ສະພາບດິນຟ້າອາກາດ, ການອອກແບບ ແລະ ກໍ່ສ້າງໜ້າທາງຄອນກຣີດ ໃນ ສປປລາວ

SURYA DEUANHAKSA[1] , PHUXAY KHAMKHANPOM[2]

ບົດຄັດຫຍໍ້

ໃນບົດຄົ້ນຄວ້ານີ້ ແມ່ນນຳສະເໜີວິທີການເອົາຂໍ້ມູນສະພາບດິນຟ້າອາກາດ ຈາກອົງການດາວທຽມ NASA MERRA climate data ໂດຍອົງການ NASA MERRA climate data ໄດ້ບັນທຶກ ແລະກຳນົດ ເຂດການກະຈາຍຕົວຂອງສະພາບດິນຟ້າອາກາດໃນ ສປປ ລາວອອກເປັນ 60 ສະຖານີ, ໃນການວິເຄາະ ແລະ ຄິດໄລ່ຫາຄ່າການກະຈາຍຕົວຂອງສະພາບອາກາດໃນ 3 ພາກຂອງ ສປປ ລາວ ໂດຍພາກເໜືອສຸ່ມເອົາແຂວງ ຊຽງຂວາງ, ພາກກາງສຸ່ມເອົານະຄອນຫລວງວຽງຈັນ ແລະ ພາກໃຕ້ສຸ່ມເອົາແຂວງຈຳປາສັກ: (1). ອຸນນະພູມ ສະເລ່ຍ ແຕ່ປີ1985-2020, (2). ຄວາມໄວລົມສະເລ່ຍ ແຕ່ປີ1985-2020, (3).ປະລິມານແສງແດດໂດຍ ສະເລ່ຍ ແຕ່ປີ1985-2020, (4). ປະລິມານນ້ຳຝົນສະເລ່ຍ ແຕ່ປີ1985-2020 ແລະ (5). ຄວາມຊຸ່ມສະເລ່ຍ ຂອງສະພາບອາກາດແຕ່ປີ1985-2020 ເພື່ອປະກອບເຂົ້າໃນບົດວິທະນານິພົນປະລິນຍາເອກ, ເພື່ອນຳເອົາຂໍ້ມູນ ດັ່ງກ່າວມາຄິດໄລ່, ກຳໜົດຄ່າ Parameter, ການອອກແບບກໍ່ສ້າງໜ້າທາງຄອນກຣີດ ໂດຍປຽບທຽບກັບ ມາດຕະຖານການອອກແບບ AASHTO 1993 (ຫຼື 1998) ແລະ ມາດຕະຖານເຕັກນິກເສັ້ນທາງໃນ ສສ ຫວຽດນາມ ເພື່ອນຳໃຊ້ເຂົ້າໃນການອອກແບບກໍ່ສ້າງເສັ້ນທາງຄອນກຣີດ ໃຫ້ມີຄວາມເໝາະສົມ ແລະ ສອດຄ່ອງ ກັບສະພາບຄວາມເປັນຈິງຂອງສະພາບພູມີອາກາດໃນ ສ ປປ ລາວ.

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Weather, climate, for design and build concrete pavement in Lao PDR

SURYA DEUANHAKSA[1] , PHUXAY KHAMKHANPOM[2]

Abstract

In this study, it is presented how to obtain climate data from NASA MERRA climate data by NASA MERRA climate data, recording and reducing the climate distribution zone in Malaysia into 60 stations, in analyzing and calculating the cost of climate distribution in 3 regions of India by northern Bangladesh, central Bangladesh and southern Bangladesh: (1). The average temperature from 1985-2020, (2). Average wind speed from 1985-2021, (3). The average amount of sunshine from 1985-2020, (4). Average rainfall from 1985-2020 and (5). Average moisture of the weather from 1985-2020 to incorporate into a graduate radio, to bring such information to calculate, to calculate parameter value, concrete face construction design by comparing it to the AASHTO 1993 (or 1998) design standard and the road technical standards in Vietnam to be used to design concrete roads to be appropriate and in accordance with the reality of the weather conditions in the Lao PDR.

Keywords: Weather, climate, parameters used in cement concrete pavement design in Lao PDR

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1. Introduction

For the design and construction of concrete it is necessary to take into account the conditions of weather, climate, hydrology, building materials, and traffic. But currently in Lao PDR, various projects are following foreign standard requirements, so they are not appropriate. The concrete design can follow the AASHTO 1993 (or 1998) standards, the mechanical test method and according to basic standard 39 of the road standard of the Republic of Vietnam (old agreement 3230). The methods are different, but they must be based on traffic parameters, material parameters and weather and traffic conditions. In this topic, PhD students conduct research on climate, weather and traffic parameters in the Lao People's Democratic Republic. In this chapter, the researcher is studying the specific information of Savannakhet province

- Referring to the research of the United States of America that conducted a research study in Chicago, Illinois, Chicago, which the results of the research from 1985-2019 are average temperature 68.80 ^{O}F, average wind speed 5.90 mph, average sunshine 38.00%, average rainfall 47.50 inches, average humidity 11.20%

- Referring to the research of the United States of America research conducted in Phoenix, Arizona, the results of the 1985-2019 research are average temperature 74.70 ^{O}F, average wind speed 5.30 mph, average sunshine 60.80%, average rainfall 6.60 inches, average humidity 14.80%

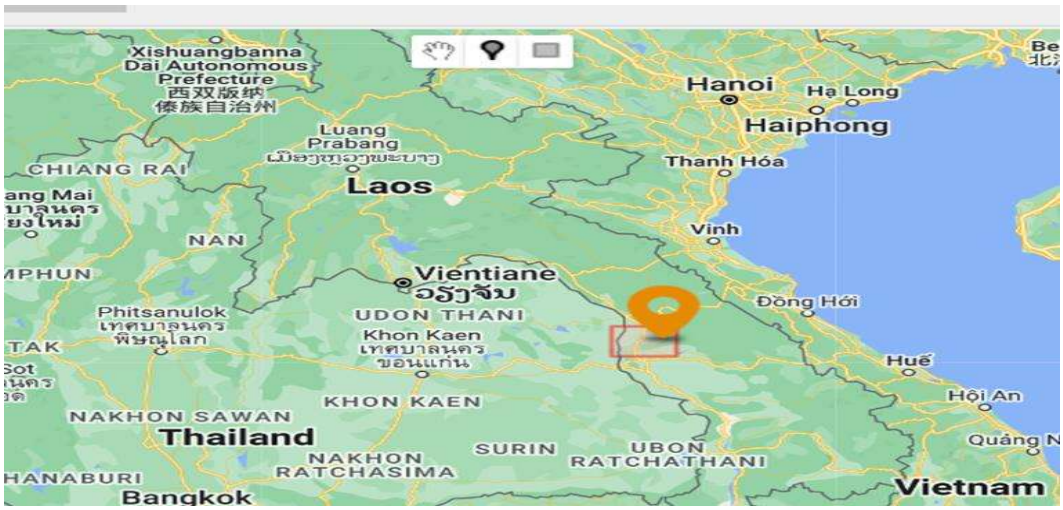
- Referring to the research of the United States of America research conducted in Key West, Florida, the results of the 1985-2019 research are average temperature 77.70 ^{O}F, average wind speed 8.40 mph, average sunshine 72.60%, average rainfall 36.80 inches, average humidity 5.60 %

2. The scope of research studies, data analysis equipment and methods

2.1. The scope of research studies

According to NASA's geographical division MERRA climate data, dividing the climate distribution zone in Malaysia into 60 NASA MERRA climate data stations, researchers chose to select the provincial weather zone, with the MERRA code 117386 as a case study.

The northern air zone is PHONGSALY province with the MERRA code 123141, the central are VIENTIANE capital with the MERRA code 119109, SAVANNAKHET province with the MERRA code117386 and the south is CHAMPASACK province with the MERRA code 115083



https://infopave.fhwa.dot.gov/Tools/MEPDG Inputs From MERRA

2.2. Equipment tools

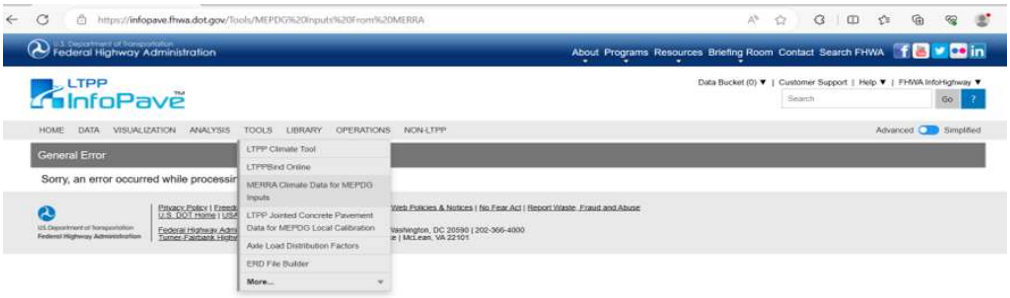
The tools used for data analysis include: computer, internet signal, excel program, Minitab program and AASHTO Ware pavement design ME program.

- Computer: a tool used to install programs, download data;
- Internet signal: in connection to search or find the desired information;
- Excel program, Minitab program and AASHTO Ware pavement design ME program: used to analyze statistical data such as: find average values, create tables, draw graphs, process...

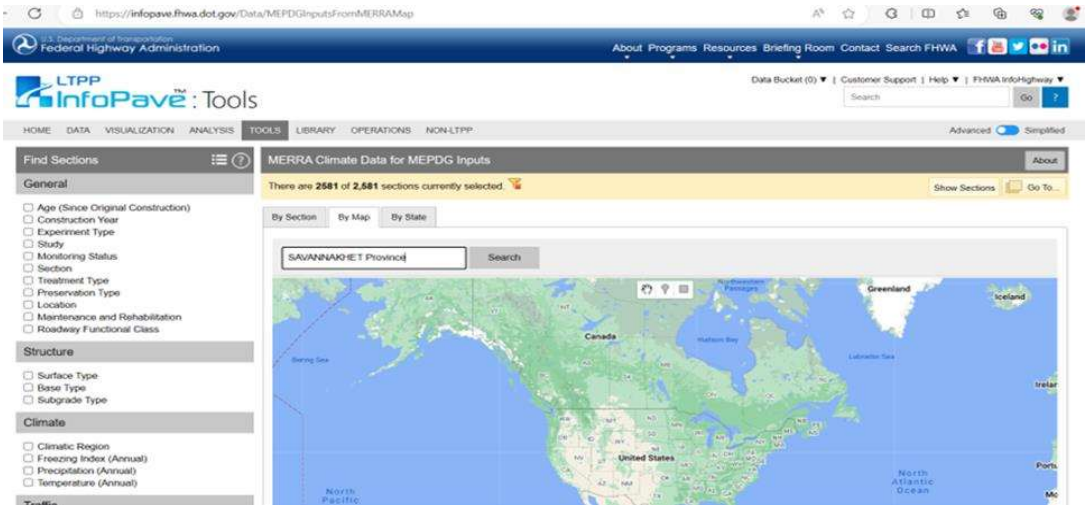
2.3. How to analyze data

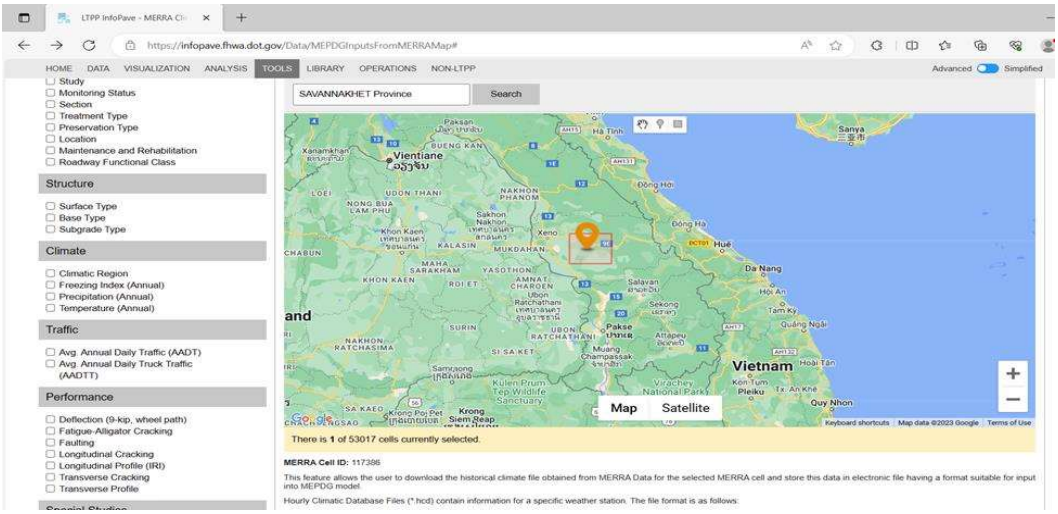
- Go to the website of the Federal Highway Administration of the United States of America at the website: https://infopave.fhwa.dot.gov/Tools/MEPDG Inputs From MERRA

- Click on TOOLS, select click on MERRA Climate Data for MEPDG Inputs

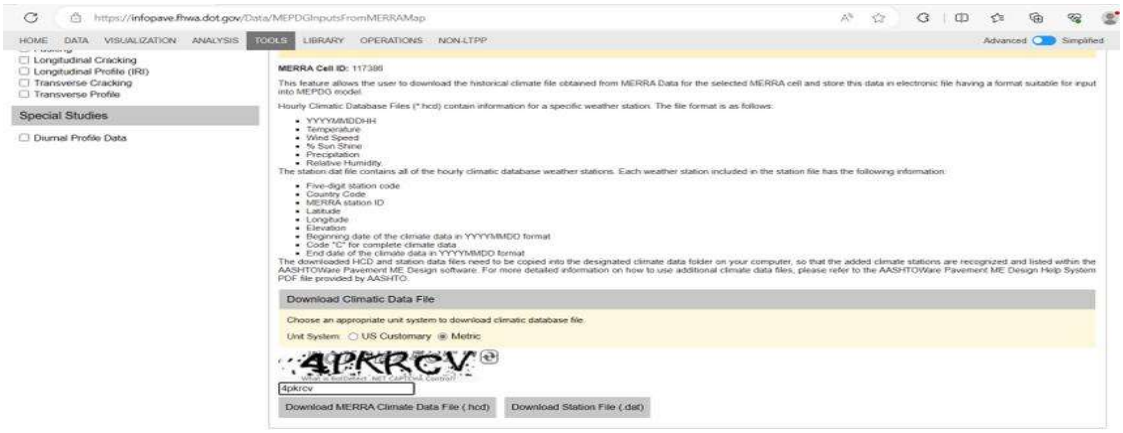


- Go to the map by map, type the name of the place: SAVANNAKHET province and click on search

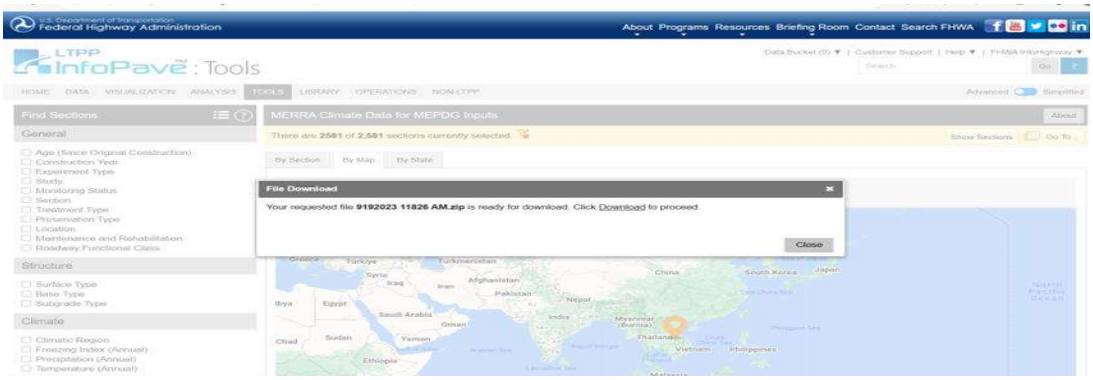




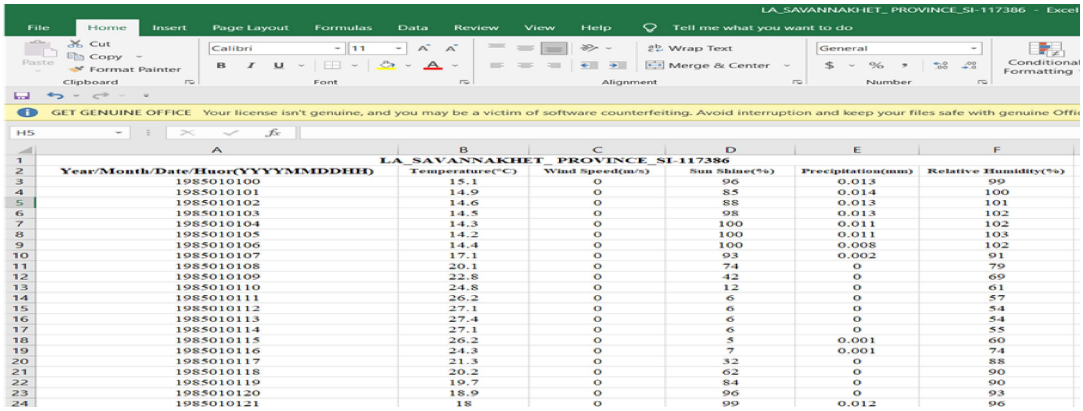
- Move down to select Metric system, insert code and download MERRA Climate Data file (.hcd)



- The software will allow downloading files with standard data structure, hourly data from 1985 to the end of 2020 click download

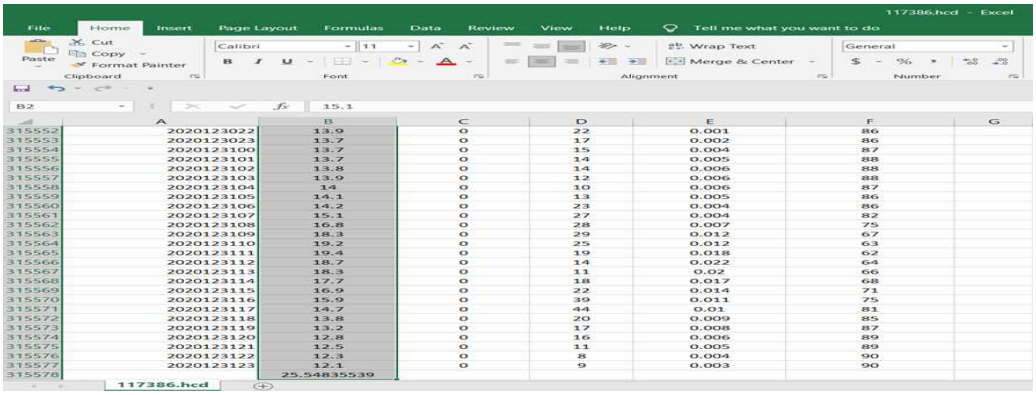


- Later, you will get a file with the extension 117386.hcd, then right-click on this file to change it to csv extension, then open the file and you will get the following

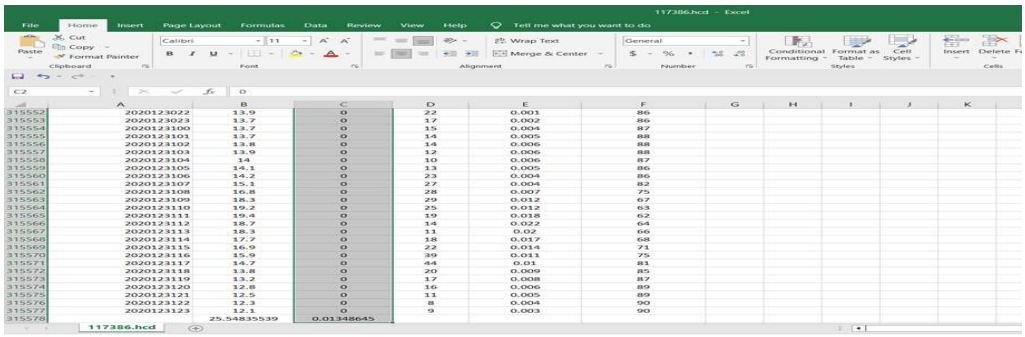


	A	B	C	D	E	F
1	LA_SAVANNAKHET_PROVINCE_SI-117386					
2	Year/Month/Date/Huor(YYYYMMDDHH)	Temperature(°C)	Wind Speed(m/s)	Sun Shine(%)	Precipitation(mm)	Relative Humidity(%)
3	1985010100	15.1	0	96	0.013	99
4	1985010101	14.9	0	85	0.014	100
5	1985010102	14.6	0	88	0.013	101
6	1985010103	14.5	0	98	0.013	102
7	1985010104	14.3	0	100	0.011	102
8	1985010105	14.2	0	100	0.011	103
9	1985010106	14.4	0	100	0.008	102
10	1985010107	17.1	0	93	0.002	91
11	1985010108	20.1	0	74	0	79
12	1985010109	22.8	0	42	0	69
13	1985010110	24.8	0	12	0	61
14	1985010111	26.2	0	6	0	57
15	1985010112	27.1	0	6	0	54
16	1985010113	27.4	0	6	0	54
17	1985010114	27.1	0	6	0	55
18	1985010115	26.2	0	5	0.001	60
19	1985010116	24.3	0	7	0.001	74
20	1985010117	21.3	0	32	0	88
21	1985010118	20.2	0	62	0	90
22	1985010119	19.7	0	84	0	90
23	1985010120	18.9	0	96	0	93
24	1985010121	18	0	99	0.012	96

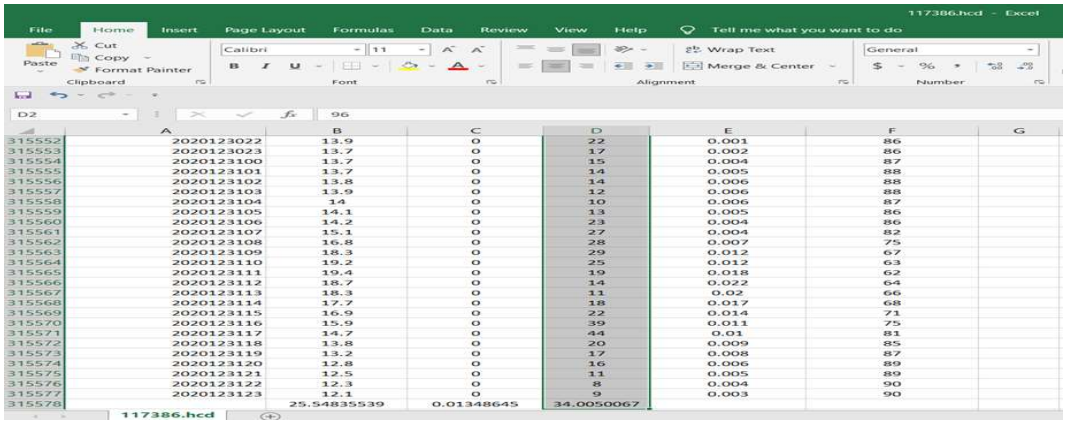
- Select column C to analyze the average value of wind speed and get a value equal to 0.013 m/s from 1985-2020



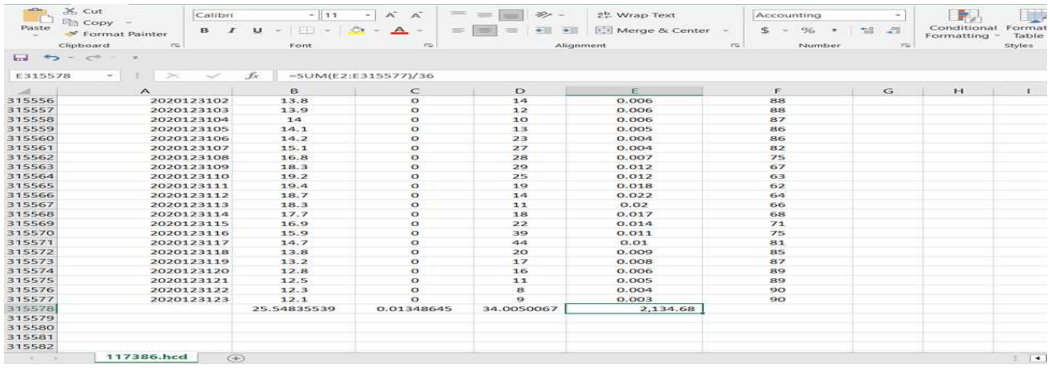
- Select column C to analyze the average value of wind speed and get a value equal to 0.013 m/s from 1985-2020



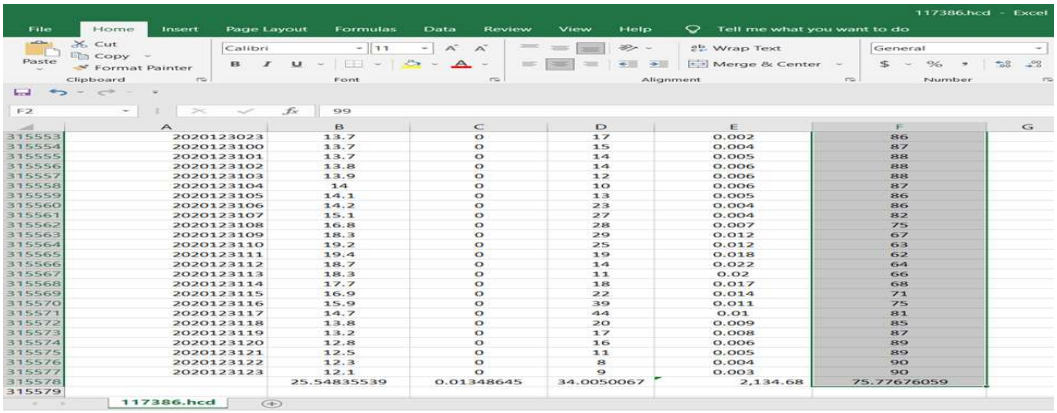
- Select column D to analyze the average amount of sunlight and get a value equal to 34% from 1985-2020



- Select column E to analyze the average value of rainfall and get a value equal to 2,134.68 mm/year from 1985-2020



- Select column F to analyze the average value of air humidity and get a value equal to 75.77% from 1985-2020



As for the weather stations in the number of 60 stations in the Lao PDR according to the requirements of the United States Space Agency, they are analyzing the distribution of conditions, such as the station in Savannakhet province. As the example above, as shown in Table 1, the weather condition and Figure 1, 2, 3, 4, 5, the distribution of the weather by month respectively, here the researchers have randomly taken to show the weather in each different area, for the northern part of LaoPDR is PHONGSALY province, the central part is Vientiane capital, Savannakhet province and southern CHAMPASACK province

3. Results

- Data from file123141.csv from 1985 to the end of 2020, we will find the average data of PHONGSALY province in the northern part of Laos in the following order: average temperature 20.83 °C, average speed 0.098 m/s, average amount of sunlight 40.89%, average annual rainfall 1,858.58 mm, average humidity 77.17%.

- Data from file119109.csv from 1985 to the end of 2020, we will find the average data of Vientiane capital in the central part of Laos in the following order: average temperature 25.79 °C, average

speed 1.48 m/s, average sunshine 36.81%, average annual rainfall 1,674.19 mm, average humidity 70.80%. - Data from file117386.csv from 1985 to the end of 2020, Savannakhet Province: average temperature 25.55 °C, average speed 0.013 m/s, average amount of sunlight 34%, average annual rainfall 2,134.68 mm, average humidity 75.77%

- Data from file115083.csv from 1985 to the end of 2020, we will find the average data of CHAMPASACK province in the south of Laos in the following order: average temperature 27.00 °C, average speed 0.088 m/s, average sunshine 30.45%, average annual rainfall 3,552.12 mm, average humidity 71.65%

4. Criticism

In this article, it is presented to take weather data from NASA, collect data from satellite images, take data from the MERRA series from the website:

https://infopave.fhwa.dot.gov/Tools/MEPDG Inputs From MERRA to analyze and calculate the distribution of weather conditions, such as calculating the temperature, wind speed, amount of rain, amount of sunlight and humidity of the weather in Lao PDR or many countries around the world.

- Due to geographical factors, the weather in the 3 zones is different, the north has the lowest weather, the south and the middle have the highest weather.

5. Conclusion

From the results of analyzing and calculating the weather conditions, the results of the weather conditions in 3 parts of the Lao PDR can be shown in the table and pictures below;

Table 1 weather conditions , Figure 1 Distribution of average temperature by month, Figure 2 Distribution of average wind speed by month, Figure 3 Distribution of the average amount of sunlight by month, Figure 4 Distribution of average rainfall by month, Figure 5 Distribution of average air humidity by month

6. References

(i) Vietnamese language

- Bộ Giao thông vận tải (1995),Quy trình thiết kế áo đường cứng 22TCN 223- 95.
- Bộ Giao thông vận tải (2011), Quyết định 315/QĐ-BGTVT ngày 23/02/2011 về việc ban hành "Hướng dẫn lựa chọn quy mô kỹ thuật đường giao thông nông thôn phục vụ Chương trình mục tiêu Quốc gia xây dựng nông thôn mới giai đoạn 2010 - 2020".
- Bộ Giao thông vận tải (2012), Quyết định số 1951/QĐ-BGTVT ngày 17/8/2012 về việc Ban hành "Quy định tạm thời về kỹ thuật thi công và nghiệm thu mặt đường bê tông xi măng trong xây dựng công trình giao thông".
- Bộ Giao thông vận tải (2012), Quyết định số 3230/QĐ-BGTVT ngày

14/12/2012 về việc ban hành "Quy định tạm thời về thiết kế mặt đường bê tông xi măng thông thường có khe nối trong xây dựng công trình giao thông".

(ii) Foreign languages

- AASHTO Guide for Design of Pavement Structures 1986.
- AASHTO Guide for Design of Pavement Structures 1993.
- AASHTO Guide for Design of Pavement Structures 1998.
- (ii) software or calculation program
- Software download from http://www.fhwa.dot.gov/pavement/tpp/rigidorder.cfm
- Software download from http://www.ltpp-products.com
- Software to design the road surface for cars according to AASHTO standards./.

- Crystal Ball software
- Program MS EXCEL
- Program Minitab

Table 1 weather conditions

NO	zone	Average temperature (°C)	Average wind speed (m/s)	Average of sun shine (%)	Average annual rainfall (mm)	Average humidity (%)
1	**North**					
	PHONGSALY province	20.83	0.098	40.89	1,858.58	77.17
2	**Central region**					
	Vientiane capital	25.79	1.480	36.81	1,674.19	70.80
	Savannakhet Province	25.55	0.013	34.00	2,134.68	75.77
3	**South**					
	CHAMPASACK Province	27.00	0.088	30.45	3,552.12	71.65

Figure 1 Distribution of average temperature by month

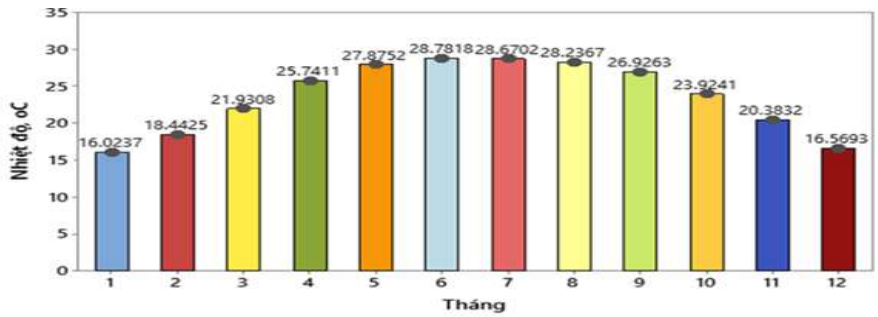


Figure 2 Distribution of average wind speed by month

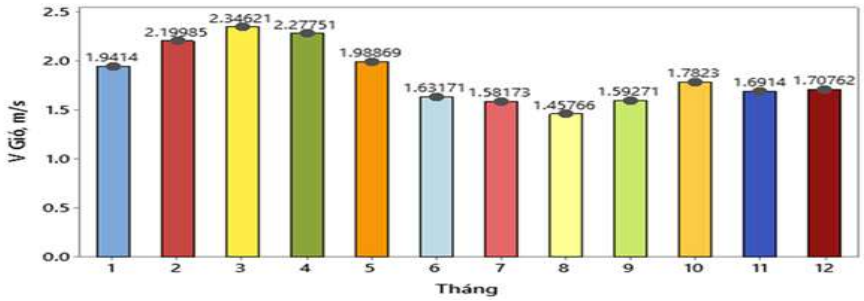


Figure 3 Distribution of the average amount of sunlight by month

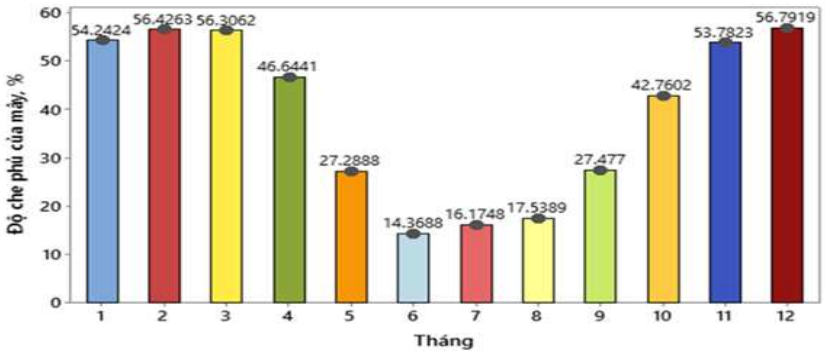


Figure 4 Distribution of average rainfall by month

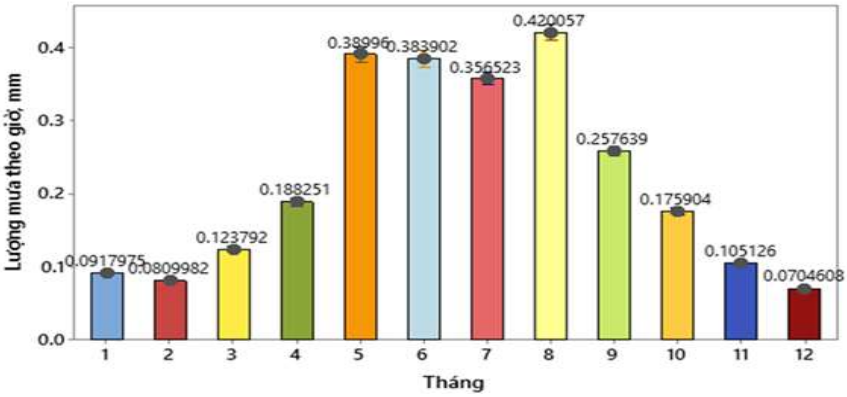
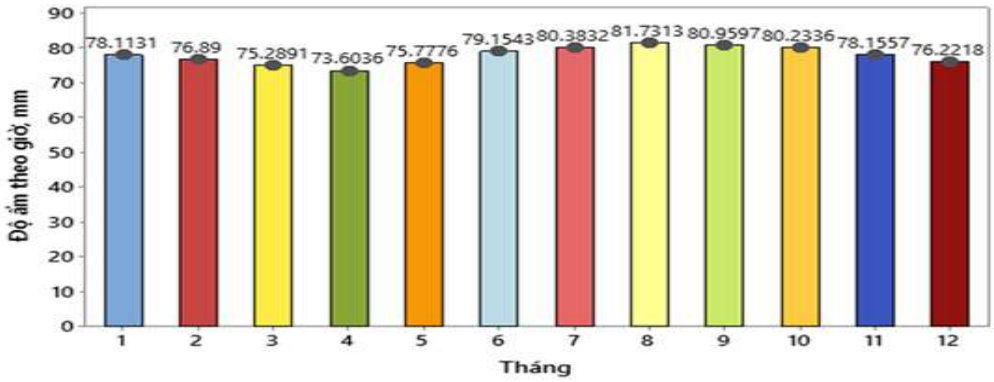


Figure 5 Distribution of average air humidity by month


Độ ẩm theo giờ, mm
Tháng
78.1131
76.89
75.2891
73.6036
75.7776
79.1543
80.3832
81.7313
80.9597
80.2336
78.1557
76.2218
0
10
20
30
40
50
60
70
80
90
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