Sumatra Journal of Disaster, Geography and Geography Education, June, 2020, Vol. 4, No. 1, pp. 17-21
DISASTER, GEOGRAPHY, GEOGRAPHY EDUCATION http://sjdgge.ppj.unp.ac.id/index.php/Sjdgge
ISSN : 2580 - 4030 (Print) 2580 - 1775 (Online), Indonesia

SPATIAL MODEL OF COVID 19 DISTRIBUTION BASED ON DIFFERENCES IN CLIMATE CHARACTERISTICS AND ENVIRONMENT OF ACCORDING TO THE EARTH LATITUDE

*Olivia Oktorie and Isril Berd

Environmental Science, Pascasarjana Universitas Negeri Padang, Indonesia
Email: ochy.oliviaoktorie@gmail.com

*Corresponding Author, Received: April 10. 2020, Revised: May 15. 2020, Accepted: May 15. 2020

ABSTRACT: The purpose of this research is to analyze the spread of COVID-19 on the earth's surface. The method used is a spatial method with the Geographic Information System (GIS) analysis technique. The results of this study explain that the spread of COVID-19 very much occurs in the region of moderate latitude. Besides, tropical climate conditions can also make the virus more quickly become unstable. The Coronavirus spreads faster in countries with high latitudes and humid climates. The spread and concentration of the COVID-19 virus increasingly to the poles are easier to develop, current conditions at high latitudes or poles are not significantly affected due to a small population concentration and population activity, so the virus cannot spread, because the body's virus does not find a host (human) to live and develop.

Keywords: COVID-19, Latitude, Climate

1. INTRODUCTION

Coronavirus is a virus that attacks the respiratory system. The disease caused by a viral infection is called COVID-19. Coronavirus can cause mild disturbances to the respiratory system, severe lung infections, to death. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) better known as Coronavirus is a new type of coronavirus that is transmitted to humans. Although more often attacks the elderly, this virus can affect anyone, ranging from infants, children, to adults, including pregnant women and nursing mothers. Coronavirus infection is called Corona Virus Disease 2019 (COVID-19) and was first discovered in the city of Wuhan, China at the end of December 2019. This virus spreads very quickly and has spread to almost all countries, including Indonesia [1, 2].

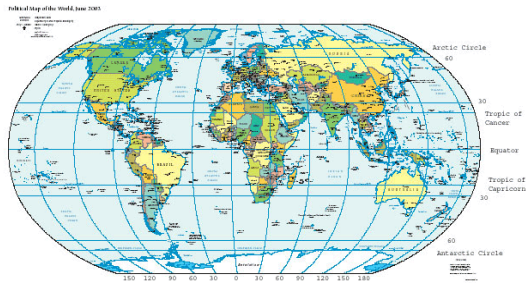

Fig. 1. Division of the Earth's Environment Based on Latitude [1]

From the results of research conducted by experts, the conclusion is that the COVID-19 virus is very sensitive at high temperatures and high humidity, environmental conditions can inhibit the development of the virus and potentially kill the virus naturally [1-5]. Conditions with high temperature and humidity are classified each year in the Tropical Climate, which is at latitudes 00-23.30 LU/LS [6-9].

2. METHOD

The method used in this study is a spatial method, with a Geographic Information System analysis tool. Image cutting system on the existing map of the earth's latitude, then overlay with existing conditions [10-15]. Comparison of COVID-19 distribution concentrations, obtained by comparing images and maps of COVID-19 distribution in a span of 2 times.

3. RESULTS AND DISCUSSION

The characteristics of the Tropical Climate are: 1) The average air temperature is high because the sun is always vertical. Generally, the temperature is between 20-23°C. Even in some places, the average annual temperature reaches 30 ° C [16-20], 2) The average annual temperature amplitude is small. At the equator between 1 - 5°C, 3) while the daily amplitude is greater, 4) Low air pressure and slow and regular changes, and 5) More rain than any other region in the world.

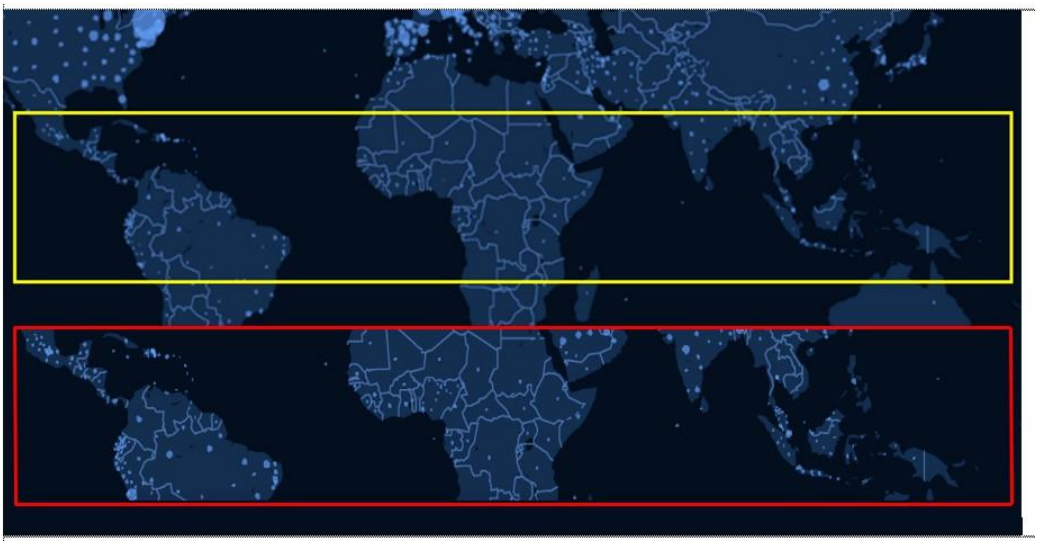

Fig. 2. COVID-19 distribution in low latitude or tropical climate [5]
COVID-19 distribution in low latitude or tropical climate [5]

[1] According to BMKG (April 25, 2020), based on the results of research by the Joint Team of the Meteorology, Climatology and Geophysics Agency and Gadjah Mada University found that the tropical climate in Indonesia can inhibit COVID-19 virus breeding. Based on statistical analysis studies, mathematical modelling and literature studies on the Effects of Weather and Climate on the Spread of COVID-19, tropical climate conditions can make viruses more quickly become unstable [10-14].

The Coronavirus spreads faster in countries with high latitudes and humid climates. The distribution of COVID-19 cases is in the same climate zone, which is in a high latitude position in the subtropical and temperate regions. According to the study, it can be concluded temporarily, countries with high latitude tend to have higher vulnerability compared to tropical countries [21-23].

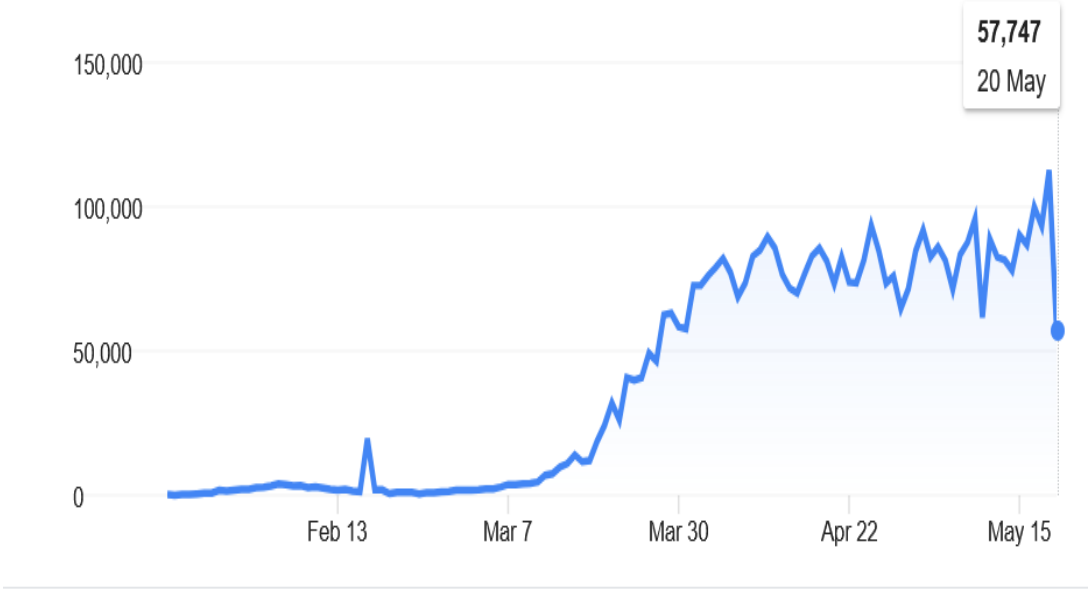

Fig 3. The Dynamics of COVID-19 Infection in the World [5]

The Subtropical Region is the region of the Earth which lies to the north and south after the tropical region bounded by the northern return line and the southern return line at latitude 23.5° north and south. Subtropical climatic conditions are characterized by disturbances and obstacles from

nature such as storms, snowfall, or tornadoes. The subtropical climate has 4 seasons namely spring, summer, autumn and winter. The four seasons above have their characteristics, with maximum temperature, minimum temperature, humidity, and different living conditions.

Fig. 4. COVID-19 distribution in Medium Latitude or Sub-Tropical Climate [5]
COVID-19 distribution in Medium Latitude or Sub-Tropical Climate [5]

[2] Ideal air conditions to reproduce the Coronavirus, namely temperatures around 8 to 10 degrees Celsius and humidity 60-90 per cent. Spatially, it can be seen that the concentration of the COVID-19 distribution is more numerous and develops at moderate or sub-tropical latitudes when compared to low latitudes or tropic and high latitudes or pole.

Table 1. COVID-19 cases in the World's Top 40

Country	Confirmed	Case/1 Million People	Recovered	Deaths
United States	1,581,903	4,800	301,341	93,806
Russia	308,705	2,104	85,392	2,972
Brazil	293,357	1,388	116,683	18,894
United Kingdom	248,293	3,737	—	35,704
Spain	232,555	4,937	150,376	27,888
Italy	227,364	3,774	132,282	32,330
Germany	178,531	2,147	156,802	8,270
Turkey	152,587	1,835	113,987	4,222
France	143,845	2,145	63,354	28,132
Iran	126,949	1,523	98,808	7,183
India	112,359	83	45,300	3,435
Peru	104,020	3,237	41,968	3,024
Mainland China	82,967	59	78,249	4,634
Canada	80,142	2,110	40,776	6,031
Saudi Arabia	62,545	1,828	33,478	339
Mexico	56,594	447	38,876	6,090
Belgium	55,983	4,858	14,847	9,150
Chile	53,616	2,806	22,504	544
Pakistan	48,091	219	14,155	1,017
Netherlands	44,447	2,547	—	5,748
Qatar	37,097	13,503	6,600	16
Ecuador	34,854	1,997	3,536	2,888
Belarus	32,426	3,445	11,415	179
Sweden	31,523	3,051	4,971	3,831
Switzerland	30,658	3,570	27,800	1,630
Portugal	29,660	2,886	6,452	1,263
Singapore	29,364	5,148	11,207	22
Bangladesh	26,738	159	5,207	386
United Arab Emirates	26,004	2,629	11,809	233

Country	Confirmed	Case/1 Million People	Recovered	Deaths
Ireland	24,315	4,941	19,470	1,571
Poland	19,739	514	8,183	962
Ukraine	19,230	459	5,955	564
Indonesia	19,189	72	4,575	1,242
South Africa	18,003	306	7,950	339
Colombia	17,687	358	4,256	630
Kuwait	17,568	3,975	4,885	124
Romania	17,387	896	10,356	1,141
Israel	16,667	1,816	13,504	279
Japan	16,433	130	12,286	784
Austria	16,319	1,833	14,882	633

Source: [5]

Polar climate is a cold climate found in the polar regions. In that area winter lasts for a long-time, cool summers are short, the air is dry, the ground freezes throughout the year when winter the entire land is covered with ice has a type of vegetation in the form of moss and bushes. Its territory in the northern hemisphere is North America, Greenland, and the northern coast of Siberia, while in the southern hemisphere is Artic.

Fig. 5. COVID-19 distribution in High Latitude or Pole [5]
COVID-19 distribution in High Latitude or Pole [5]

[2] Explains that the spread and concentration of the COVID-19 virus which is increasing to the poles are easier to develop, current conditions at high latitudes or poles are not significantly affected because of a small concentration of population and population activity. population, so the virus cannot spread, because the body of the virus does not find a host (human) to live and develop. Based on this, the factors needed by the COVID-19 virus to develop are climatic conditions and temperatures <150 C with low humidity, then have densities and densely human activities.

4. CONCLUSIONS

Climate change will affect the speed of the spread of the COVID-19 virus. Based on statistical analysis studies, mathematical modelling and literature studies on the influence of weather and climate on the spread of COVID-19, tropical climate conditions can make the virus more quickly become unstable. The Coronavirus spreads faster in countries with high latitudes and humid climates.

5. REFERENCES

[1] BMKG. Karaktersitik Iklim dalam Penyebaran Covid 19. BMKG-UGM. 2020
[2] Nanshan Chen, Min Zhou, Xuan Dong, Jieming Qu, Fengyun Gong, Yang Han, Yang Qiu, Jingli Wang, Ying Liu, Yuan Wei, Jia'an Xia, Ting Yu, Xinxin Zhang, and Li

Zhang. Epidemiological and Clinical Characteristics of 99 Cases of 2019 Novel Coronavirus Pneumonia in Wuhan, China: A Descriptive Study. The Lancet. Vol. 395. Issue. 10223. P 507-513. 2020

[3] Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan China: the mystery and the miracle. J Med Virol2020; published online Jan 16. DOI:10.1002/jmv.25678.2

[4] Huang C, Wang Y, Li X, et al. 2020. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020; published online Jan 24. https://doi.org/10.1016/S0140–6736(20)30183–5.4. 2020

[5] WHO. Clinical management of severe acute respiratory infection when Novel coronavirus (nCoV) infection is suspected: interim guidance. Jan 11, 2020. https://www.who.int/internalpublications-detail/clinicalmanagementofsevereacute-respiratoryinfectionwhennovelcoronavirus-(ncov)infectionissuspected. 2020

[6] Hermon, D. Geografi Lingkungan: Perubahan Lingkungan Global. UNP Press. 2010.

[7] Hermon, D. Mitigasi Bencana Hidrometeorlogi: Banjir, Longsor, Degradasi Lahan, Ekologi, Kekeringan, dan Puting Beliung. UNP Press. Padang. 2012.

[8] Oktorie, O., D. Hermon, Erianjoni, A. Syarief and A. Putra. A Calculation and Compiling Models of Land Cover Quality Index 2019 uses the Geographic Information System in Pariaman City, West Sumatra Province, Indonesia. International Journal of Recent Technology and Engineering (IJRTE). Vol. 8. Issue 3 pp. 6406-6411. 2019

[9] Oktorie, O. A Study of Landslide Areas Mitigation and Adaptation in Palupuah Subdistrict, Agam Regency, West Sumatra Province, Indonesia. Sumatra Journal of Disaster, Geography and Geography Education. Volume 1. Issue. 1. p: 43-49. Master Program of Geography Education. 2017.

[10] Wang, Tianbing; Du, Zhe; Zhu, Fengxue; Cao, Zhaolong; An, Youzhong; Gao, Yan; Jiang, Baoguo. Comorbidities and Multi-Organ Injuries in The Treatment of COVID-19. The Lancet. 395 (10228): e52. 2020

[11] Guan, Wei-jie; Ni, Zheng-yi; Hu, Yu; Liang, Wen-hua; Ou, Chun-quan; He, Jian-xing; Liu, Lei; Shan, Hong; Lei, Chun-liang. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine. 382 (18): 1708–1720. 2020

[12] Guan, Wei-jie; Ni, Zheng-yi; Hu, Yu; Liang, Wen-hua; Ou, Chun-quan; He, Jian-xing; Liu, Lei; Shan, Hong; Lei, Chun-liang. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine. 382 (18): 1708–1720. 2020

[13] Wang, Lisheng; Wang, Yiru; Ye, Dawei; Liu, Qingquan. Review of The 2019 Novel Coronavirus (SARS-CoV-2) Based on Current Evidence. International Journal of Antimicrobial Agents: 105948. 2020

[14] Wang, Yixuan; Wang, Yuyi; Chen, Yan; Qin, Qingsong. Unique Epidemiological and Clinical Features of The Emerging 2019 Novel Coronavirus Pneumonia (COVID-19) Implicate Special Control Measures. Journal of Medical Virology. 92 (6): 568–576. 2020

[15] Jin, Ying-Hui; Cai, Lin; Cheng, Zhen-Shun; Cheng,. A Rapid Advice Guideline for The Diagnosis and Treatment of 2019 Novel Coronavirus (2019-nCoV) Infected Pneumonia. Military Medical Research. 7 (1): 4. 2020

[16] Hermon, D., A. Putra and O. Oktorie. Suitability Evaluation of Space Utilization Based on Enviromental Sustainability at The Coastal Area of Bungus Bay in Padang City, Indonesia. International Journal of GEOMATE. Volume 14. Issue 41. p: 193-202. Geomate International Society. 2018.

[17] Oktorie, O. Model Kebijakan Responsif Pemulihan Bencana Letusan Gunung Sinabung. Jurnal Kapita Selekta Geografi. Volume 1. Issue 1. p: 15-20. 2018.

[18] Hermon, D. Geografi Bencana Alam. Jakarta: PT RajaGrafindo Persada. 2015.

[19] Hermon, D. Mitigasi Perubahan Iklim. Rajawali Pers (Radjagrafindo). 2016.

[20] Hermon, D. Mitigation and Adaptation: Disaster of Climate Change. Sara Book Publication. India. 2019

[21] Hui DS, I Azhar E, Madani TA, Ntoumi F, Kock R, Dar O, Ippolito G, Mchugh TD, Memish ZA, Drosten C, Zumla A, Petersen E. The Continuing 2019-nCoV Epidemic Threat of Novel Coronaviruses to Global Health-The Latest 2019 Novel Coronavirus Outbreak in Wuhan, China. Int J Infect Dis. 2020 Jan 14;91:264–266. 2020

[22] Centers for Disease Control and Prevention. How to Protect Yourself & Others. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fprepare%2Fprevention.html. 2020

[23] Simbolon, V. Rumus Melawan Virus. https://www.cnnindonesia.com/longform/gaya-hidup/20200313/laporan-mendalam-rumus-melawan-virus/index.html. 2020