WELCOME

PRESENTED BY:

KH. GOLAM SHAWKAT

UPAZILA ENGINEER

SHIBPUR, NARSINGDI.

MASTER IN WATER ENGINEERING AND MANAGEMENT

- FINANCED BY:

"LGED'S HUMAN RESOURCES DEVELOPMENT AND CAPACITY BUILDING PROJECT"

- COURSE DURATION: 09TH AUGUST 2021- 31ST JULY 2022

Local Government Engineering Department (LGED)

COURSE OVERVIEW

- Water is The Most Abundant Resource on The Earth. At The Same Time, It is The Most Scarce Resource on The Earth Also.
- Today's Major Challenges For Civil/ Water Engineers And Managers Include Securing Water for People and for Food Production, Protecting Vital Ecosystems and Dealing with Variability and Uncertainty of Water in **Space** and **Time**.
- The Main Objective of Water Engineering and Management Course is to Acquire Knowledge and Hands-on Practice by Tools and Techniques to Come up with Viable and Sustainable Solutions Within The Framework of the Integrated Water Resources Management.

COURSE STRUCTURE

- Water Engineering And Management (WEM) is Under School of Engineering & Technology (SET) of AIT.
- **This is a One Year Master Program (3 Semesters) Comprised of 12 (Twelve) Subjects Including a Special Study Totaling 30 Credits.**
- The Total 3 Semesters Are Divided Into The Followings:
  - ✓ 1st Semester (August Semester): 5 Subjects, 13.0 Credits
  - ✓ 2nd Semester (January Semester): 5 (4 Theory + 1 Laboratory) Subjects, 14.0 Credits
  - ✓ Inter- Semester (June Semester): 2 Subjects (Including Special Study), 3.0 Credits

COURSE DETAILS

1st Semester (August 2021 semester)

- CE 74.11: Watershed Hydrology
- CE 74.12: Hydrodynamics
- CE 74.13: Water Resources Systems
- CE 74.14: Concepts In Water Modelling
- CE 74.41: Water Supply And Sanitation

2nd Semester (January 2022 Semester)

- CE 74.15: Research Design And Experimental Method (Laboratory)
- CE 74.17: Integrated Water Resources Management (IWRM)
- CE 74.18: Climate Change And Water Resources
- CE 74.22: Irrigation And Drainage Systems Management
- CE74.52: Groundwater Development And Management

Inter- Semester (June 2022 Semester)

- AT76.13: Remote Sensing Data Analysis
- ED52.9004: Analysis using R

CE 74.11: WATERSHED HYDROLOGY (3.0 CREDIT)

Prof. Mukand S. Babel

COURSE OUTLINE:

- Understanding in Depth Aspects of Hydrologic Cycle, Transport Processes (Physical & Chemical) and Their Applications to Engineering Problems and Hydrologic Design.
- Recognizing The Limitations in Design of Water Development and Management Projects.
- Applying Hydrological Theories and Principles to Water Problems.

CE 74.12: HYDRODYNAMICS (3.0 CREDIT)

Dr. Ho Huu Loc

COURSE OUTLINE:

- Understanding The Fundamental Principles of Fluid Mechanics and Their Application Areas of:

  I. Pipeline Systems,

  II. Open Channels,

  III. Hydraulic Structures;

- Learnt About Fluid Statics- Dynamics By Means of Experimental And Empirical Methods;
- Undertaking Appropriate Modelling Tools For The Design of Pipeline Systems and Hydraulic Structures (Weirs, Spillways, Sluice Gate, Culvert);

CE 74.13: WATER RESOURCES SYSTEM (3.0 CREDIT)

Prof. Sangam Shrestha

COURSE OUTLINE:

- This Course Was Designed to Provide in-depth Understanding of Simulation, Optimization, Multi-criterion-decision-making Study for Successful Water System Analysis;
- Study About Water Pricing & Water Allocation;
- Measuring Performance of Different Water Resources Systems in Terms of Reliability, Resilience & Vulnerability.

CE 74.14: CONCEPTS IN WATER MODELLING (1.0 CREDIT)

Dr. Sutat Weesakul

COURSE OUTLINE:

- Learned About Physical & Mathematical Modelling (Step by Step) of Water Resources Engineering and Their Applications;
- Measuring Performance of Models in Terms of Different KPI Such As RMSE, EI, MAPE etc.

CE 74.41: WATER SUPPLY AND SANITATION (3.0 CREDIT)

Prof. Mukand S. Babel

COURSE OUTLINE:

- The Objective Was to Provide Engineering Principles and Tools for Designing and Operating Water Supply and Sanitation Systems;
- Comprehends the Wide Range of Health and Social Issues Related to Water Supply, Sanitation And Hygiene;
- Brief Discussion about SDG Achievements.

CE 74.15: RESEARCH DESIGN AND EXPERIMENTAL METHOD (LAB) (2.0 CREDIT)

Prof. Sangam Shrestha

Arturo Roa

COURSE OUTLINE:

- Hands on Practice of Different Laboratory Experiments & Use of Different Data Analyzing Tools;
- Calibration of Different Water Flow Measuring Apparatus;
- Field Exercise At Khun Dan Prakan Chon Dam of Some Experiments That We had Done in The Laboratory.

STUDY TOUR AT KHUN DAN PRAKAN CHON DAM

CE 74.17: INTEGRATED WATER RESOURCES MANAGEMENT (IWRM) (3.0 CREDIT)

Prof. Mukand S. Babel

COURSE OUTLINE:

- The Objective of This Course was to Provide Knowledge and Understanding of The Multi- Dimensional Facets Leading to Effective Water Resources Management;
- Understanding the Role of Stakeholder Participation in Water Management, and Identify the Various Means of Stakeholder Engagement;
- Water Demand Forecasting And Management, Risk Management, Public Awareness System were Also Studied.

❖ I was Able to Provide an Unique Idea about Improving Current Water Tariff System in Bangkok Metropolitan Area which was Highly Appreciated by Water Engineering & Management Department, AIT .

CE 74.18: CLIMATE CHANGE AND WATER RESOURCES (3.0 CREDIT)

Prof. Sangam Shrestha

Course Outline:

- Deliberation of Climate Change and Climate Variability with Their Effects on Different Water Resources Systems;
- Historical And Regional Aspects of Climate Change and Water;
- Brief Discussion About Global Warming and Green House Gases;
- Elaborate Study About Different Emission Scenarios (SRES, RCP, SSP Etc.);
- Downscaling of General Circulation Models (GCM) And Regional Climate Models (RCM) for Future Climate Change Projection;
- Produced Some Expertise on **ArcGIS And RclimDex Software** for Trend Analysis of A Time Series;
- Study About Adaptation & Mitigation Measures to Climate Change in Water Sector.

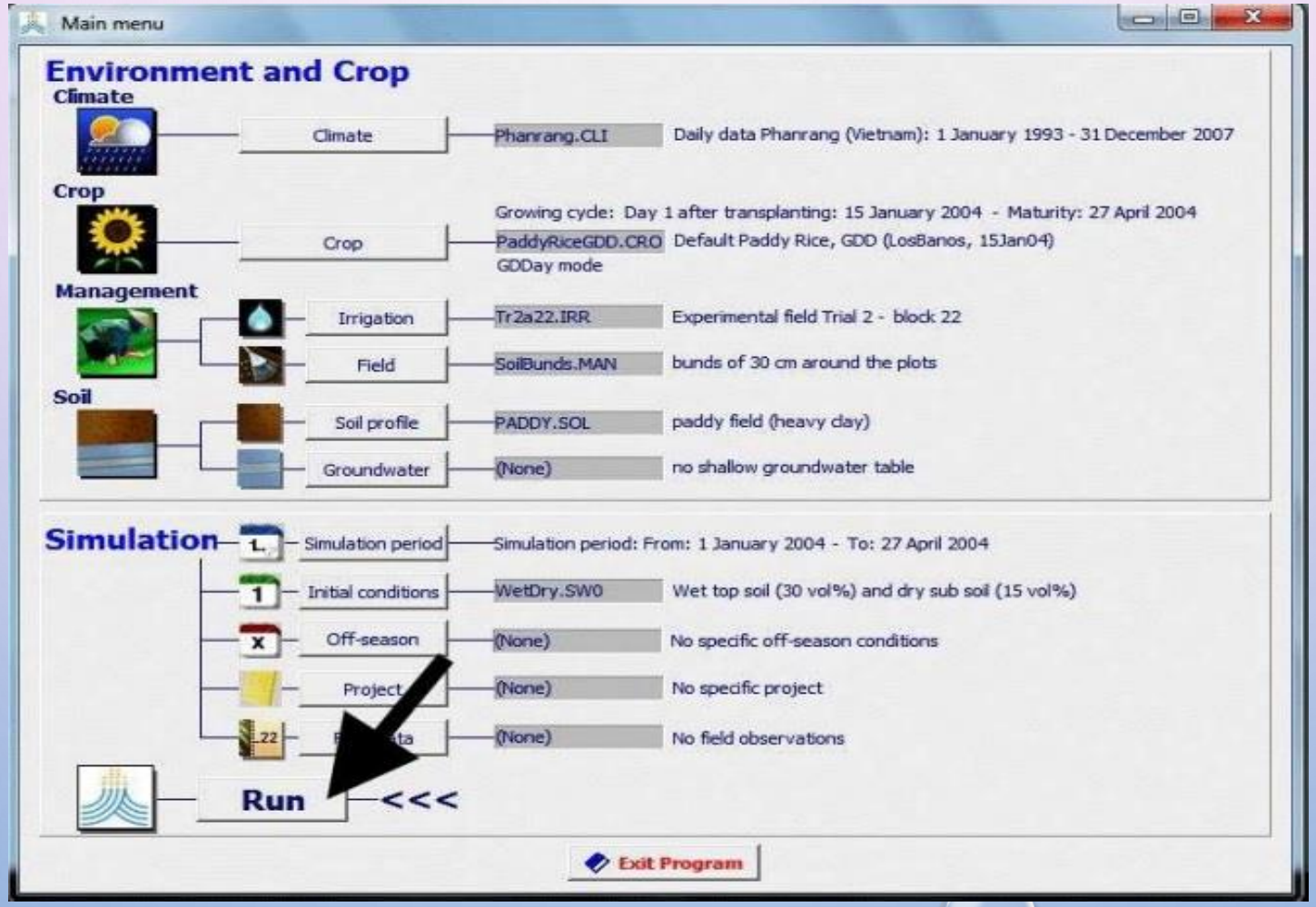
CE 74.22: IRRIGATION AND DRAINAGE SYSTEMS MANAGEMENT (3.0 CREDIT)

Dr. Mohana Sundaram Shanmugam

COURSE OUTLINE:

- This Course Was Designed for Introducing Different Procedures to Supply Irrigation Water to Agricultural Areas from Both Surface Water Sources and Ground Water Sources;
- This Course Also Focused on Irrigation Water Quality, Deficit Irrigation, Different Methods of Irrigation;
- Reuse of Waste Water After Irrigation was Also Studied in This Course;
- An Open Source Software- “AquaCrop” was Taught in this Course for Determining Maximum Crop Yield.

INTERFACE OF AquaCrop SOFTWARE



CE 74.52: GROUNDWATER DEVELOPMENT AND MANAGEMENT (3.0 CREDIT)

Dr. Mohana Sundaram Shanmugam

COURSE OUTLINE:

- Characterization The Groundwater Aquifers, Development And Managements of Aquifers ;
- Brief Discussion About Groundwater Flow, Sub-surface Logging Techniques, Groundwater Contamination;
- Cause And Effect of Land Subsidence and Saltwater Intrusion;
- Groundwater Vulnerability Assessment Using QGIS Software.

OUTPUT OF QGIS SOFTWARE

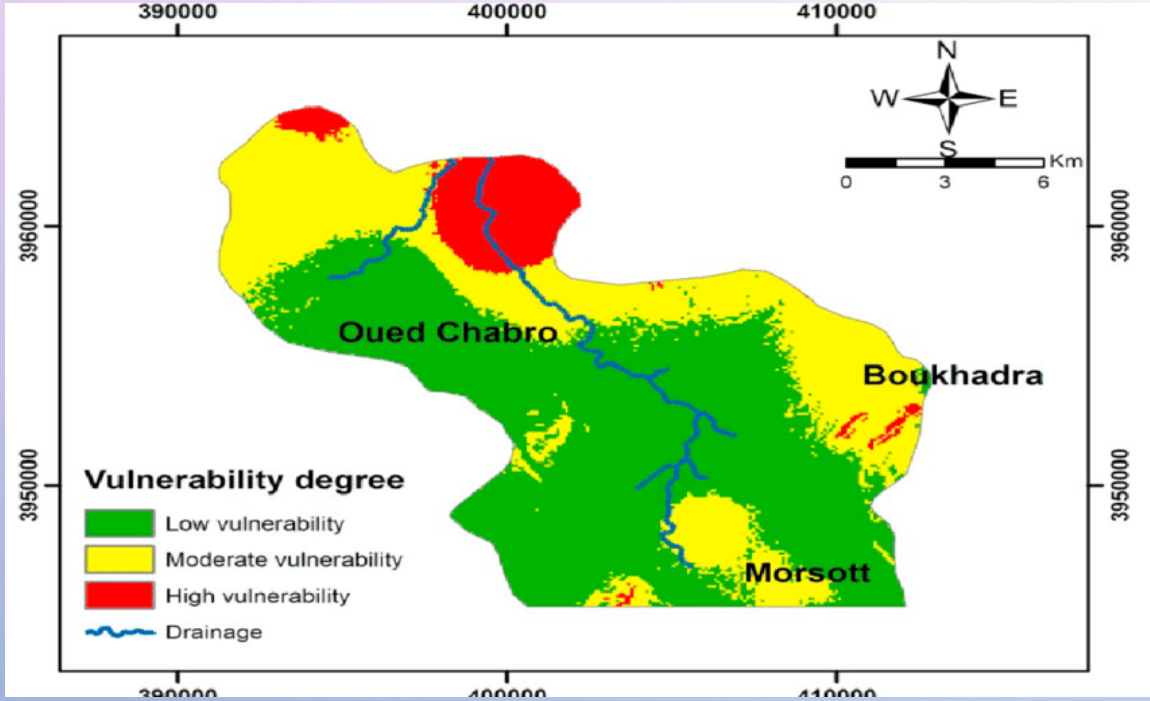


Fig:DRASTIC Map (Vulnerability Map) of a specific region

This type of map is produced by inputting the following factors of specific regions:

D – Depth to Water

R – Net Recharge

A – Aquifer Media

S – Soil Media

T – Topography

I – Impact of Vadose Zone Media

C – Hydraulic Conductivity of Aquifer

ED52.9004: ANALYSIS USING “R” (1.0 CREDIT)

Dr. Takuji W. Tsusaka

Course Outline:

- “R” Packages Are Extensions to The R Statistical Programming Language;
- A Very Handy Programming Language for All Discipline People;
- Descriptive Analysis, Regression Models, Graphical Representation of a Giant Time Series Can be Decomposed by “R” Packages Easily ;
- Identify the Reactive and Proactive Variables of a System.

AT76.13: REMOTE SENSING DATA ANALYSIS (2.0 CREDIT)

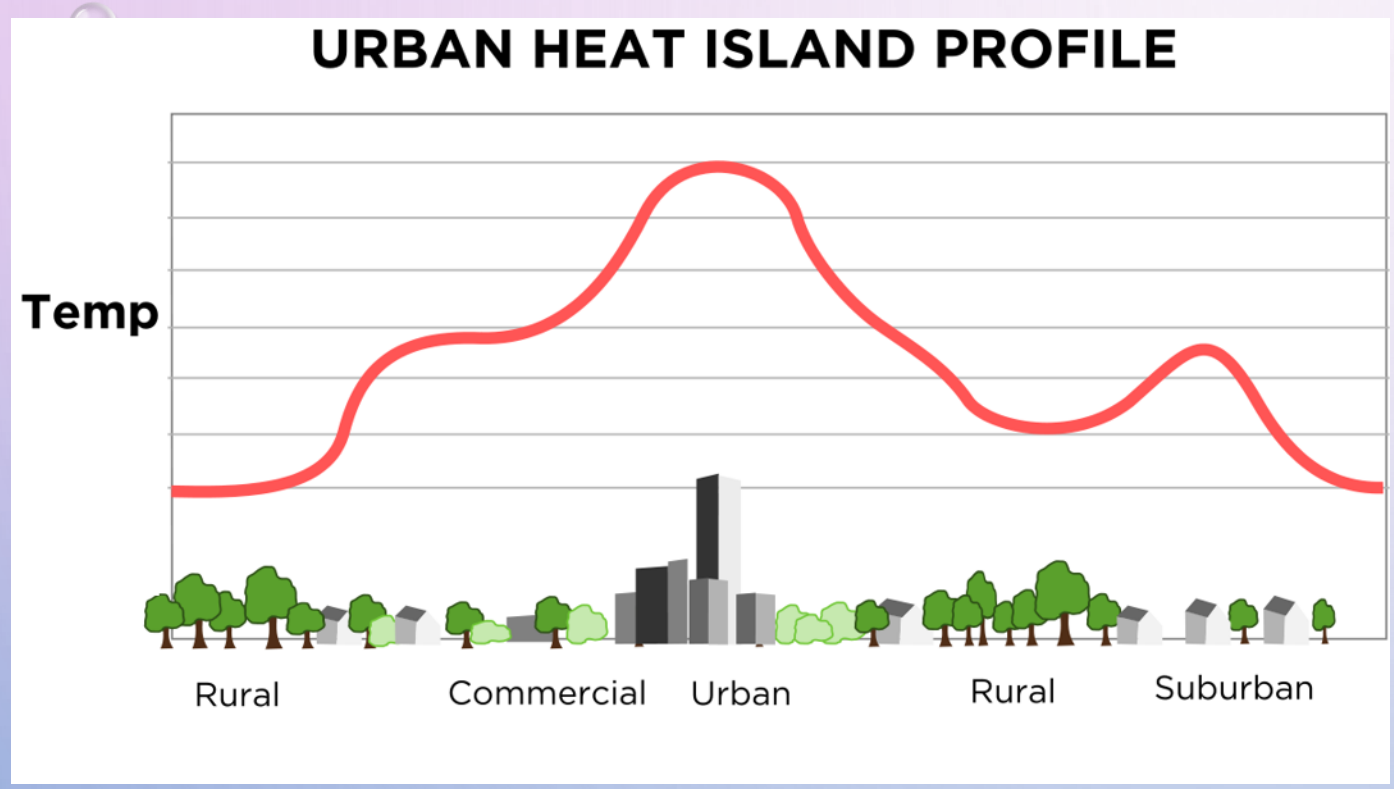
Dr. Salvatore G.P. Virdis

COURSE OUTLINE:

- Providing Practical Knowledge and In-depth Understanding of The Remote Sensing;
- Elaborate Study About Remotely Sensed Data Collection, Processing, Analysis Tools and Techniques, Time Series Analysis, Data Visualization Techniques;
- Both ArcGIS And QGIS Were Also learned For This Course.

❑ My Special Study Topic Was **"Determination of Urban Heat Island in Bangkok Metropolitan Region (BMR)"** Under This Course.

SPECIAL STUDY: DETERMINATION OF URBAN HEAT ISLAND IN BANGKOK METROPOLITAN REGION (BMR)



- An Urban Heat Island (UHI) is an urban area or metropolitan area that is significantly warmer (both air temperature and LST) than its surrounding rural areas due to human and natural activities.

- Land surface Temperature (LST) is defined as the skin temperature of the ground which can be established by the radiative transfer model.

OBJECTIVES

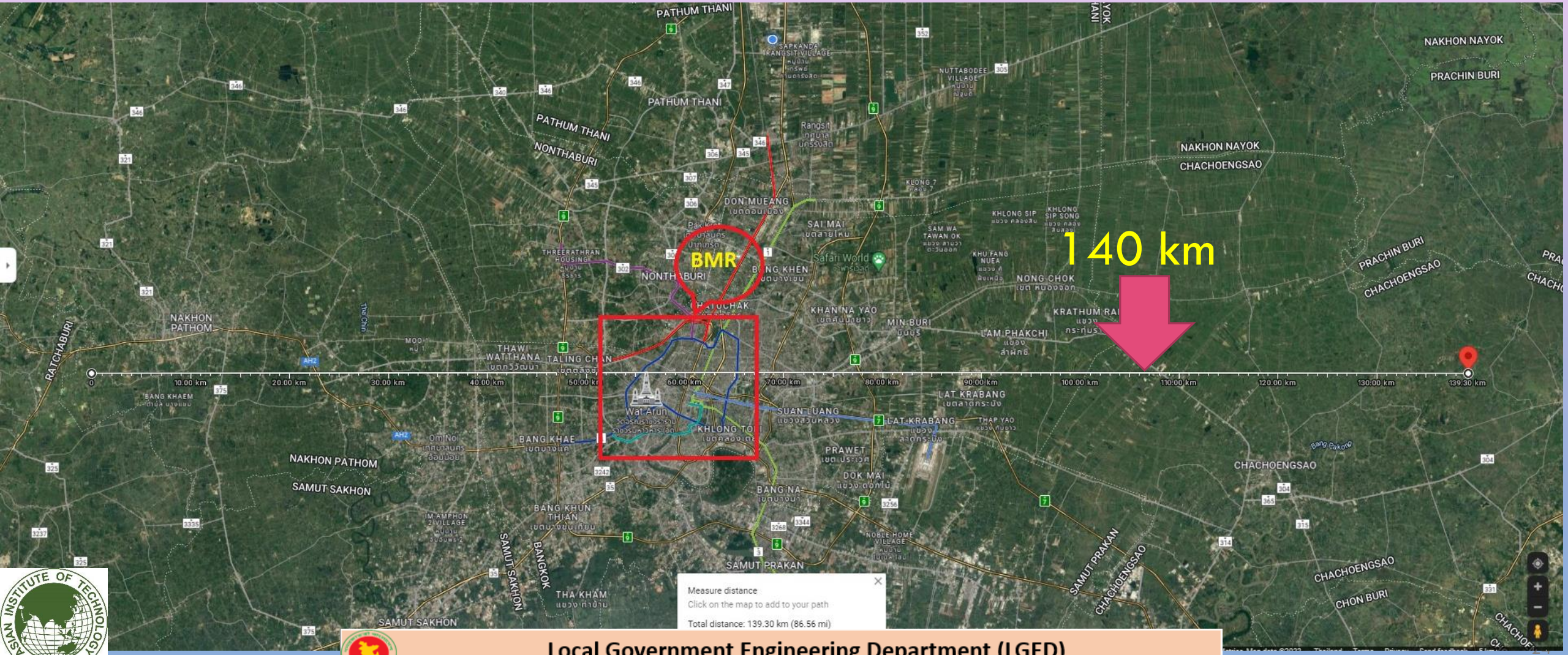
Determination of seasonal profile at Bangkok Metropolitan Region (BMR) along with adjacent areas of BMR

Determination of heat island of the study area

Trend analysis of LST at one urban and two rural points

Analysis of possible causes of spatial variation

STUDY AREA



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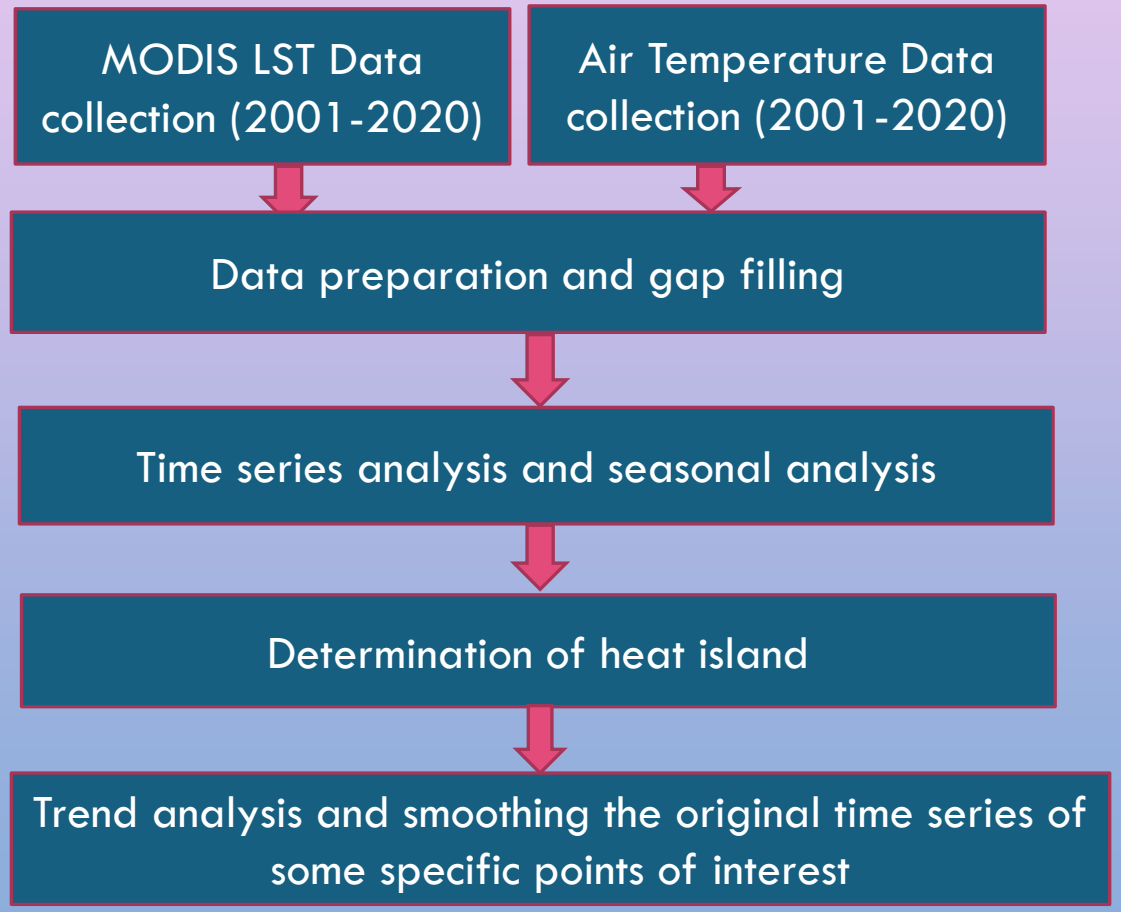
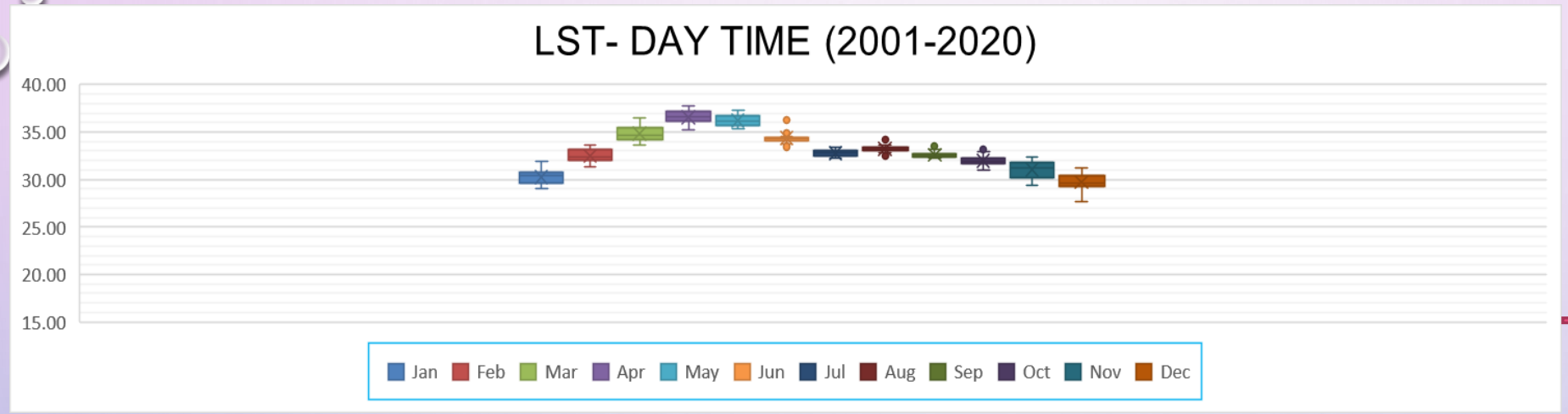
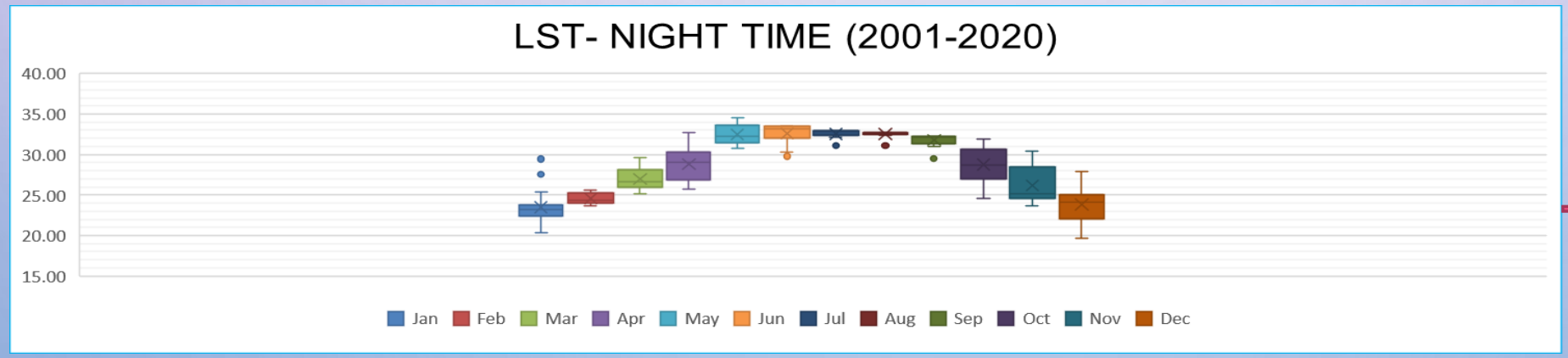
METHODOLOGY



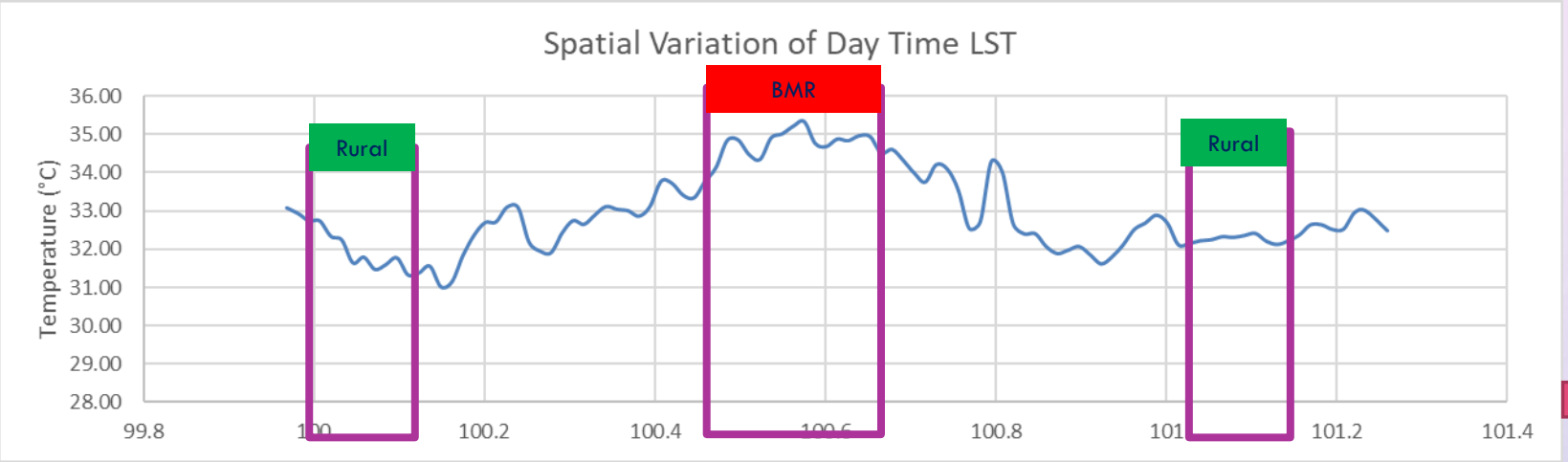
SEASONAL PROFILE OF STUDY AREA

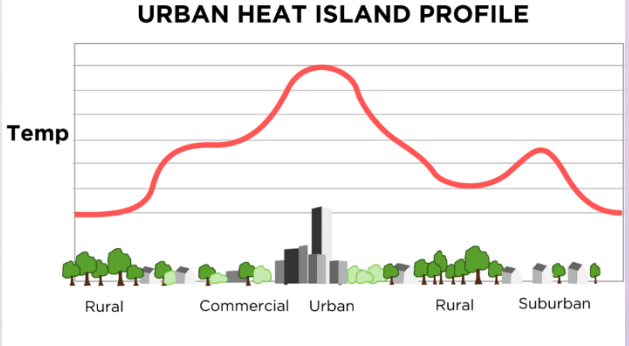


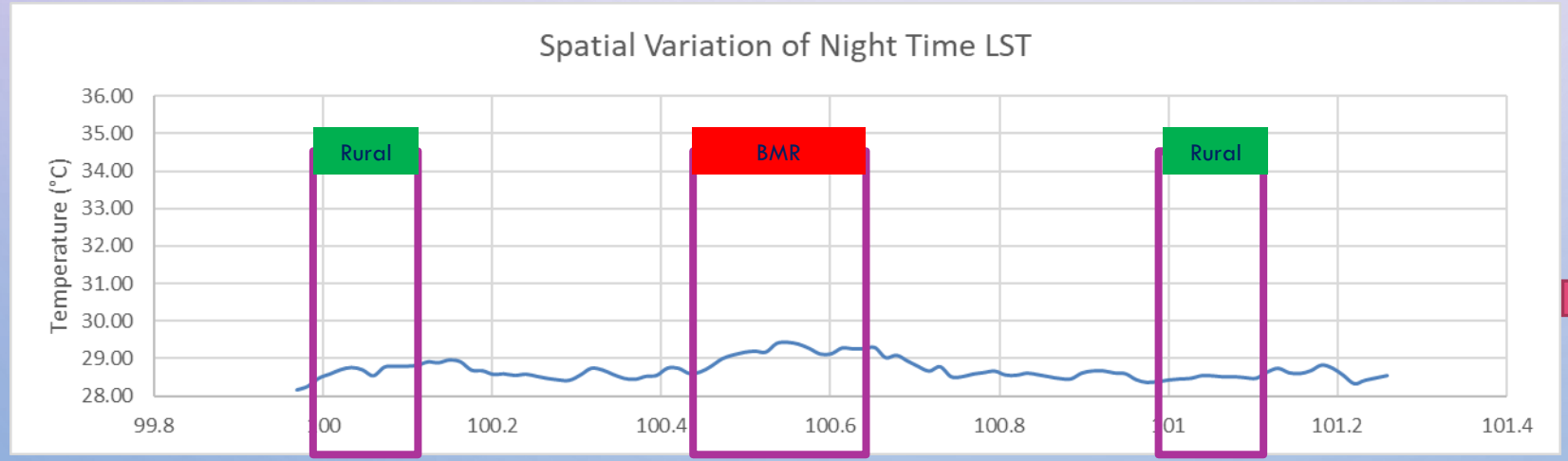


- April, May, June are the hottest and December-January are the coldest months of Bangkok with respect to both day time & night time LST.

SPATIAL VARIATION (HEAT ISLAND)

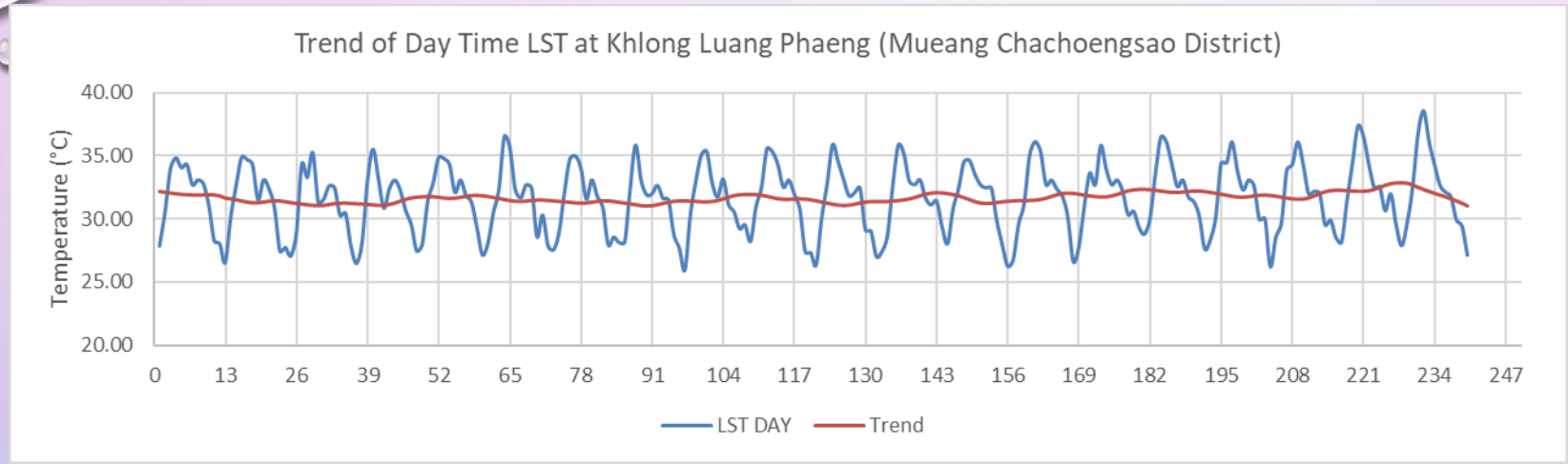


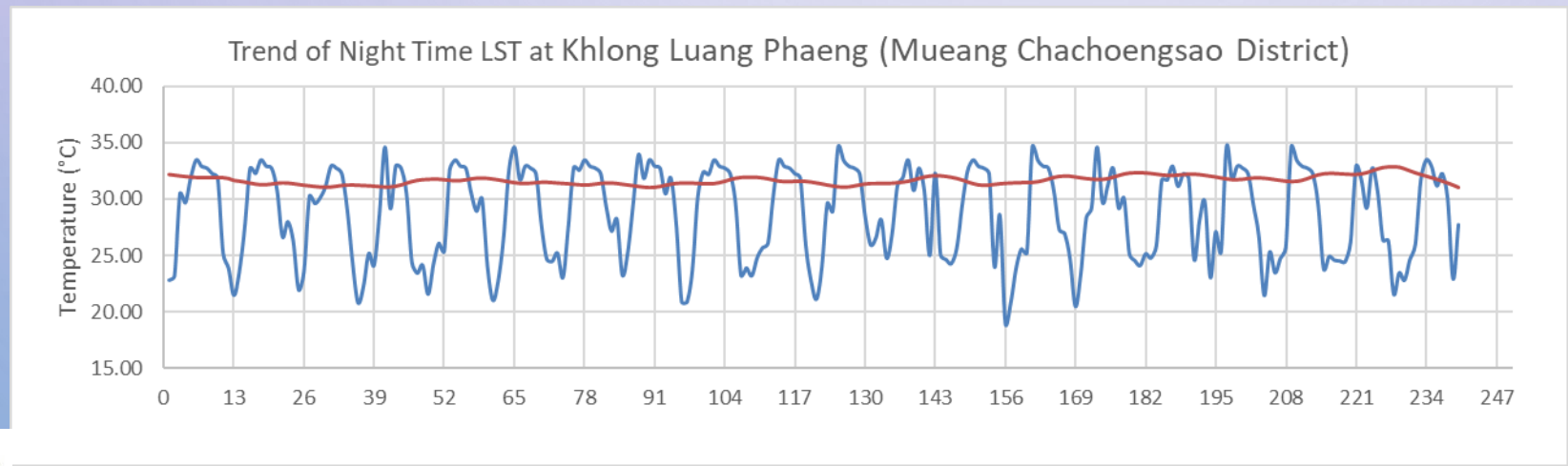




- Both figure shows that the land surface temperature is higher in Bangkok Metropolitan Region (BMR) than the rural and sub-urban areas.
- The highest day time LST Was Found 35.35°C.
- The highest night time LST Was Found 29.43 °C at the same place of BMR.

TREND ANALYSIS





KEY FINDINGS FROM THE SPECIAL STUDY

- Seasonal Profile of Study Area.
- Positive Correlations Between LST and Spatial Condition.
- Other Climatic Factors i.e. Relative Humidity, Pressure etc. has Also Some Influences for Generating Heat Island.
- Suggesting Some Adaptation and Mitigation Strategies for Urban Heat Island (UHI) Effect.

SCOPE OF USING KNOWLEDGE IN LGED

- Being a Civil Engineer, I Can Use My Watershed Hydrology Related Knowledge to Design, Build and Operate Dams and Other Reservoirs Constructed By LGED.
- Can Utilize my Acquired Knowledge to Construct Climate Resilient Structures Which is Already Practiced by LGED Now a Days.
- Using Efficient Strategies, I Can Try to Ensure Stakeholder's Participation in Small Scale Water Projects.
- Can Concentrate More in Sustainable Development.
- The Experimental Findings Can be Useful in Providing Some Innovative Solutions to Solve Some Practical Engineering Problems.
- Can Contribute by Providing Sustainable Ideas for Irrigation and Drainage Purpose at Small Scale Water Project Area.
- Similar to My Special Study Topic, I Can Do Some Analysis for My Working Area Considering Different Climatic & Hydrologic Factors. Then I Can Share My Findings to The Designer for Taking Those in Consideration While They Design.

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THANK YOU ALL