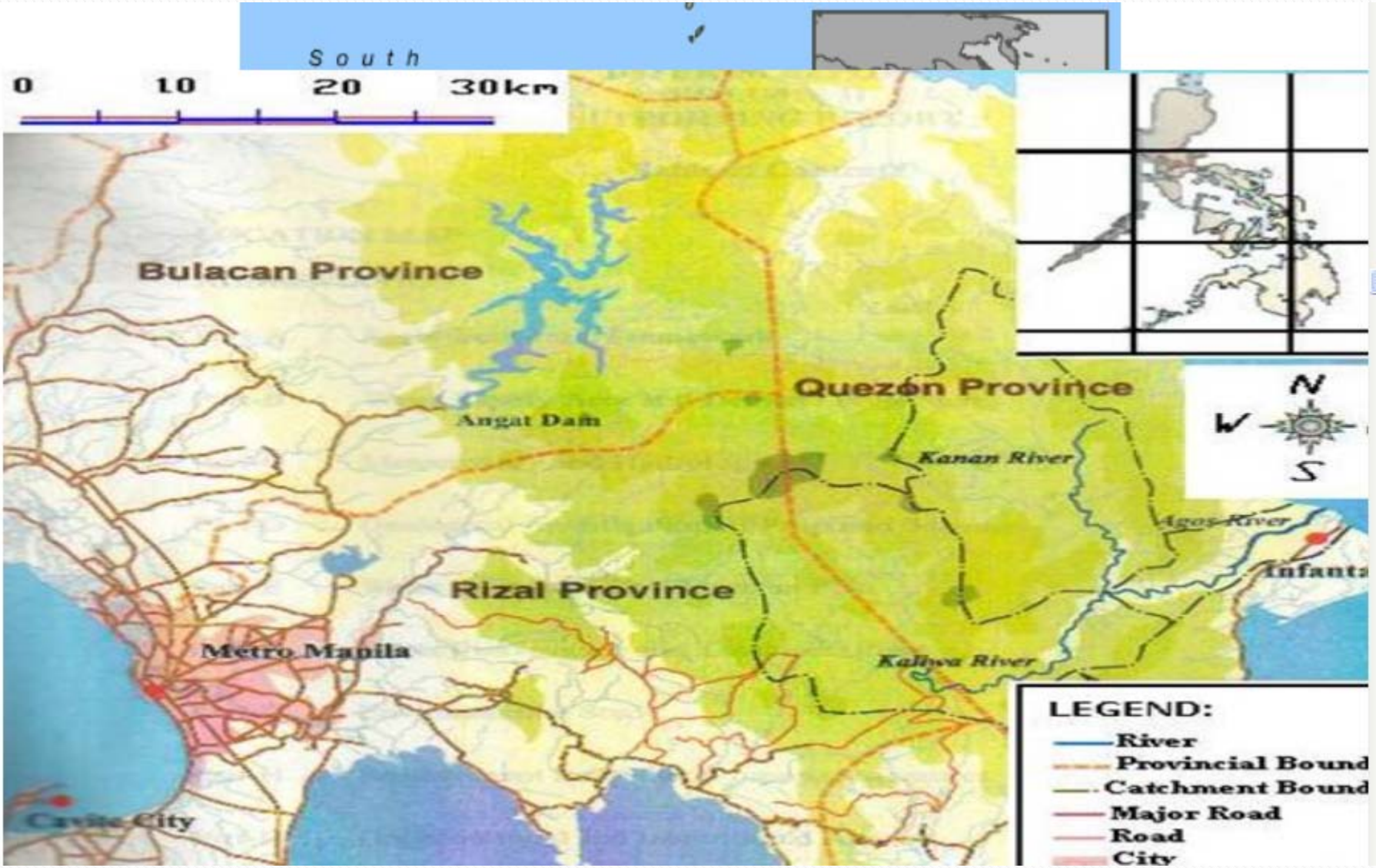
Monsoon –Inter–seasonal Variability




ANGAT DAM



Location of monitored dams in Luzon

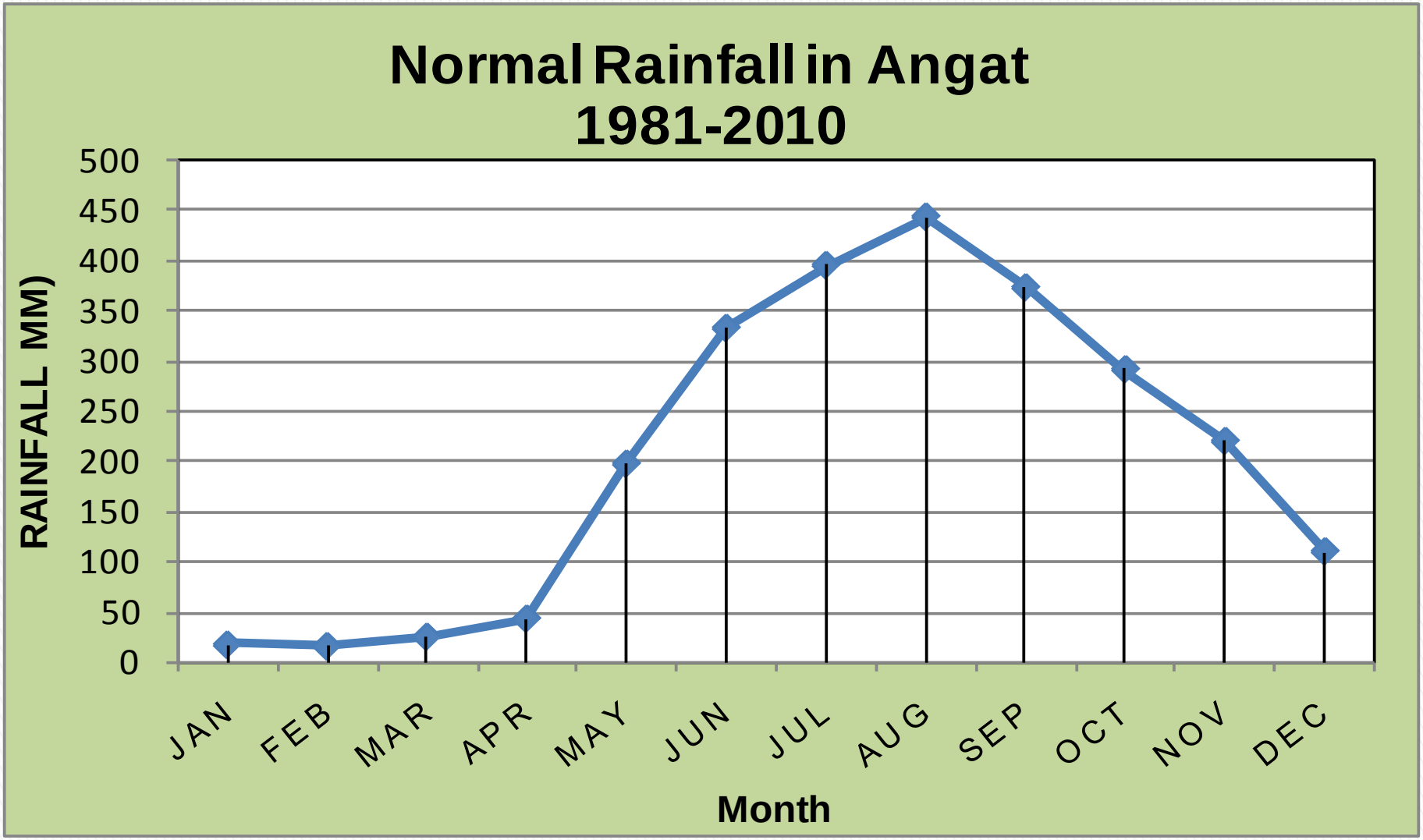

South
0 10 20 30km
Bulacan Province
Quezón Province
Angat Dam
Kanan River
Agos River
Rizal Province
Metro Manila
Kaliwa River
Cavite City
N
W
S
LEGEND:
River
Provincial Bound
Catchment Bound
Major Road
Road
City

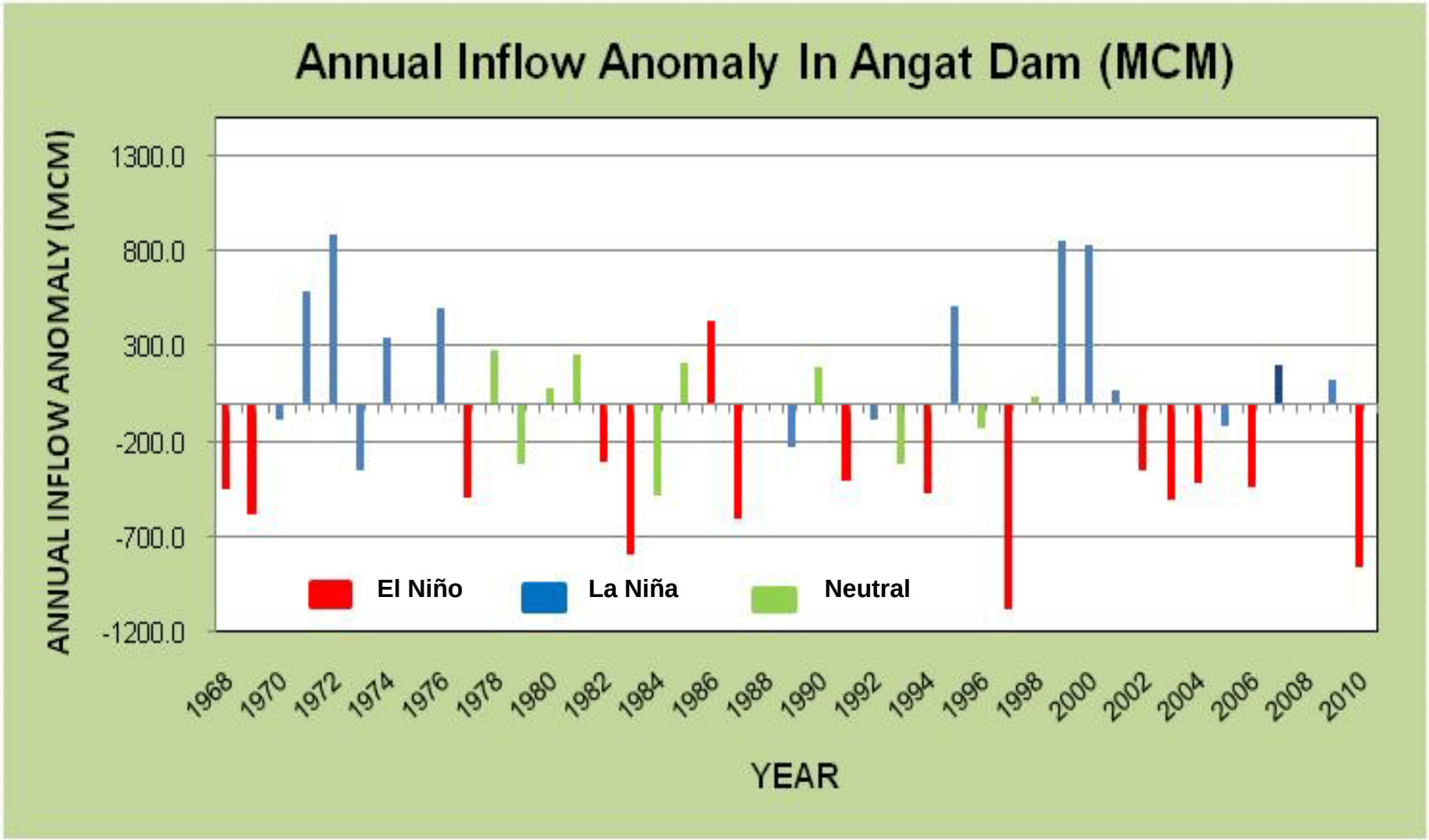
Multiple functions of Angat Dam

- Provides irrigation to about 31,000 hectares of farmlands in the provinces of Pamapanga and Bulacan.
- Supplies domestic and industrial water requirements of residents in Metro Manila.
- Generates hydroelectric power to feed the Luzon Grid
- Serves as flood control to downstream towns and villages.

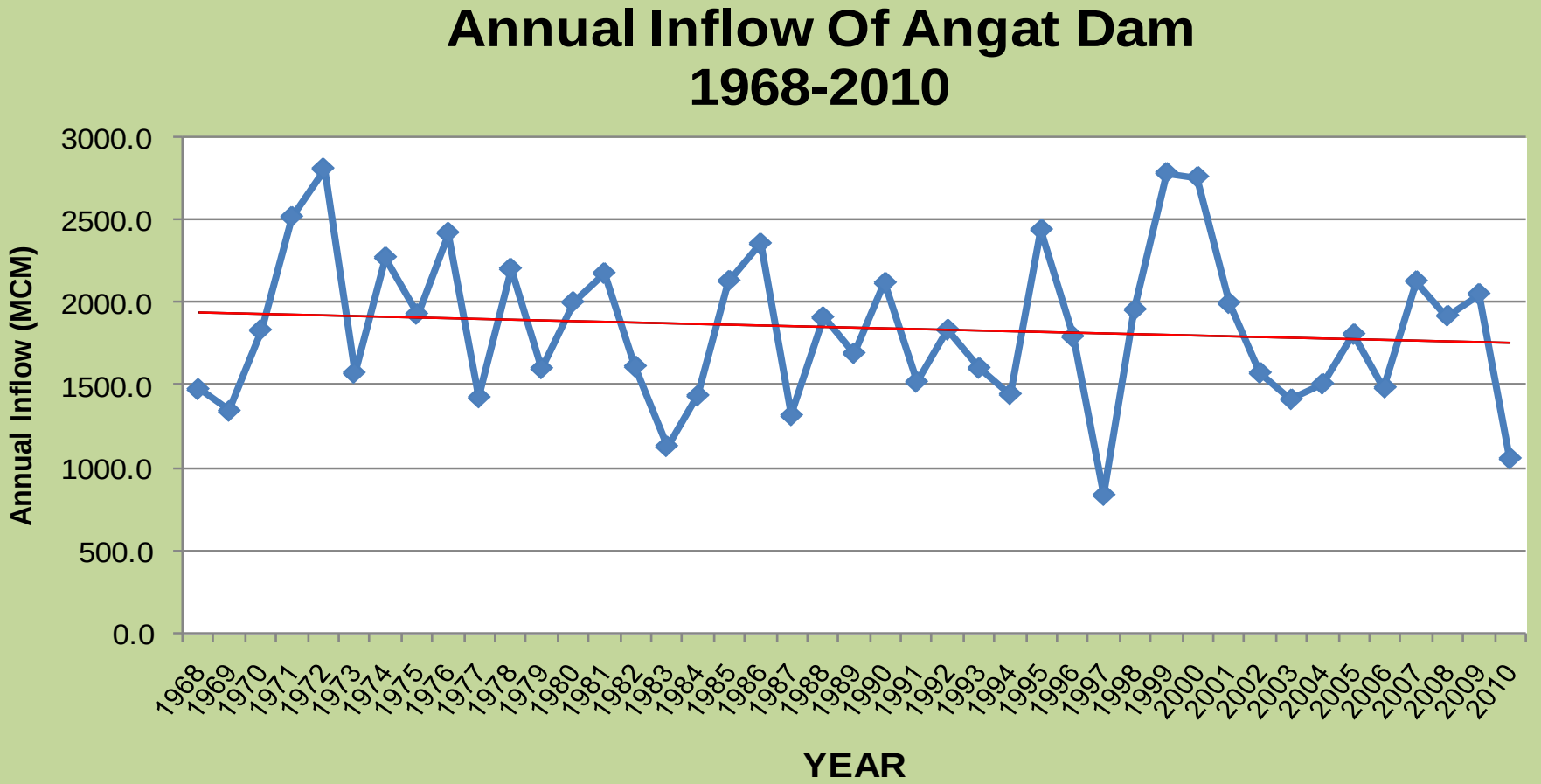
Aerial view of the Angat Hydroelectric Plant

Courtesy of Mr. Rodolfo German (Angat dam)


Normal Rainfall in Angat
1981-2010
RAINFALL MM)
500
450
400
350
300
250
200
150
100
50
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Month

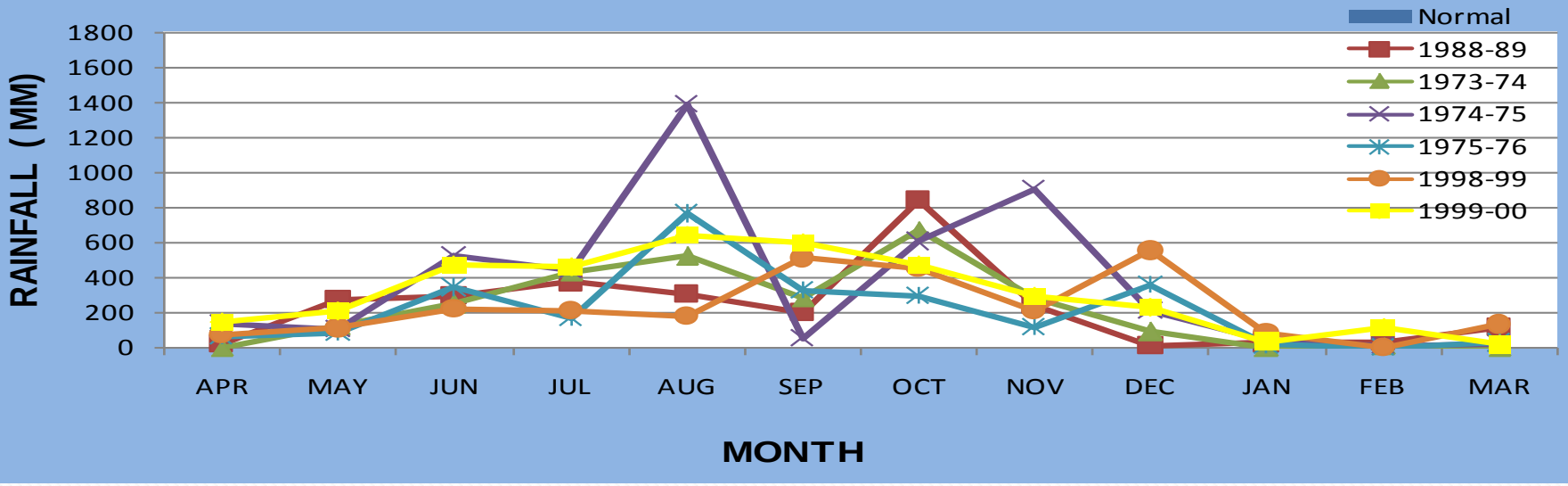

Annual Inflow Anomaly In Angat Dam (MCM)
ANNUAL INFLOW ANOMALY (MCM)
1300.0
800.0
300.0
-200.0
-700.0
-1200.0
El Niño
La Niña
Neutral
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
YEAR

Vulnerability of Philippine Water Resource to Extreme Climate Events

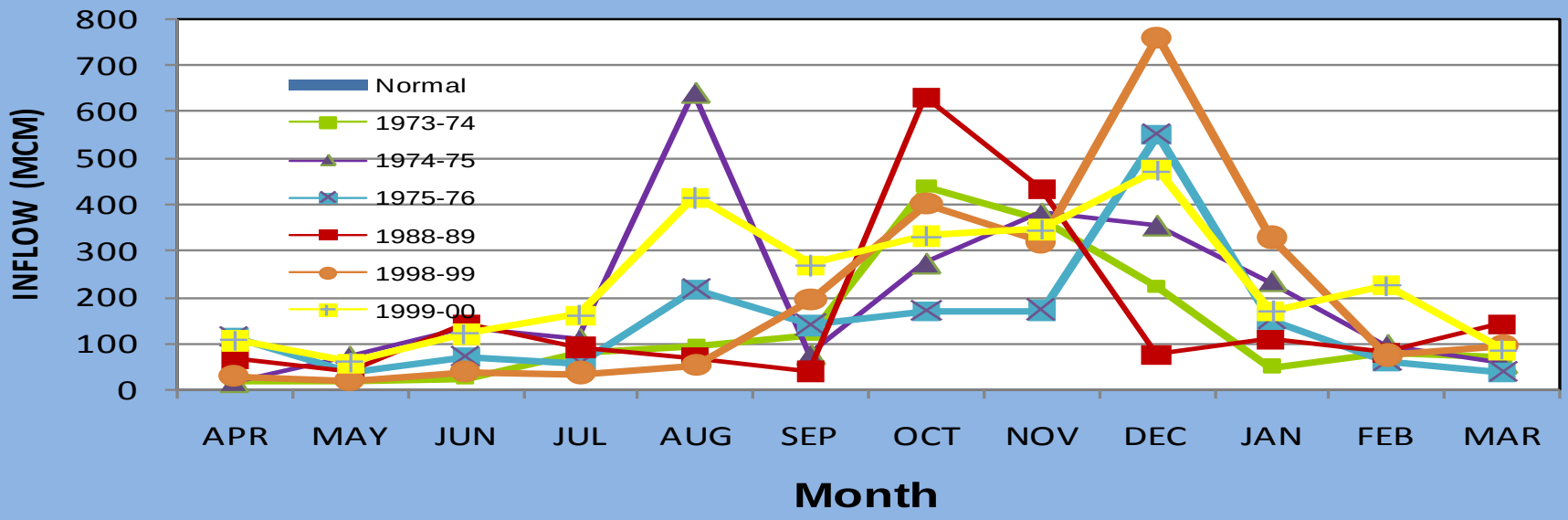


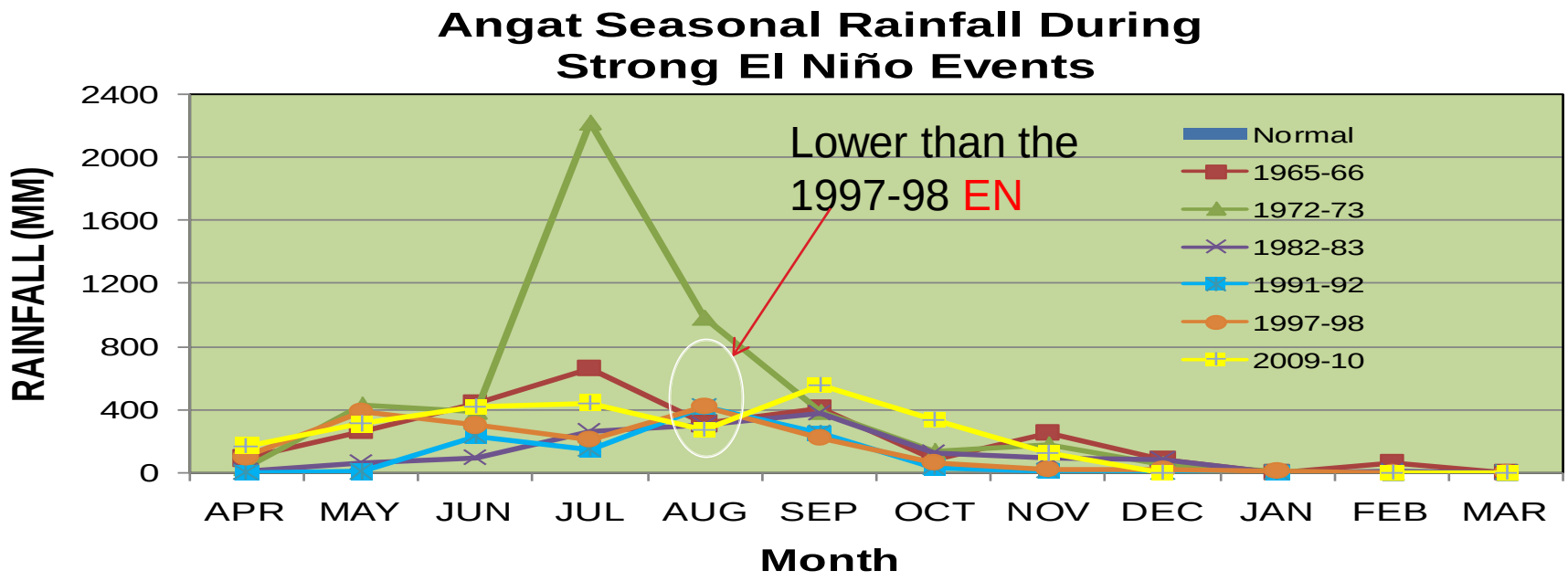
The frequency of occurrence of extreme events affects the inflow patterns of the reservoir

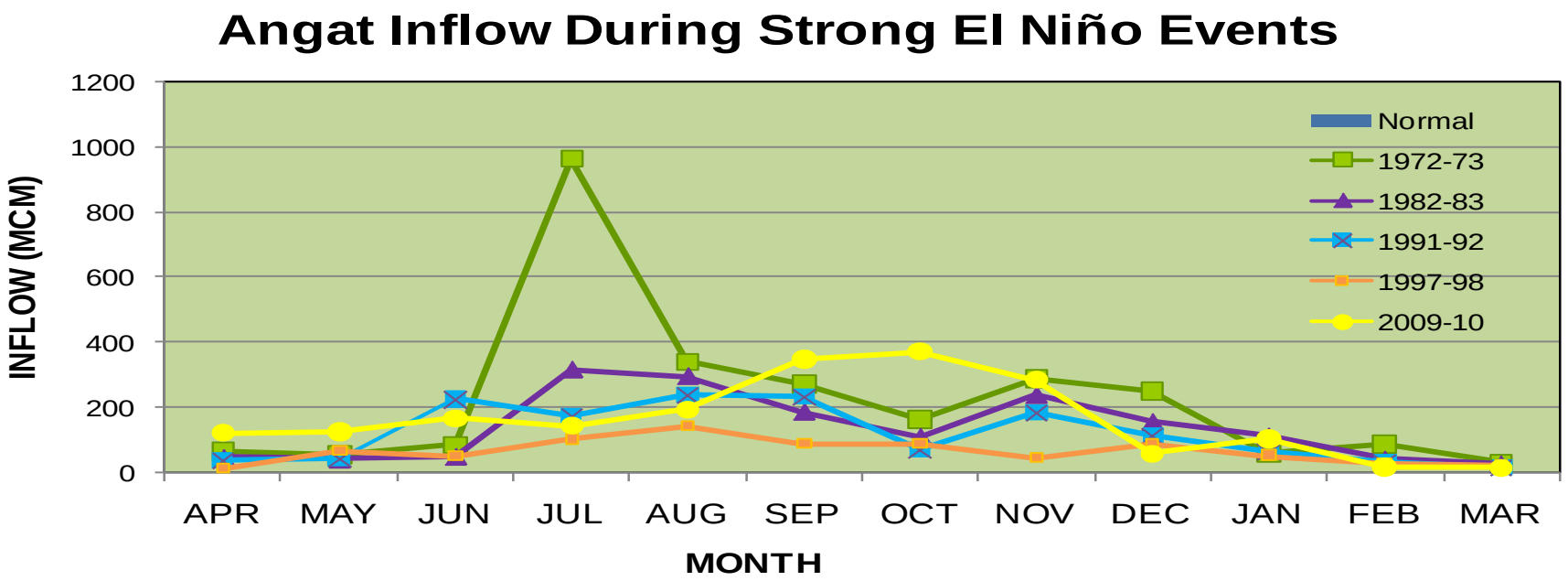
Angat Seasonal Rainfall During Strong La Niña Events

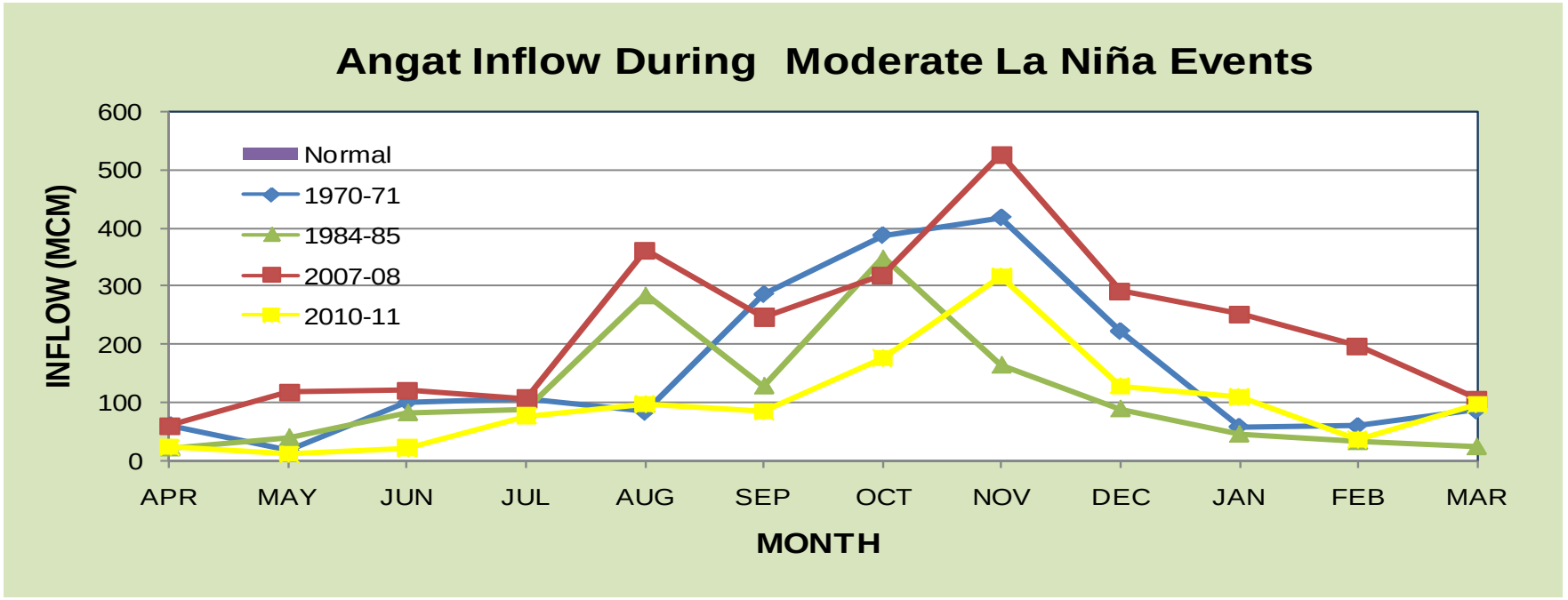


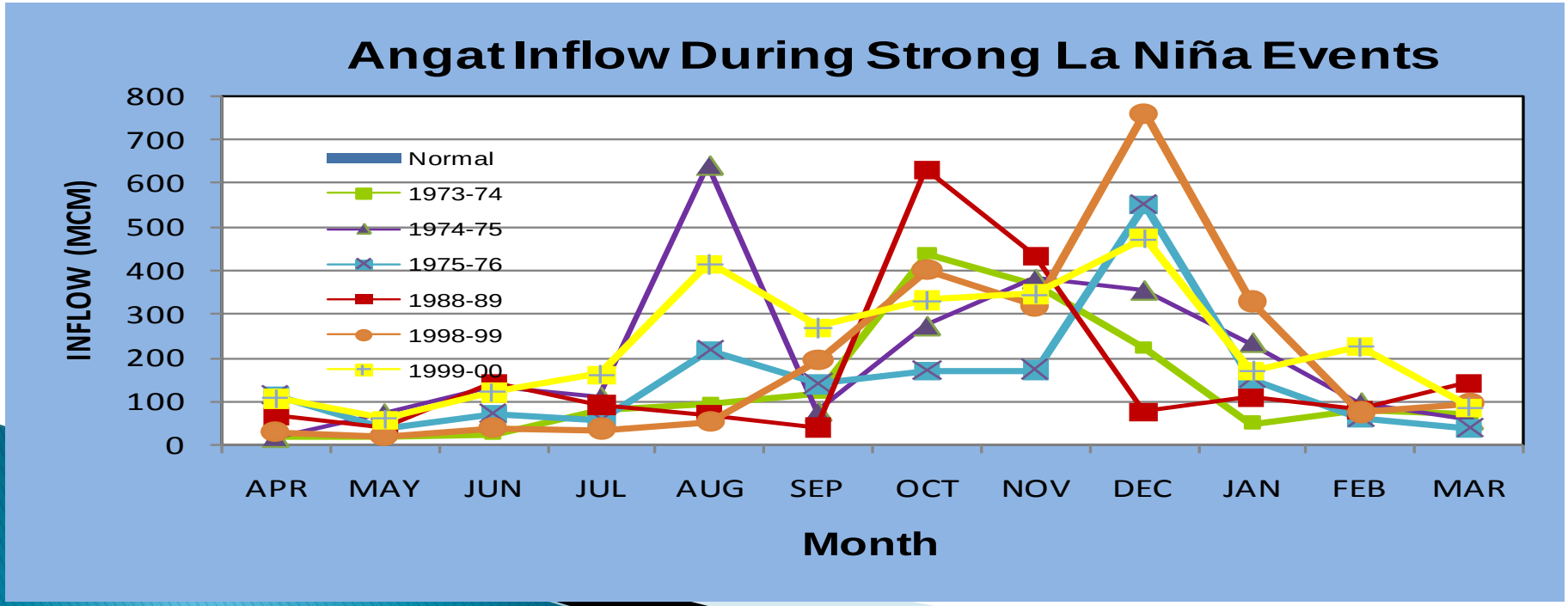
Angat Inflow During Strong La Niña Events



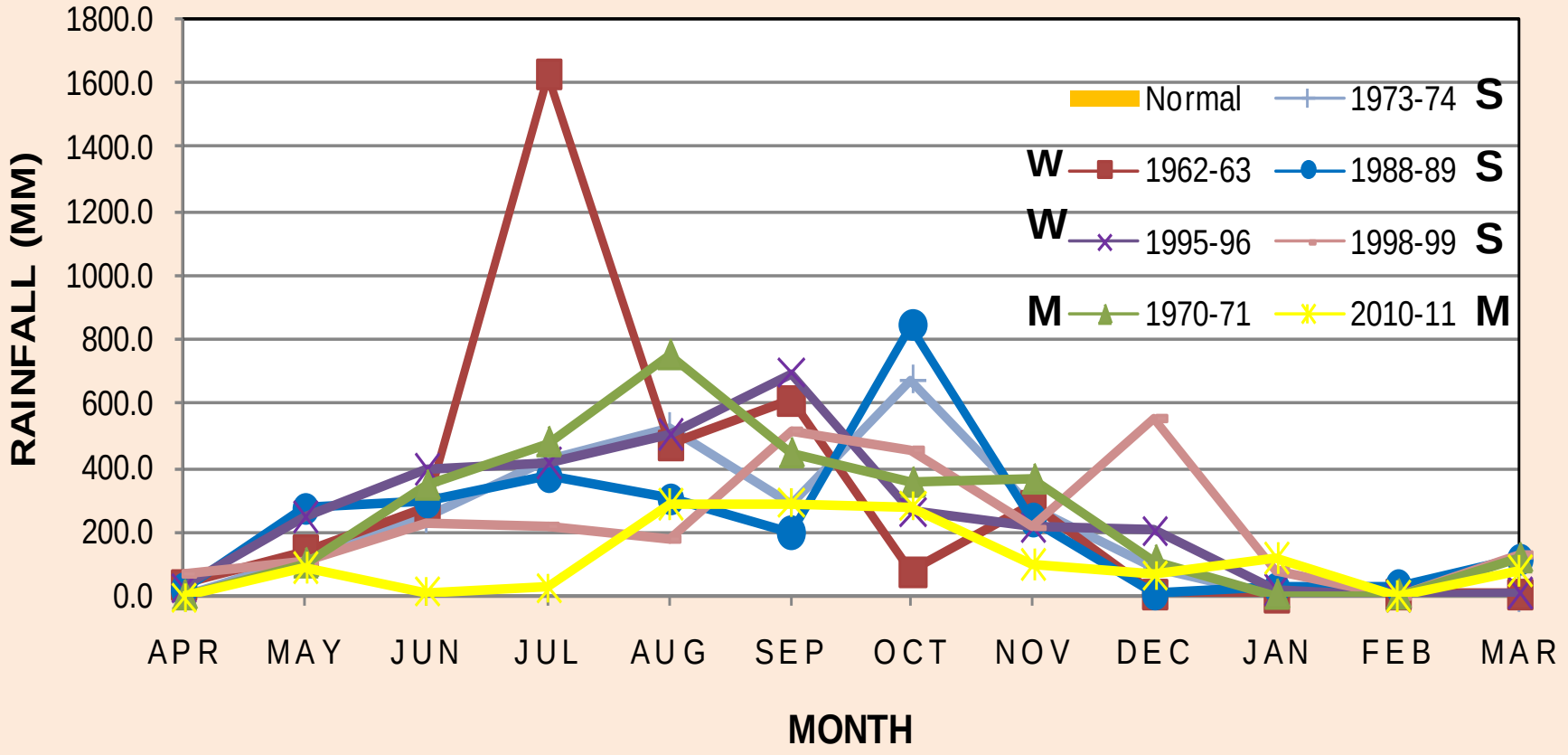

Angat Seasonal Rainfall During Strong El Niño Events
RAINFALL (MM)
2400
2000
1600
1200
800
400
0
Lower than the 1997-98 EN
Normal
1965-66
1972-73
1982-83
1991-92
1997-98
2009-10
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
Month


Angat Inflow During Strong El Niño Events
INFLOW (MCM)
1200
1000
800
600
400
200
0
Normal
1972-73
1982-83
1991-92
1997-98
2009-10
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
MONTH

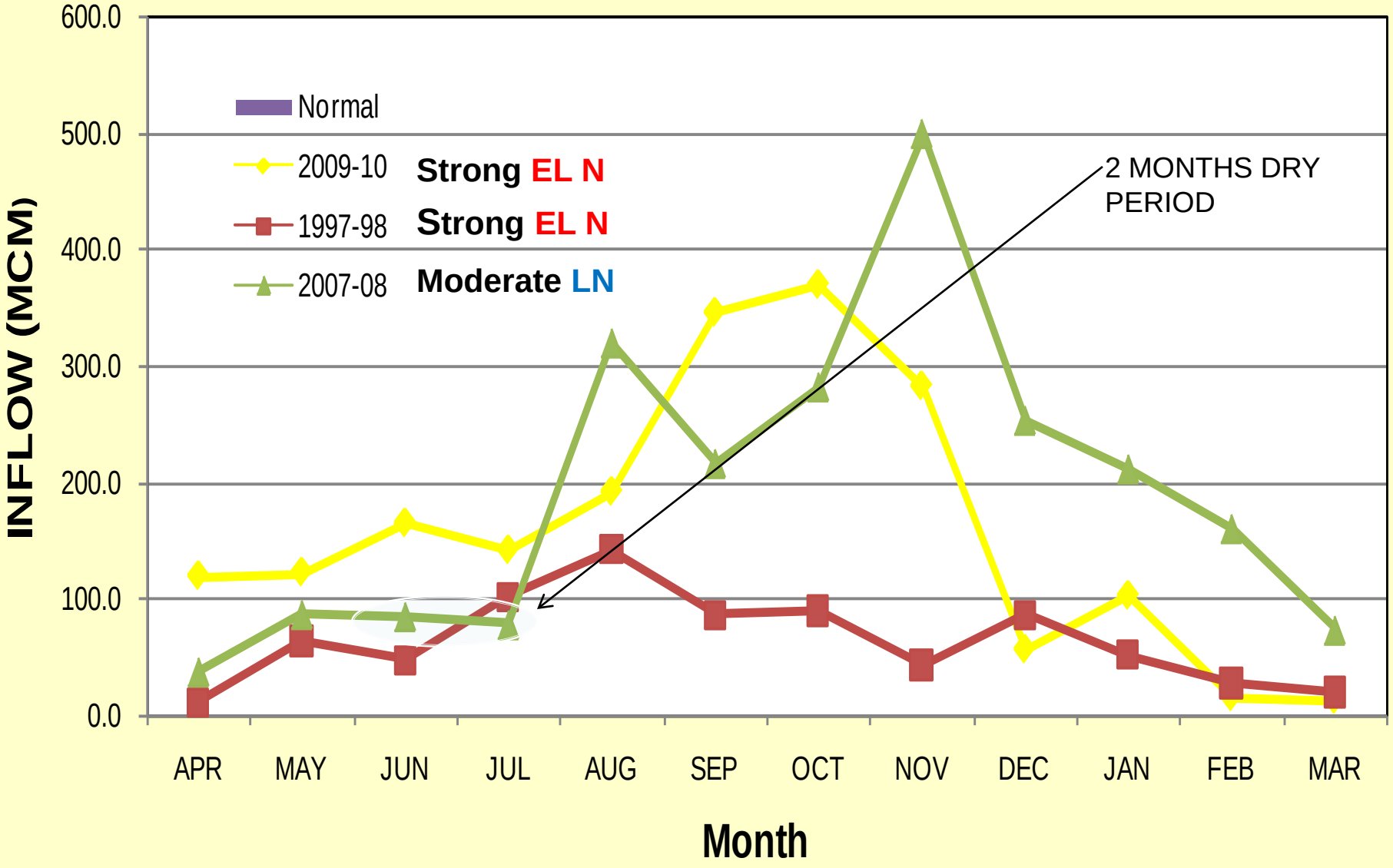

Angat Inflow During Moderate La Niña Events
INFLOW (MCM)
600
500
400
300
200
100
0
Normal
1970-71
1984-85
2007-08
2010-11
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
MONTH


Angat Inflow During Strong La Niña Events
INFLOW (MCM)
800
700
600
500
400
300
200
100
0
Normal
1973-74
1974-75
1975-76
1988-89
1998-99
1999-00
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
Month

Angat Seasonal Rainfall For Selected La Niña Event



Angat Inflow During 1997-98, 2009-10 El Niño and 2007-2008 La Niña



Impact of 2007-2008 La Niña

- June- July dry spell condition over Region 1,II, Cordillera Administrative Region (CAR), National Capital Region(NCR) and Central Luzon was experienced.

- The water level at Angat dam, the main source of Metro Manila's water, last July 25, 2007, Wednesday was at 173 meters, seven meters below the critical level of 180 meters.

Impact of 2007-2008 La Niña

- Angat dam has lost 30 percent of its capacity to supply water for domestic use, irrigation and power generation during July 2007.

- Water disruptions in the network of water service providers have resulted to water rationing during July.

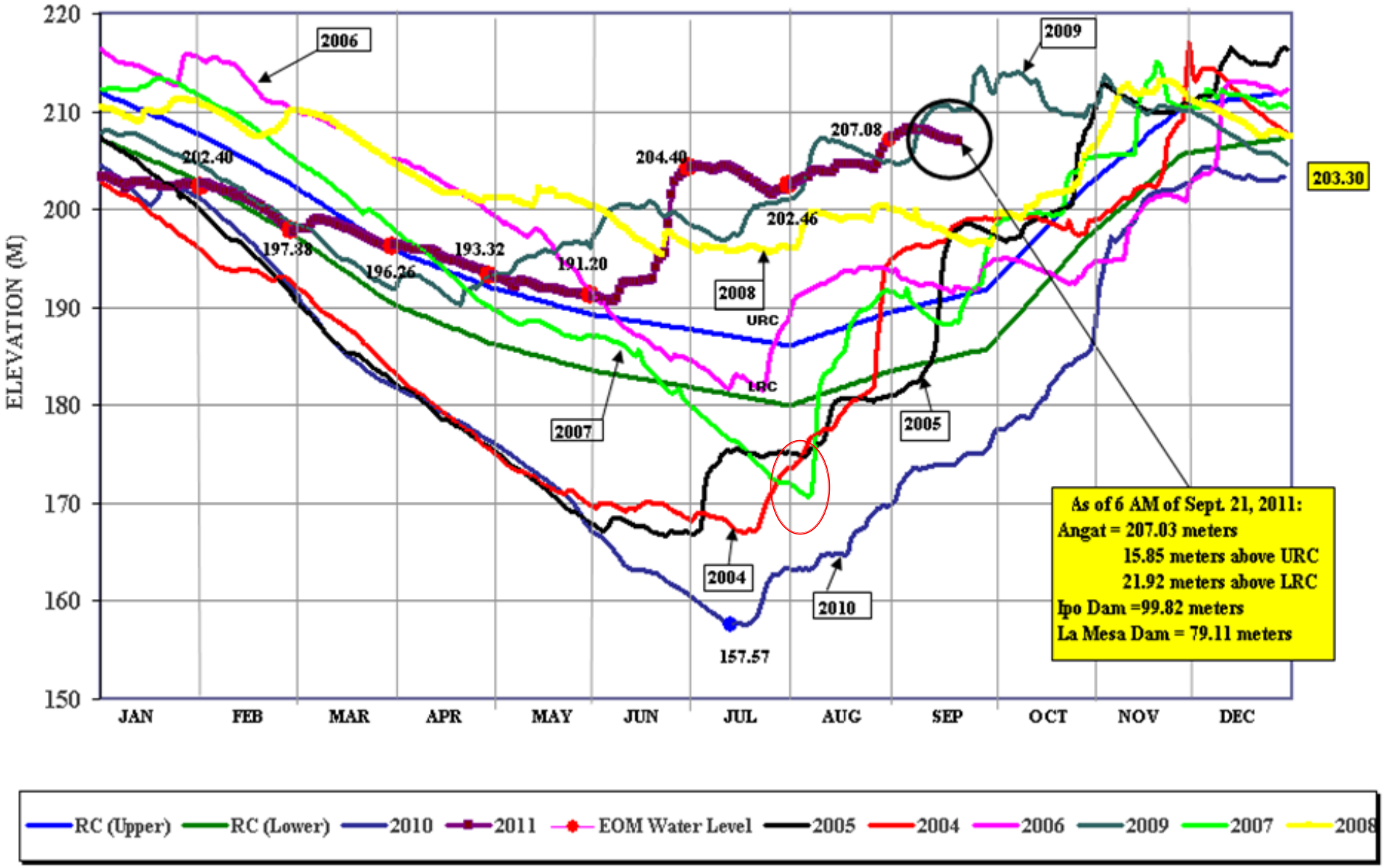
Impact of 2009-2010 El Niño

•.The below normal rainfall condition over most areas of Luzon during November 2009 to May 2010 caused Angat Dam to hardly get enough replenishment from the July 2010 rainfall.

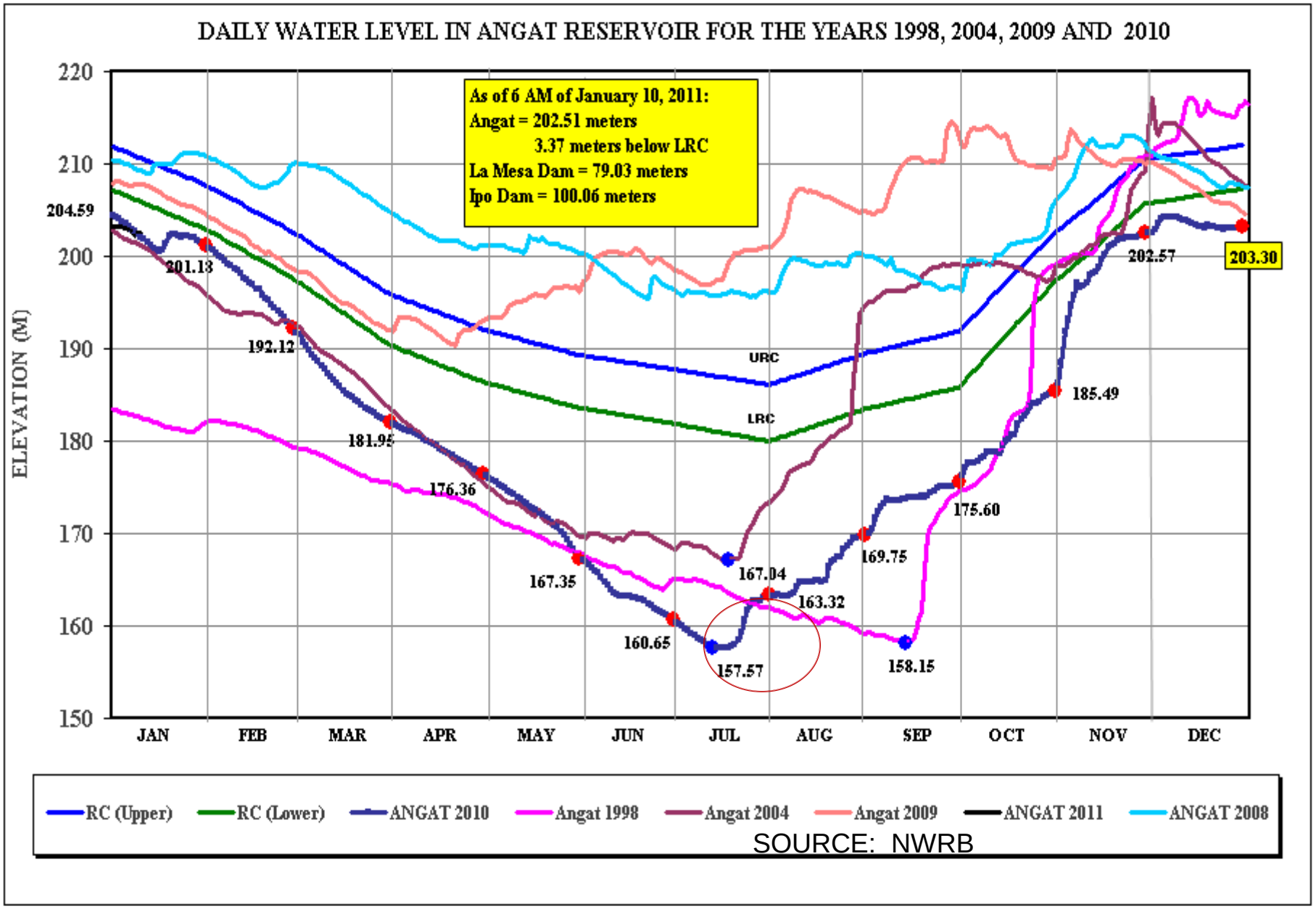
• With this condition, Angat Dam, which supplies more than 90 percent of Metro Manila's domestic water supply, had reached last July 2010 an elevation of 157.57 meters way below the critical level of 180 meters and lower than the dam's lowest level of 158.15 meters in September of 1998, an El Niño year.

• The dwindling shares of the water from Angat Dam of the water concessionaires resulted to water rationing among its Metro Manila's customers.

Angat Daily Water Level : (2004 to 2011) VS. RULE CURVES

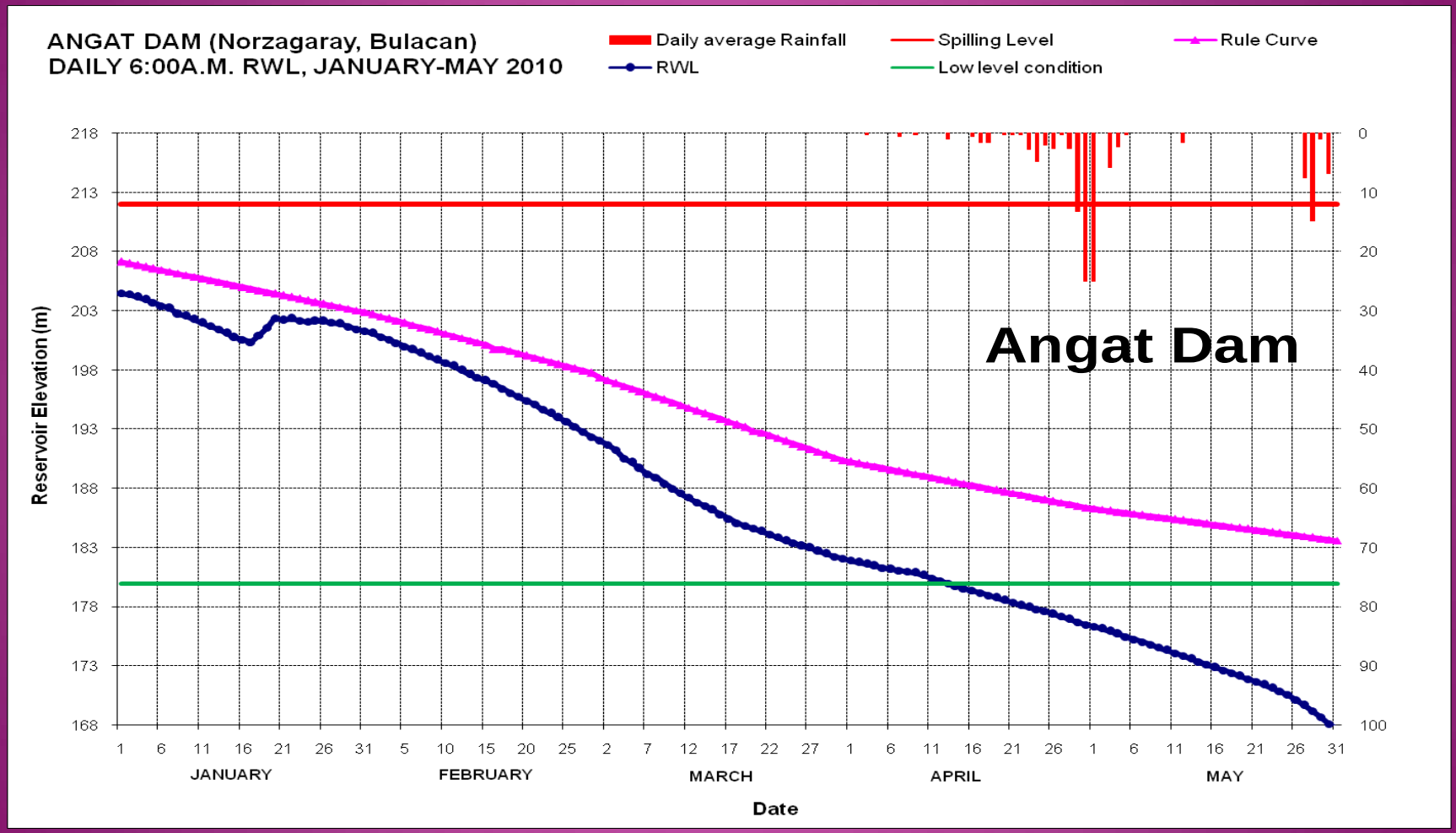


Angat Daily Elevations (1998, 2004, 2008, 2009, 2010)

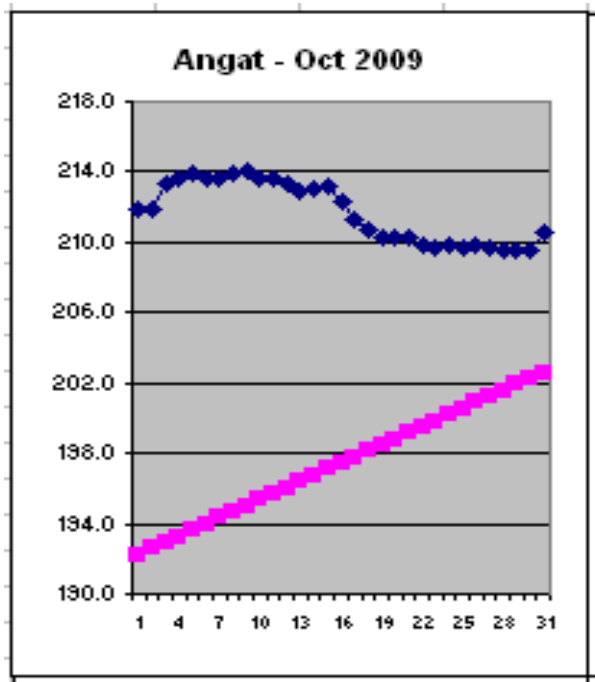


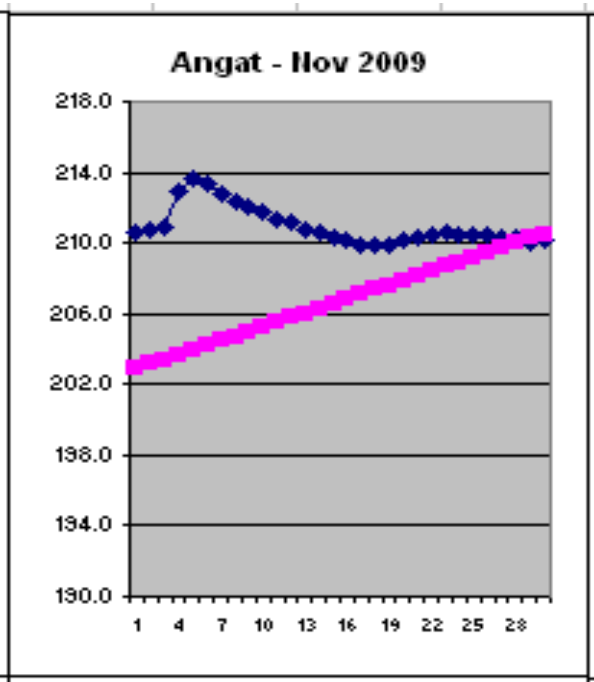
SOURCE: NWRB

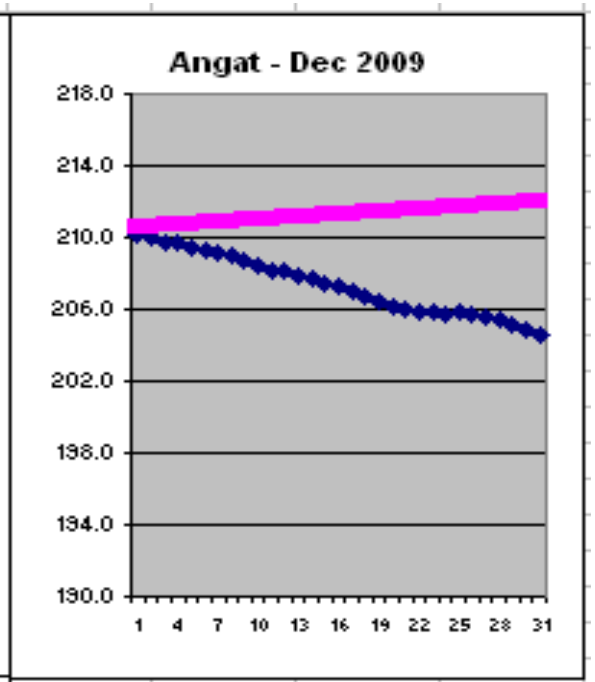
Angat Dam Water Level During January - May 2010

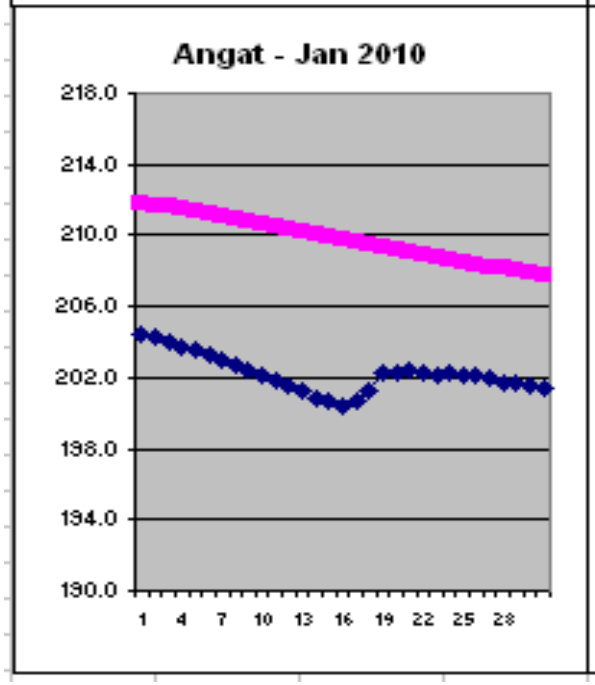


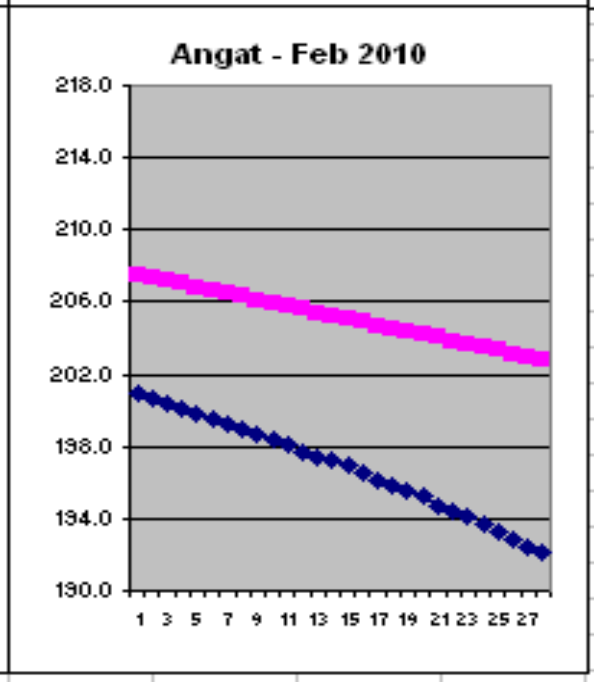
Courtesy from FFD, PAGASA

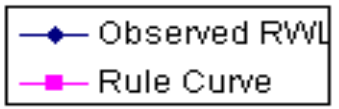












RWL of Angat Dam from October 2009 to February 2010

FFD, PAGASA

A reverse impact of El Niño episode during the Northern hemisphere summer months, where enhanced rainfall occur

Flooding in Metro Manila: Tropical Storm Ketsana"ONDOY" Sept. 24 - 27, 2009

Government Initiative

- Government response to ENSO events started from the PAGASA initiative of providing monthly weather outlook and advisories to member agencies of Inter Agency Committee for Water Crisis Management.

- Activation of the priority programs of the El Nino and La Nina Presidential Task Force particularly on the climate related disaster risk management aspect .

- Cloud seeding operation efforts of the government to offset the effects of dry spell condition on Angat Dam.

- Upgrade climate impact awareness through massive tri-media campaign

Challenges…

- Risk communication in dealing with uncertainties.
- Improve integration of climate information into decision making process.

The need..

- Improve climate forecast information that is localized, timely and easily understandable by the end user.

Thank you for your attention.