NATIONAL WATER FORUM 2014

MICC (II), Nay Pyi Taw **21st Oct 2014**

Presentation on "Water and Climate Change"

Thematic Working Group (TWG 3),
Expert Group of the NWRC

Presented by Prof. Dr. Khin Ni Ni Thein, Secretary of the Expert Group, Alternate Leader of TWG (3)

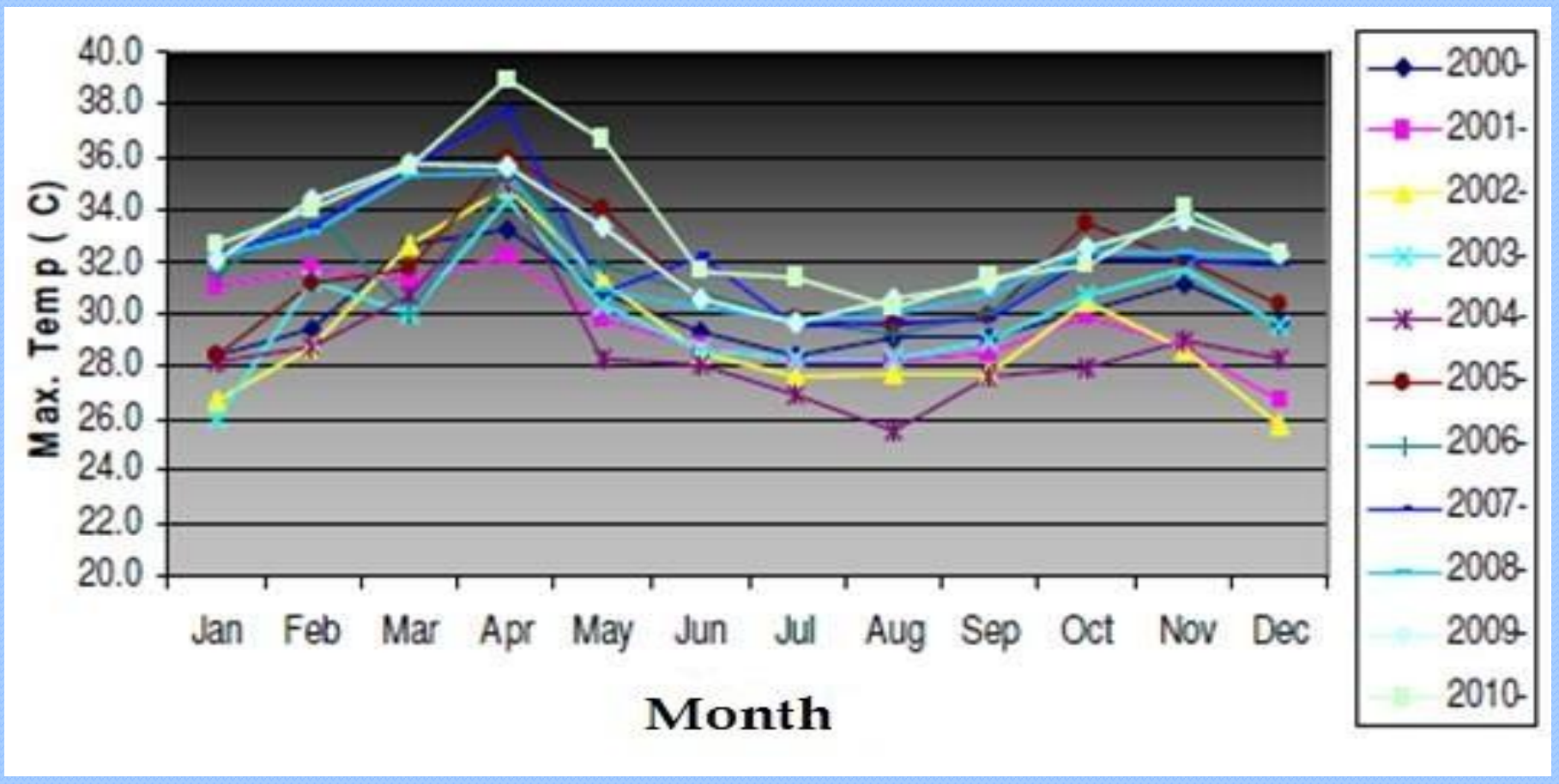
Climate change is changing our assumptions about water resources

I. Climate Change is Real
II. Energy and Water
III. Food Security
IV. Water-Food-Energy nexus
V. Climate Change Adaptation
VI. IWRM and how NWRC can support MCCA

I. Climate Change is Real

Climate Change Impacts Visible in Myanmar

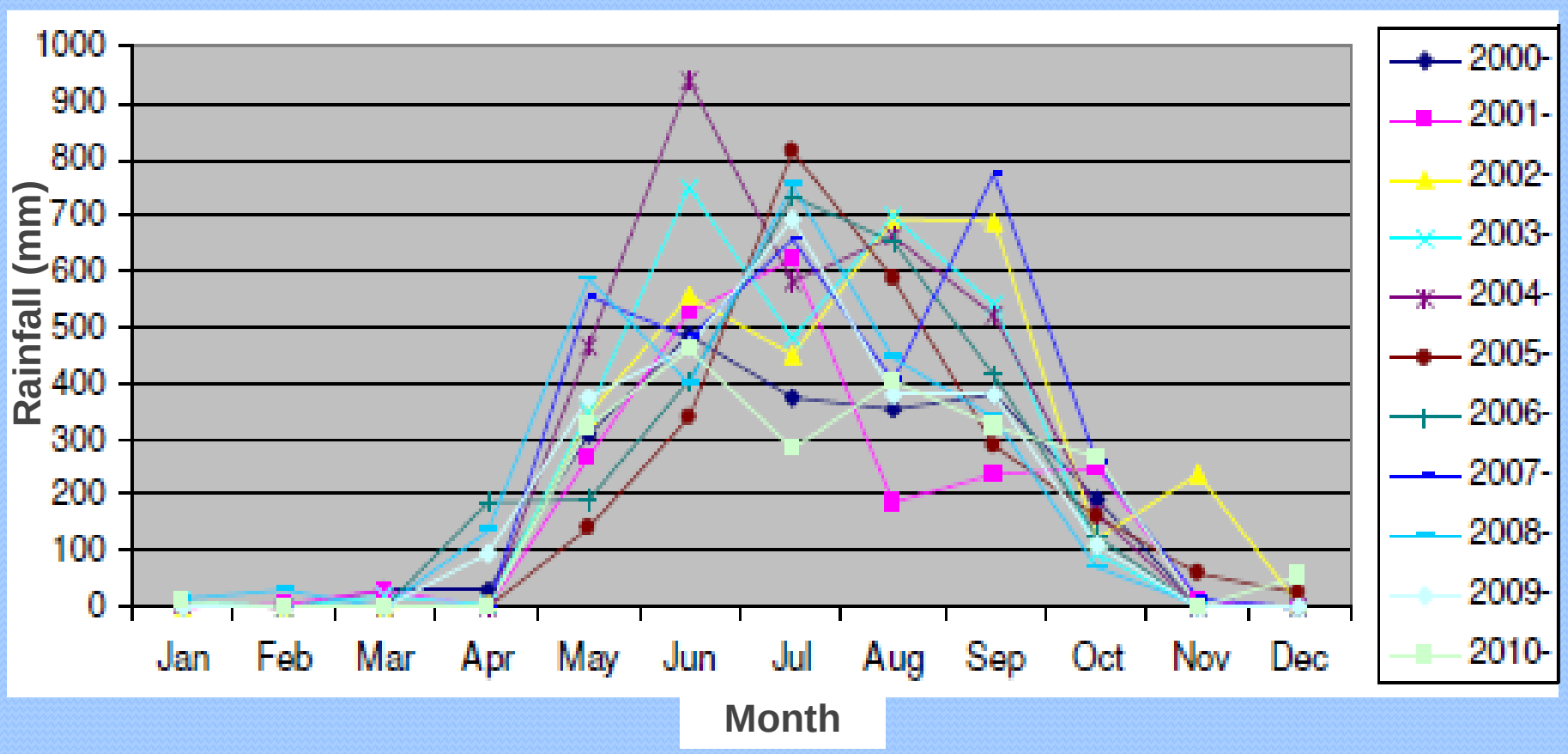
Variation of Maximum Temperature (2000 – 2010)



Source: Department of Meteorology and Hydrology (DMH)

Climate Change Impacts Visible in Myanmar

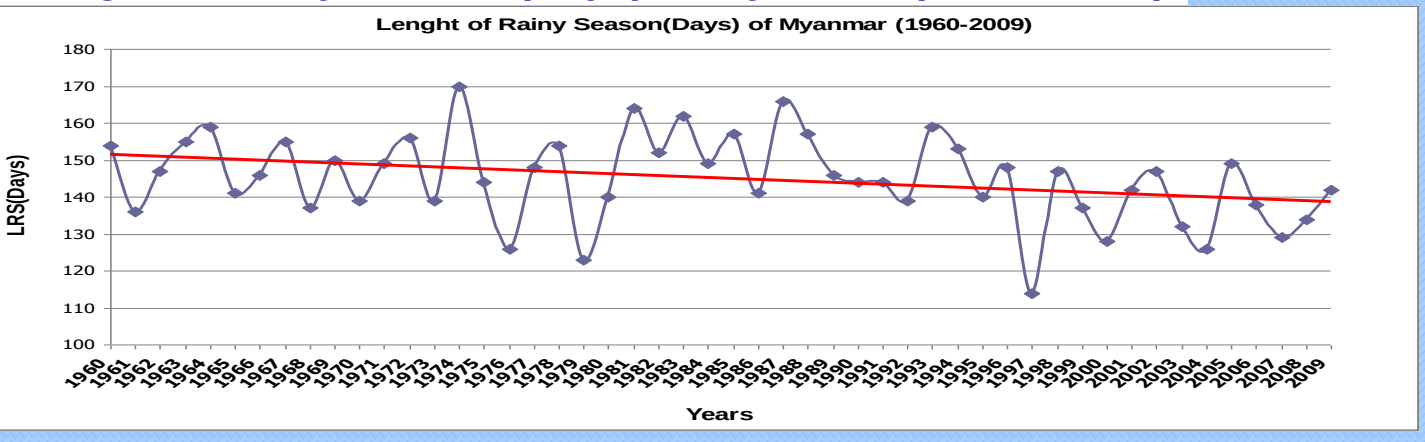
Variation of Rainfall Distribution (2000 – 2010)



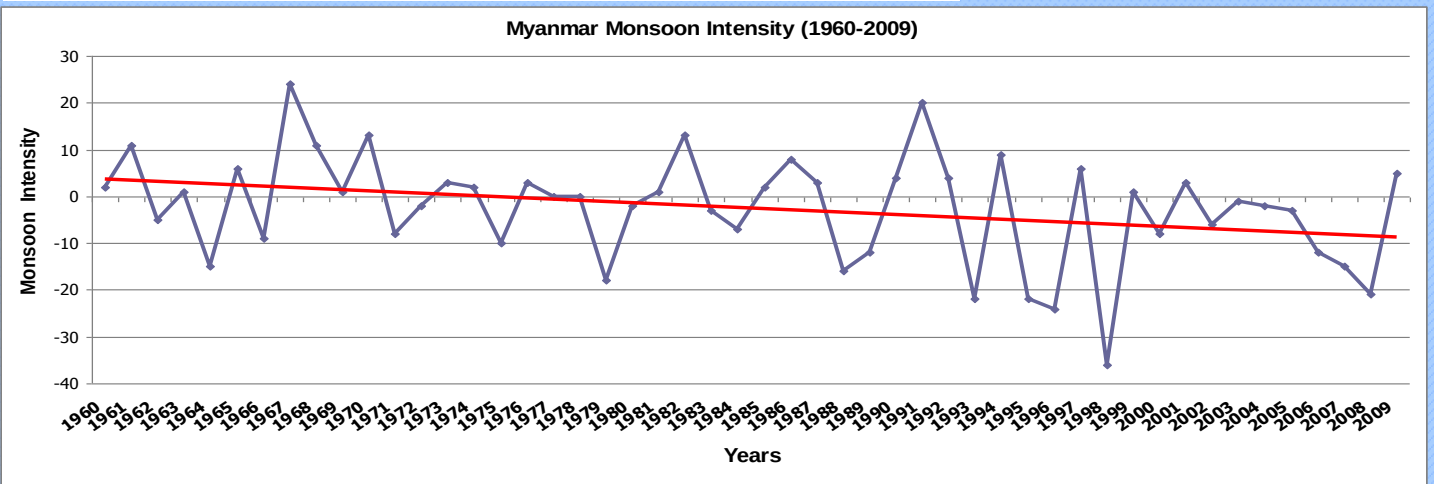
Source: DMH

Climate Change Impacts Visible in Myanmar

Length of Rainy Season (Days) of Myanmar (1960 - 2009)



Myanmar Monsoon Intensity (1960 - 2009)

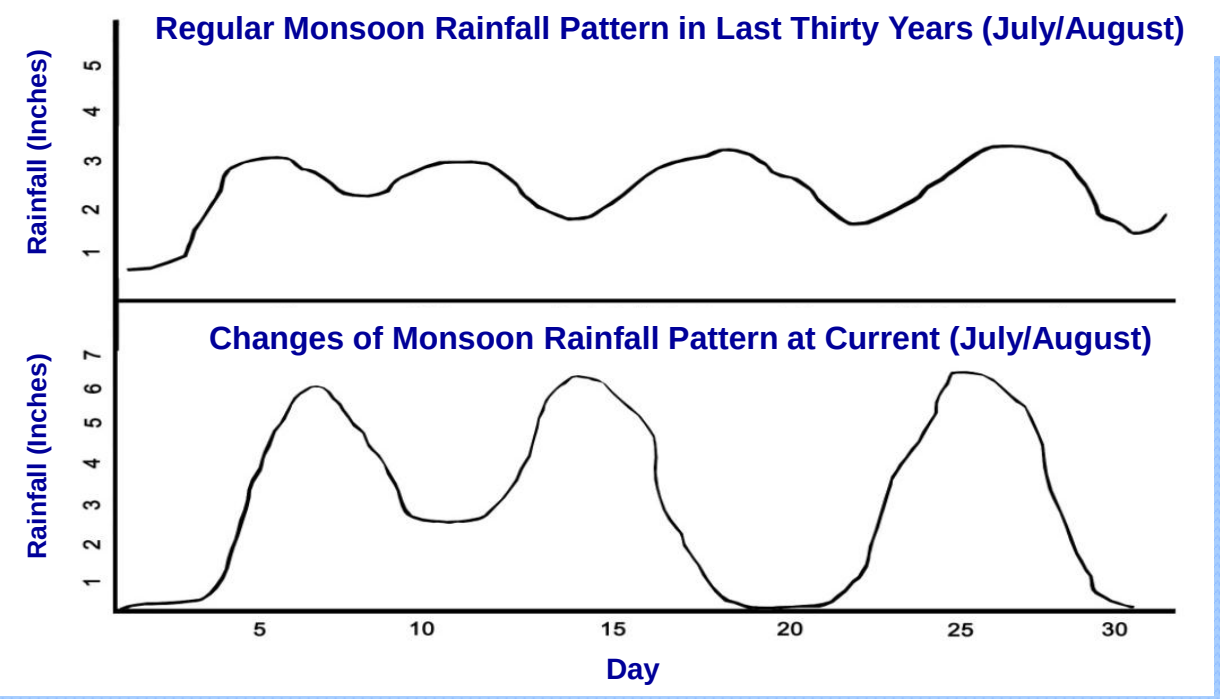


MONSOON:

- Late onset
- Early withdrawal
- Shorter rainy season
- Weakening of monsoon intensity
- Increased rainfall variability
- Heavy rainfall in short period
- Flood
- Water Insecurity

Source: DMH

Rainfall Pattern in Myanmar



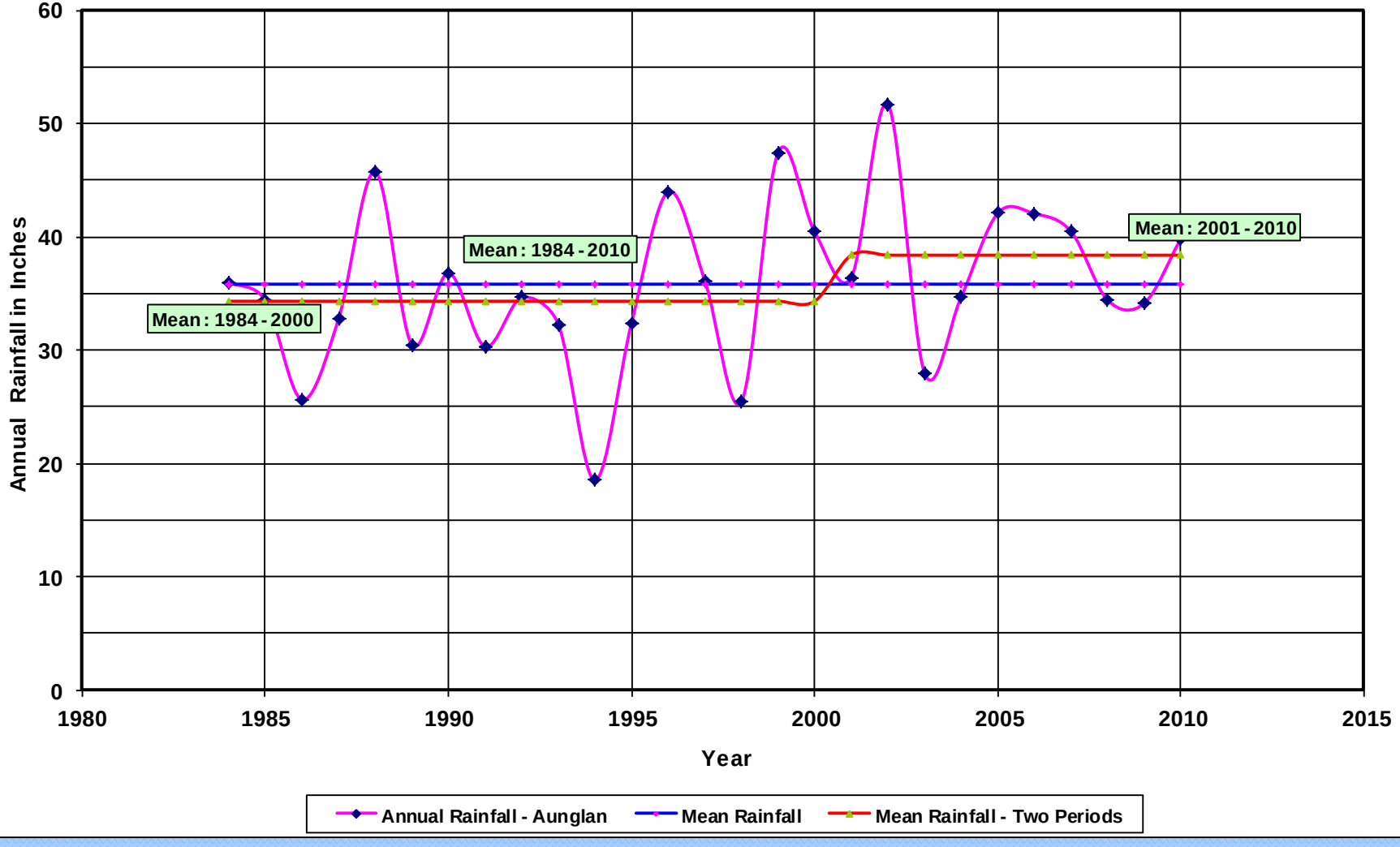
Source: DMH and Hydrology Dept. MOAI

- Comparison between the regular monsoon rainfall pattern of mid rainy season (during July and August) in the last 30 years and recent 10 years.
- Last 30 years have more or less regular daily rainfall pattern between 1 to 3 inches, which is enough for paddy production.
- The current trend of monsoon rainfall pattern during recent 10 years has more variations - minimum 3 inches to maximum 7 inches and at times zero rain even in the mid monsoon season.
- The result is water shortage in rain-fed paddy growing areas as well as flooding problem.

Climate Change Impacts Visible in Myanmar

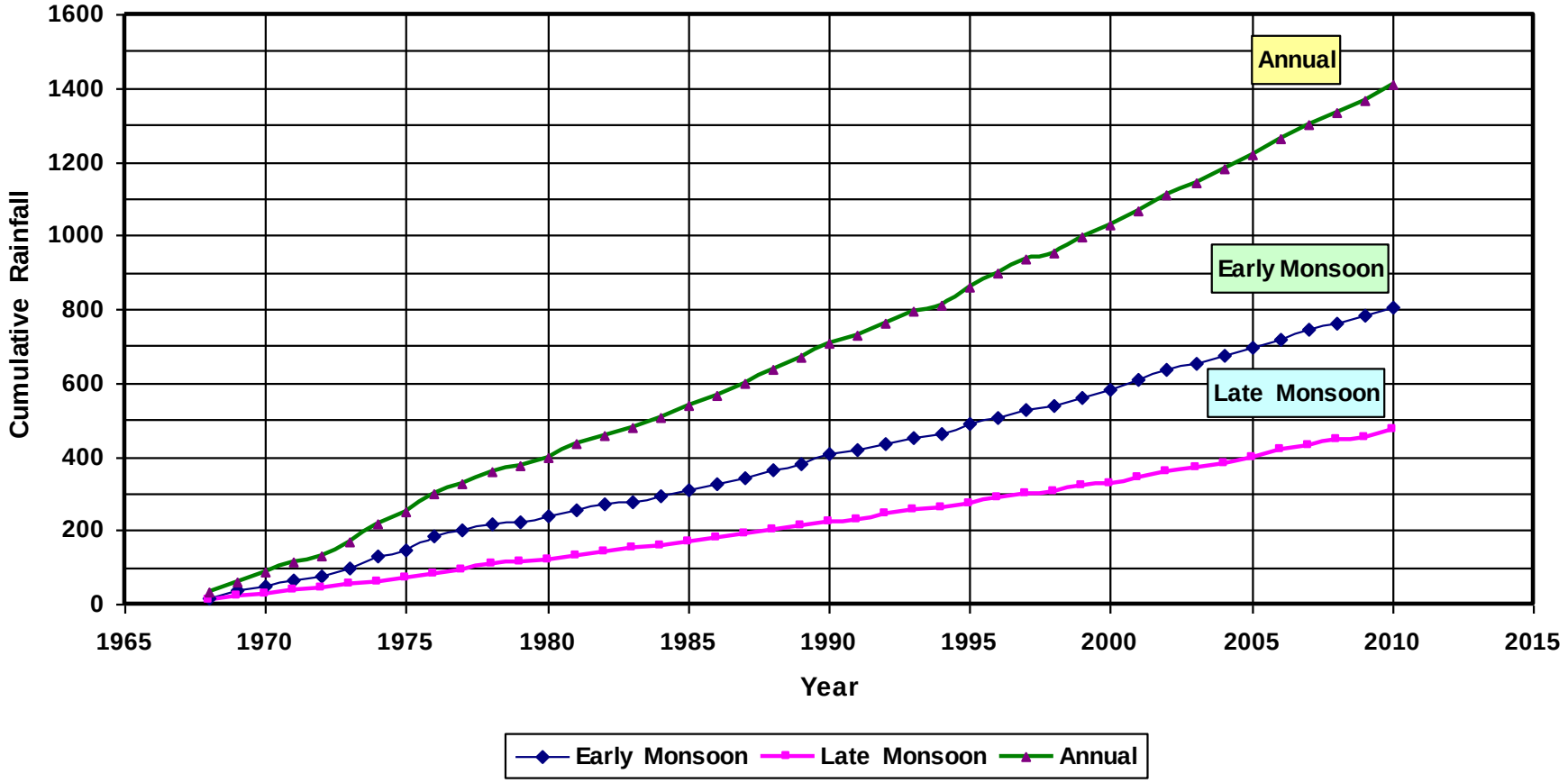
Variation of Annual Rainfall at Aunglan

[Credit: Daw Khon Ra, Hydrology Dept. MOAI]



Climate Change Impacts Visible in Myanmar

Study of Monsoon Trend at Aunglan

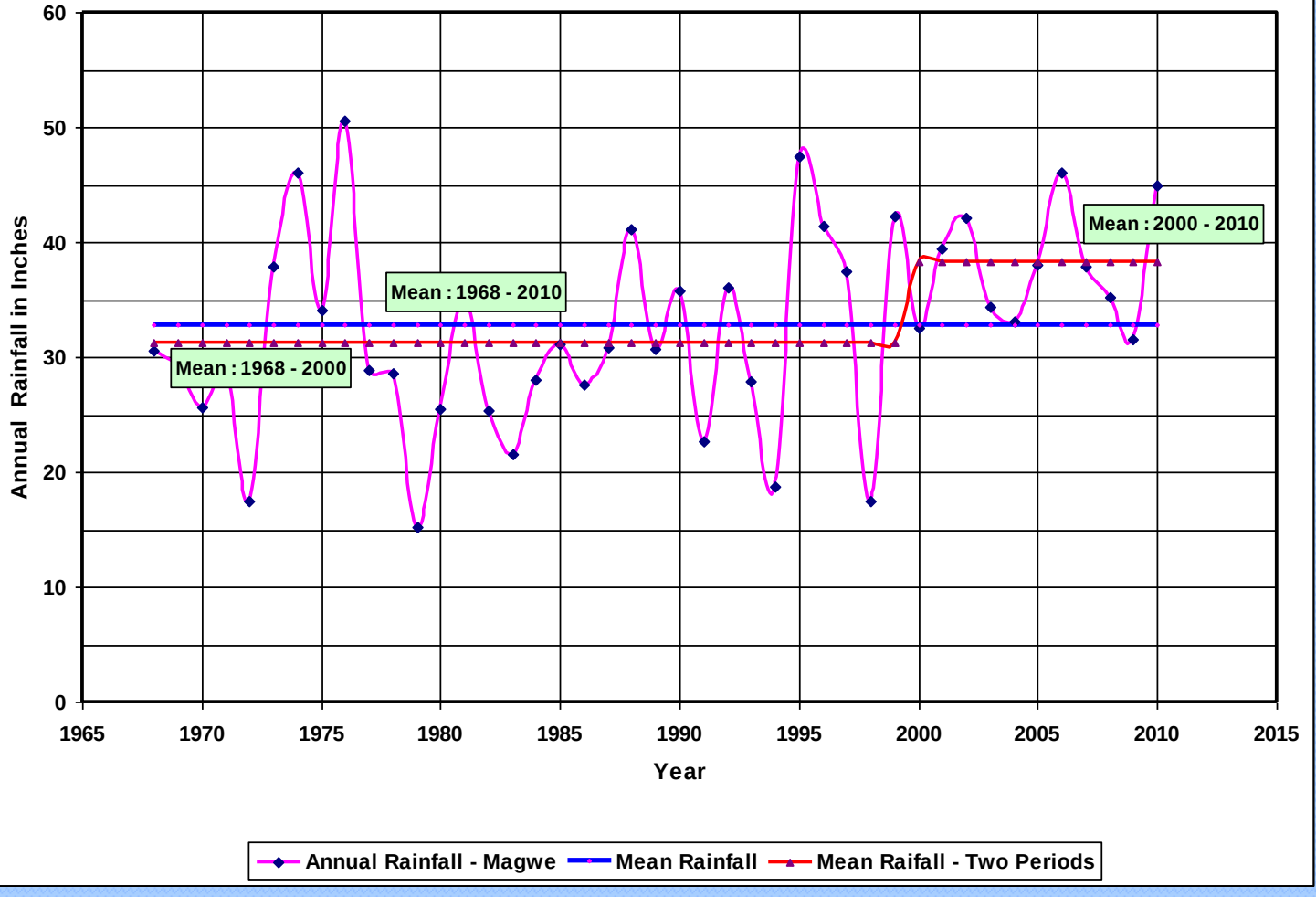


[Credit: Daw Khon Ra, Hydrology Dept. MOAI]

Climate Change Impacts Visible in Myanmar

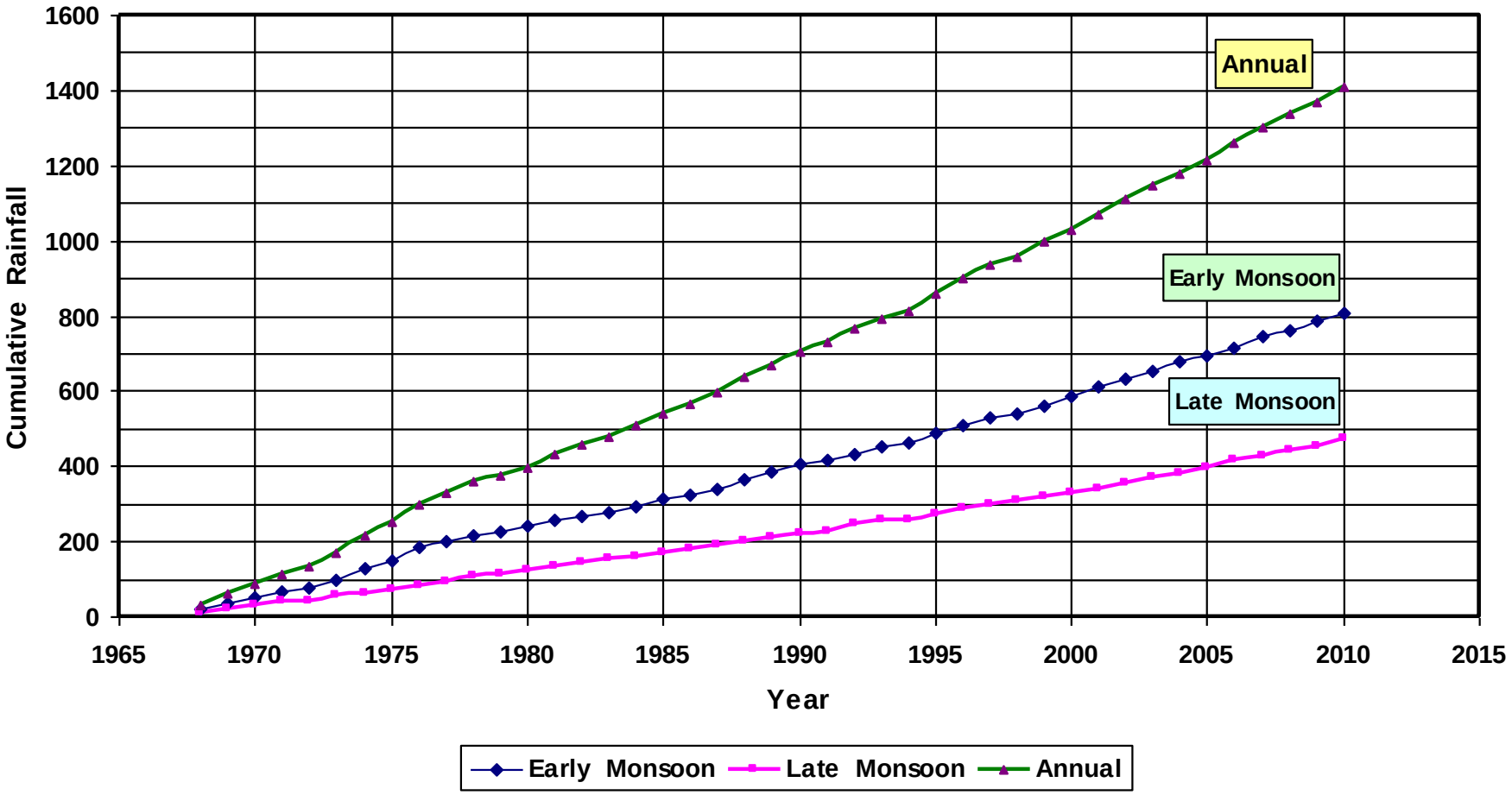
Variation of Annual Rainfall at Magwe

[Credit: Daw Khon Ra, Hydrology Dept. MOAI]



Climate Change Impacts Visible in Myanmar

Study of Monsoon Trend at Magwe



[Credit: Daw Khon Ra, Hydrology Dept. MOAI]

Climate Change Impacts Visible in Myanmar

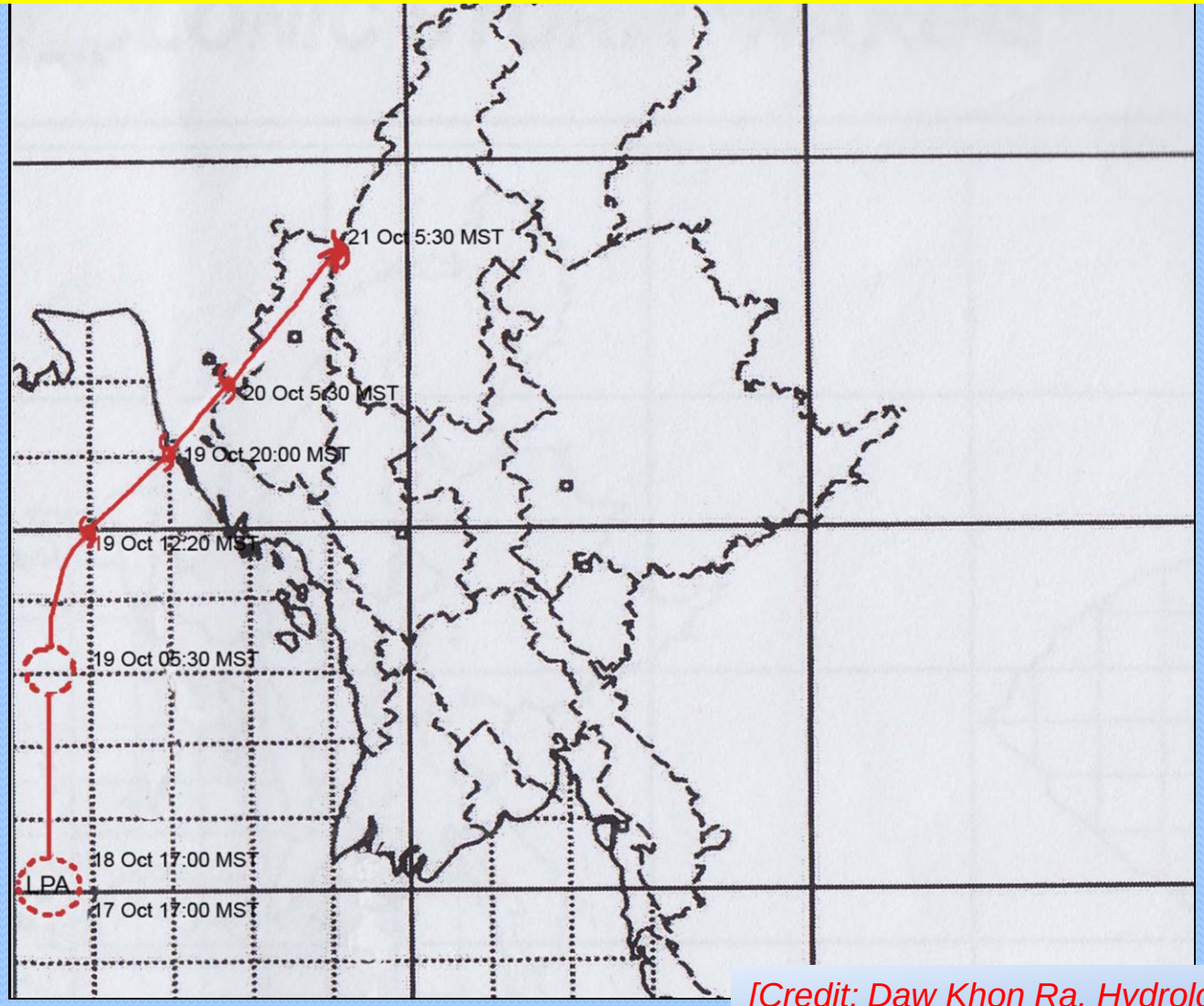
RAINFALL VARIATION : A TRACE OF CLIMATE CHANGE

STATION	Mean of The Record *(Inches)*			Departure from Annual Mean *(Percent)*	
	Annual *(1986 - 2010)*	Prior 2000 *(1986 - 2000)*	After 2000 *(2001 - 2010)*	Prior 2000 *(1986 - 2000)*	After 2000 *(2001 - 2010)*
AUNGLAN	35.82	34.32	38.38	-0.04	0.07
MAGWE	32.84	31.20	38.27	-0.05	0.17
MINBU	31.43	31.36	31.66	0.00	0.01

[Credit: Daw Khon Ra, Hydrology Dept. MOAI]

O2B Strom Track which occurred passing through Rakhine and Chin States

Climate Change Impacts Visible in Myanmar



[Credit: Daw Khon Ra, Hydrology Dept. MOAI]

SPILL VOLUMES OF 14 STUDIED DAMS FROM MAGWE REGION DURING OCTOBER 2011 (Page 1)

No.	DAM	TOWNSHIP	RESERVOIR CAPACITY AC-FT	SPILL VOLUME AC-FT	SPILL VOLUME PERCENT OF DAM CAPACITY
1	MADAY	KANMA	54,000	17,103	32
2	BWETGYI	AUNG LAN	73,192	33,076	45
3	MANN	MINBU	120,000	54,927	46
4	BANGON	TAUNGDWINGYI	7400	4957	67
5	YINSHAY	NGAPHE	2600	1809	70
6	KINMUNTAUNG	TAUNGDWINGYI	10,520	8071	77
7	PADE	AUNG LAN	32,900	28,942	88

[Credit: Daw Khon Ra, Hydrology Dept. MOAI]

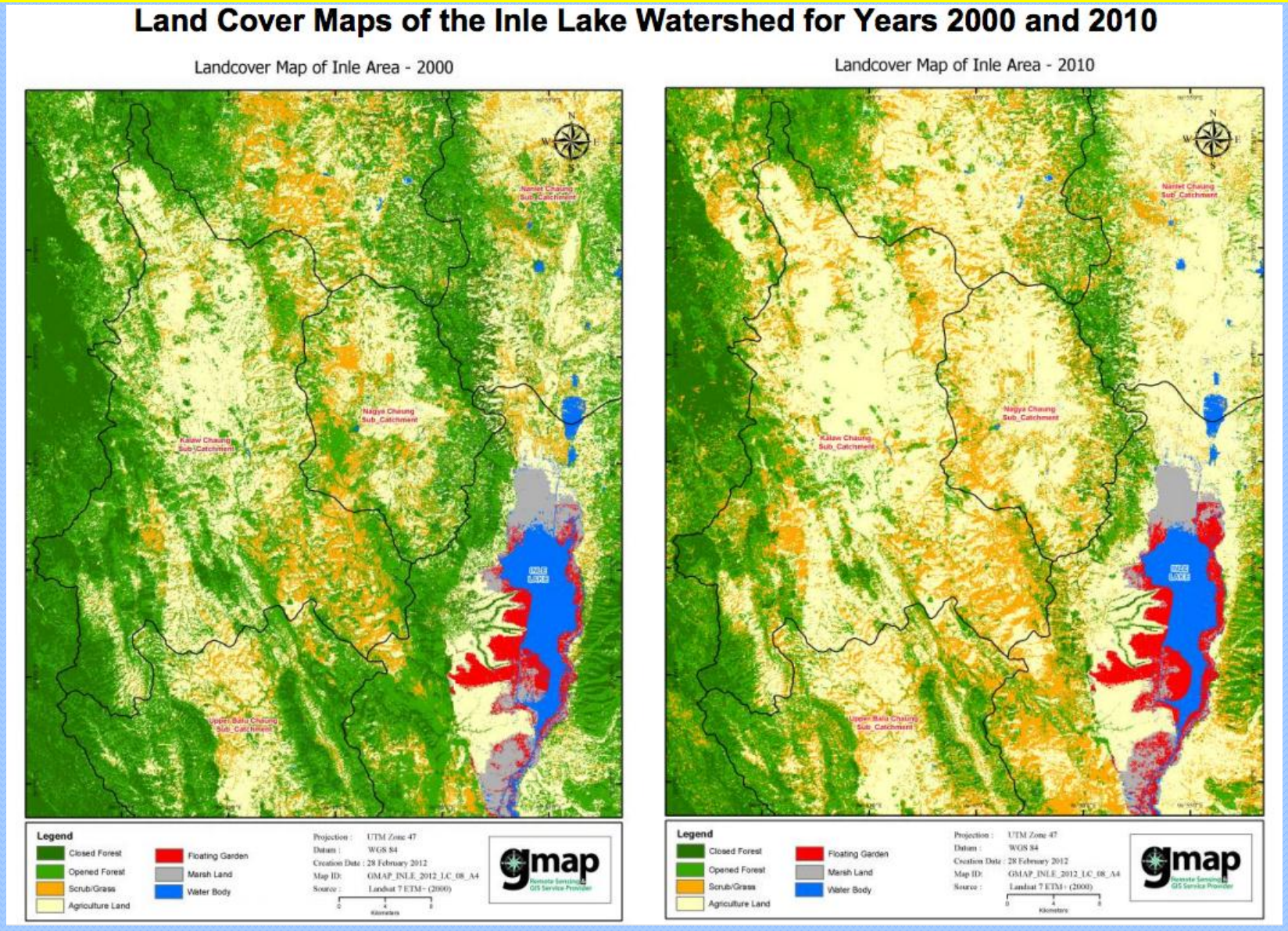
SPILL VOLUMES OF 14 STUDIED DAMS FROM MAGWE REGION DURING OCTOBER 2011 (Page 2)

No.	DAM	TOWNSHIP	RESERVOIR CAPACITY AC-FT	SPILL VOLUME AC-FT	SPILL VOLUME PERCENT OF DAM CAPACITY
8	NGAMIN	TAUNGDWINGYI	7750	9556	123
9	MONE	MINBU	674,400	858,968	127
10	SUN CHAUNG	MYO THIT	30,720	39,952	130
11	PALIN	MYO THIT	12,200	17,292	142
12	NATMAUK	NATMAUK	101,000	155,105	154
13	SALIN	SALIN	133,000	289,494	218
14	SADDAN	MYO THIT	25,000	57,424	230

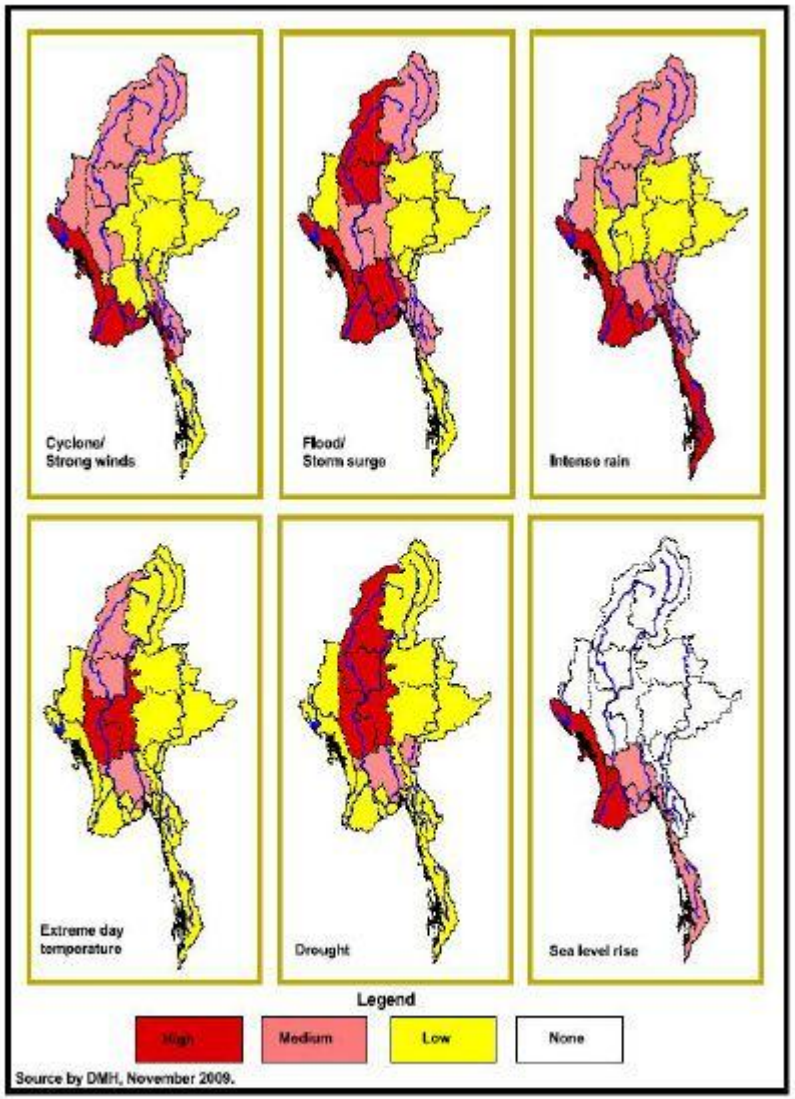
[Credit: Daw Khon Ra, Hydrology Dept. MOAI]

Climate Change Vicious Circle in Myanmar

No Trees <=> No Water <=> No Trees



Potential Hazard Areas in Myanmar under the Climate Change



The potential hazard levels for climate change features due to global warming

Myanmar Climate Change Scenarios

The MAGICC/SCENGEN model results on 3 climate scenario: -

(1) The temperature for 2001-2020 shows 0.5ºC-0.7ºC increase during the whole year in lower parts of Myanmar and record high maximum temperature may be expected. There is an increase in precipitation of about 4% during March- November in the whole country.

(2) The temperature for 2021-2050 shows 1.4 ºC -1.7ºC increase in the months June-November in the whole country. From March to November there is an indication of about 10% increase of precipitation in the whole country.

(3) The temperature for 2051-2100 shows the warming trend throughout the year especially in the cool season. The whole country will generally receive about 10% increase of precipitation during March to November and deficient rain of up to 80% is likely during the cool months from December to February.

Sea Level Rise – In 2050 the whole Ayeyarwady delta will be lost

II. Energy and Water

Water and Energy Relationship

- Water and energy consumption are interdependent
- The more water we use, the more energy we need
- The more energy we use, the more water we need

- Approximately four percent of the US's electricity is used just for moving and treating drinking water and wastewater.

- Conversely, it takes 3,000 to 6,000 gallons of water annually to power just one 60-watt incandescent bulb for 12 hours per day.

Principles of Water and Energy

1. Water and energy are interdependent
2. Increase water and energy efficiency – knowledge-based
3. A water-wise energy sector – Water Footprint
4. An energy-wise water sector – Carbon Footprint
5. Viewing wastewater as a non-conventional water resource
6. Integrated resource planning (including solid waste)
7. Maximizing social benefits

NWRC shall encourage all stakeholders – including government, utilities, private companies, NGOs, grassroots CBOs, women organizations and all tax payers to consider these principles and incorporate them into their work.

III. Food Security

Water is a main input for Food Security

- "Over the coming decades, feeding a growing global population and ensuring food and nutrition security for all will depend on increasing food production.
- This, in turn, means ensuring the sustainable use of our most critical finite source water"

Ban Ki-moon
UN Secretary General

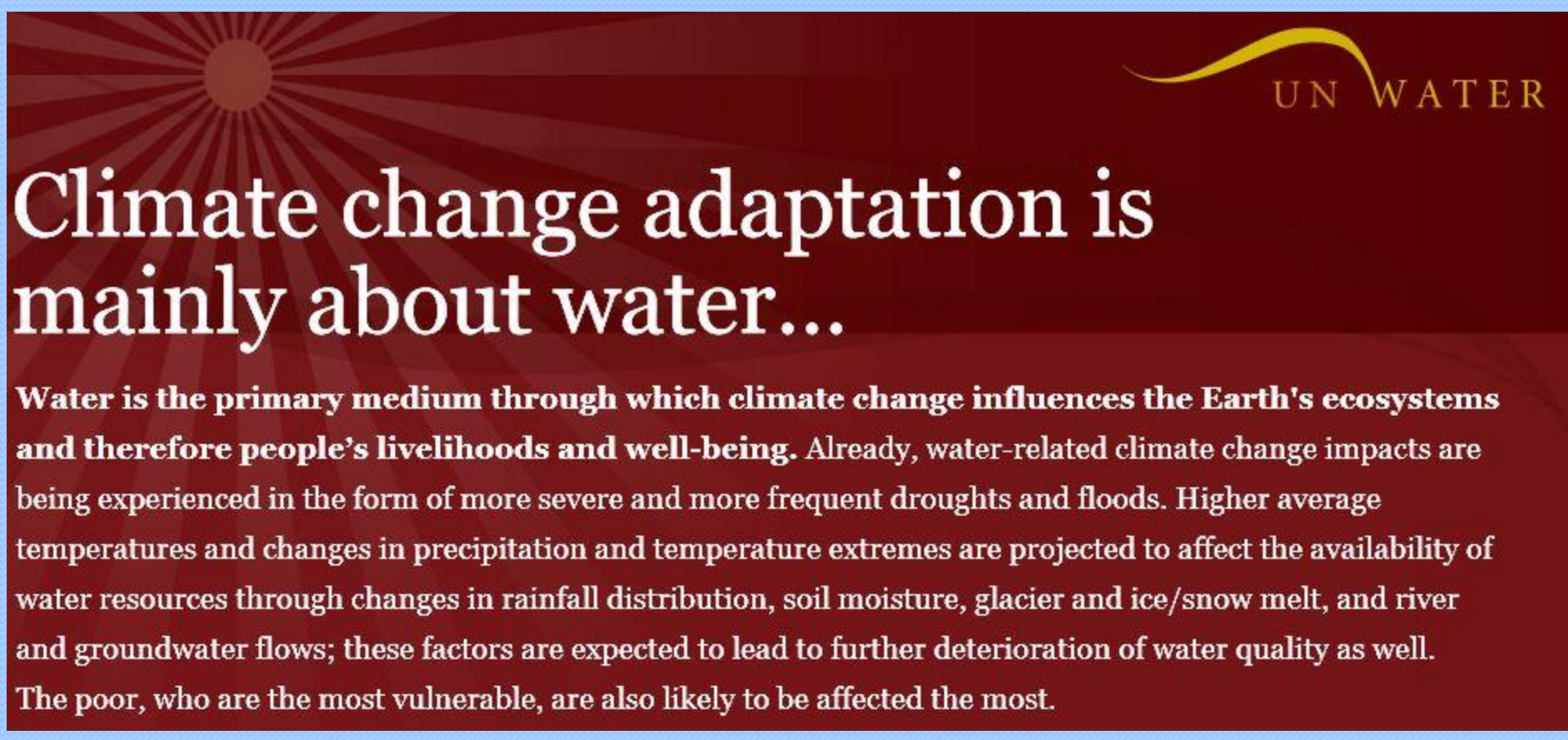
IV. Water-Food-Energy Nexus

Water-Food-Energy Nexus is a must to include in water resources planning

- **NEXUS APPROACH is a strong understanding of the interdependencies among these three systems and how to ensure food, water and energy security for an ever-growing population.**
- **This will require the work of individuals, businesses and government.**

V. Climate Change Adaptation

“Climate Change Adaptation is mainly about Water Management”, UN-Water stated.



“Water Management” = “Development Opportunities”

- **Adaptation to climate change is mainly about better water management.**
- **Recognizing this and responding to it appropriately present development opportunities.**
- **Appropriate adaptation measures build upon known land and water management practices to foster resilience to future climate change, thereby enhancing water security.**
- **Innovative technologies and integrated solutions are needed at the appropriate scales, for adaptation as well as mitigation.**
- **Any adaptation measures, however, need to be assessed for inadvertent adverse effects, in particular on the environment and on human health.**

Requires Policy Shift and Significant investment

- Climate Change Adapting through better water management requires policy shifts and significant investments -- that should be guided by the following principles:
- The sense of urgency for climate change adaptation and the recognition of the **centrality of water therein;**
- Systematically reflected in national plans or international investment portfolios for adaptation;
- **Mainstreaming adaptation within the broader development context;**
- Strengthening governance of water resources management and improving integration of land and water management;
- Improving and sharing knowledge and information on climate, water and adaptation measures, and investing in sustainable data collection and monitoring systems;

Requires Policy Shift and Significant investment (Pg2)

- **Building long-term resilience through stronger institutions and water infrastructure, including well-functioning ecosystems;**
- **Investing in cost-effective adaptive water management and technology transfer;**
- **Releasing additional funds through increased national budgetary allocations and innovative funding mechanisms for adaptation through improved water management.**

VI. IWRM and how NWRC can support MCCA

I W R M

- Strong interdepartmental (inter-ministerial) and intersectoral cooperation with the involvement of all relevant stakeholders is a precondition for effective decision-making, planning and implementation.
- **Effective cooperation should successfully integrate both top-down and bottom-up approaches.**
- Authority should be employed responsibly and stakeholders should have an impact on the process.
- Public participation should be ensured and gender issues should be taken into account when appropriate.
- IWRM should be applied together with ICZM, IGWM, ISM & IFM.

NWRC should support MCCA in the following areas

- **We need Policy Shift and Significant Investment**
- **Such reform should be guided by the following principles:**
  - **The sense of urgency for climate change adaptation and the recognition of the centrality of water**
  - **Mainstreaming adaptation within the broader development context;**
  - **Strengthening governance of water resources management and improving integration of land and water management;**

NWRC should support MCCA in the following areas (Pg2)

- **Improving and sharing knowledge and information on climate, water and adaptation measures, and investing in sustainable data collection and monitoring systems;**
- **Building long-term resilience through stronger institutions and water infrastructure, including well-functioning ecosystems;**
- **Investing in cost-effective adaptive water management and technology transfer;**
- **Releasing additional funds through increased national budgetary allocations and innovative funding mechanisms for adaptation through improved water management.**

Climate Change Adaptation is mainly about Better Water Management

Thank You for Your Time and Attention!