



**PLANNING MALAYSIA:**

*Journal of the Malaysian Institute of Planners*

**VOLUME 21 ISSUE 4 (2023), Page 152 – 163**

## **ACCESSIBILITY AND CONNECTIVITY ANALYSIS IN THE GROWING RURAL AREA: A CASE STUDY OF REMBAU DISTRICT, NEGERI SEMBILAN**

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### **Abstract**

Rural areas are the ideal place to handle urban sprawl, whether for future administrative, college, manufacturing, residential, commercial, or for business growth. In the land development context, the shifting from rural into several areas such as agricultural into houses or subdividing real estate into commercial lots etc. were seen to be worth trying. However, this will succeed with the help of better road connectivity to the demanded area. This research is aimed to explore the road accessibility and connectivity and its function in supporting the growth of land development in Rembau, Negeri Sembilan. The research methodology produces maps of new potential growth development areas using GIS techniques. For data acquisition, there was a two-approach which is using the primary and secondary data. The primary data consist of the observation on the site, interview method with the experts and local people. Meanwhile, the secondary data is using the Landsat data from USGS to produce a land-use map for four consecutive years, base map and route connectivity data for GIS method, and statistical data from related agencies. The result of this research is to produce a new potential development map in Rembau, Negeri Sembilan. Remote sensing (RS) and Geographical Information System (GIS) allows the town planners to identify the potential rural spaces to cater the urban population.

**Keywords:** Rural area; Urbanization; Accessibility; Connectivity

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## **INTRODUCTION**

The government of Malaysia is seen to be very committed towards the development of rural areas and it is continuously becoming the first agenda in rural growth (*Kementerian Pembangunan Luar Bandar, 2019*). The adaptation of a new tagline as 'Prosperous, Inclusive, Holistic, and Sustainable' will become the major goal of Malaysia's external growth process cities in 2030. Prosperous countryside perspectives reflect the Government's intention to ensure that rural residents have access to services and social facilities equivalent to the city area. Moreover, to increase the economic potential in rural areas and the number of productive populations, the government aims to encourage many urban residents and investors to move to the countryside. The rural area may become an interesting domestic and overseas destination for holidays and tourism to enjoy the natural beauty, heritage culture, and fun of the countryside living (*Kementerian Pembangunan Luar Bandar, 2019*). In short, development is a process of evolution from a low progressive to a more advanced level in either the physical or environmental aspects. The concept of development covers four key components that complement each other and need to be achieved efficiently in order to ensure rapid economic growth, equitable distribution of wealth, sustainable and people's empowerment, especially vulnerable groups such as the poor. In other words, development is nothing but a reduction effort or eradicating poverty, inequality, and unemployment in an economic context is growing.

Realising the necessity for a more comprehensive infrastructure planning management mechanism at the state level, Negeri Sembilan State built its planning support system to track the execution overtime of its development plans (Masser, 2016). Negeri Sembilan is made up of 7 Districts with 8 Local Authorities including Rembau District Council. This study uses the tools in GIS software and land-use changes using Erdas Imagine software to explore the potential factors of Rembau District in terms of its connectivity to tourist attraction places and amenities.

### **Growing Rural Area Impacted from Urbanization Process**

Land growth processes are very important in developing land. The unplanned and uncontrolled population expansion has already had important adverse effects on the suburban residents and their surroundings or environment (Mohammed et al., 2016) and this is another factor for land development to achieve unbalanced sustainability (Tahir & Abdul Malek, 2017). According to Yeh, (2004) land is under transition when it continues performing major economic roles. Implementing a modern land policy has had a significant effect on land usage patterns and land-use conversion. Overall process can tell the background or chronology of an area and it plans a better development in the future. The emergence of a new city, industrial areas, housing, skyscrapers, and large bridges could be worth millions of dollars and the existence of all is interpreted as a

modern development (Abdul Rahman, 2018). In early 1949, the concept of the growth pole was introduced by Francois Perroux. In this theory, Francois enlightened that it is very important to identify the economic space with attractive elements and potential for growth.

The industrial sector stimulates the economic growth of a region to develop backward areas as this might help for a better growth (Gavrila-paven, 2018). Thus, this could also give a great opportunity for the rural land to cater the urban and suburban activities. According to Saleh et al., (2011), the theory of Central Settlement that presented by Walter Christaller in 1933 is a generalisation made as deductive intent in describing the relationship between population size and several settlements on the earth. It is also claimed that there was a close relationship between the size of the settlement and its function. The growing population size in the city will open many new settlement areas in the fringe and rural areas. Mohd Balwi (2005) reported that in between 1970 until 1997, Malaysia underwent dramatic urban spatial changes. Not only have urban units grown in size, but the larger urban centres also grew outward and broke out the gazette borders, expanding through the countryside into the open spaces.

### **Factors Influencing the Rural Growth**

As reported in the *Rancangan Tempatan Daerah Rembau, (2014)*, Rembau District has the potential to become a Dormitory Town to residents working in the area adjacent to it, such as Tampin, Port Dickson, Kuala Pilah, Seremban district, and Alor Gajah (Malacca) including the Klang Valley (Selangor). Negeri Sembilan previously aims to become a developed state in 2020. To date, the development of activities at the core of the economy centre was given the key focus as a state growth generator. The Negeri Sembilan Structure Plan 2001-2020 and the latest District Local Plan (RTD) are among the key references to the government's planning and implementation to develop Negeri Sembilan which has affected land use in the state. Meanwhile, the focus on regional development has led to its existence rural development approach through settlement system strategies to achieve balanced economic growth, distribute, and reduce poverty. This is achieved through the provision of infrastructure facilities, including institutional infrastructure. Also, the upgrading of the urban-rural relations system attracted activities such as housing, trade, and industry along the main or secondary routes.

### **Potential Attraction Places**

Nasir Ahmad & Mustafa (2019) said that the tourism areas with good facilities and infrastructure are among the tourist's attractions to visit. Rural tourism plays an important role in the development of socio-economic development in many countries. Each district has its own attractions, e.g., the Port Dickson district offers the coastal tourism concept, while the Rembau District is more about

traditional tourism, community culture, and history. Rembau is also famous for the use of the unique customary land act and became an attraction to the academia or researcher to study further. Highland's areas such as mountains, hills and green areas are another attraction for tourists. Mountain tourism has been significant in contributing to the development of rural tourism through various programs such as adventure in sports, arts, and local culture. According to the *Rancangan Tempatan Daerah (2014)*, the tourism development resources of Rembau District comprise Gunung Datuk Forest Reserve, traditional Homestay, Rembau Museum and the Wet World Hot Water Spring, Pedas.

### ***Accessibilities***

The setting of rural settlement is quite challenging in terms of physical and geographical in most of the rural areas in the world. Accessibility plays a big role as a fundamental of sustainable living (Elisabetta, 2020). Abdullah (2016) said that the proximity distance does increase accessibility, but longer distances will make the rural area seem difficult to be reached. However, Rembau District was in good geographic location, and it was categorised under a moderate development at the National context, which it falls under category 3; developing slowly. The Port Dickson District and the Seremban District which border the Rembau District are part of the Conurbation of Kuala Lumpur. In this context, land near the core business area usually will develop faster than the area which is far away. It was reported in the *Rancangan Tempatan Daerah Rembau, (2014)*, that Rembau District was placed next to the administrative land of Seremban, Tampin, and Alor Gajah. This could be a great opportunity for the Rembau District to grow well in social, physical and economic sectors.

### ***Connectivity***

The rural development programs will focus on transforming rural areas to better investment and attractive living by enjoying all the basic amenities of quality infrastructure and social services. According to Nasir Ahmad & Mustafa, (2019), the increases in the availability of major roads in 2014 made it more efficient to connect the districts in Negeri Sembilan and it became more efficient than in 1961. Good transport access can increase the rate of accessibilities residents to goods, facilities, information, and necessities. Adding to that, good transportation facilities will also attract many new built-up land uses (Abdul Gapar *et.al*, 2021) and the growth pattern extended to the neighbouring districts.

## **RESEARCH AIM AND OBJECTIVES**

This research aim is to explore the factors that influence the growth and potential of tourism development in Rembau, Negeri Sembilan. This is supported by three objectives, that are:

- i. To identify the land use changes in 10 consecutive years (1990 to 2010).
- ii. To analyse the potential factors for Rembau Districts to grow.

### The Study Area

Rembau is a district in Negeri Sembilan that was located at south border of the Malacca State with coordinates  $2^{\circ}35'30''\text{N}$   $102^{\circ}05'45''\text{E}$ . Rembau is 402.76 square kilometres or 41,512 hectares. The district grew well with a total population of 43,011 in 2010 and it was predicted to grow at 51,800 by 2025. The village people mostly live in 17 *mukim* comprising 204 villages. The residents of this area are mostly farmers, government officers, manufacturing workers from the industrial district, such as Senawang and Seremban. It took about 20 km distance from Rembau to Senawang and 7km from Senawang to Seremban. The location of Rembau District is also near to Malacca A'Famosa Freeport Outlet which took about 25 minutes to reach. Figure 1 shows the location of the study area.

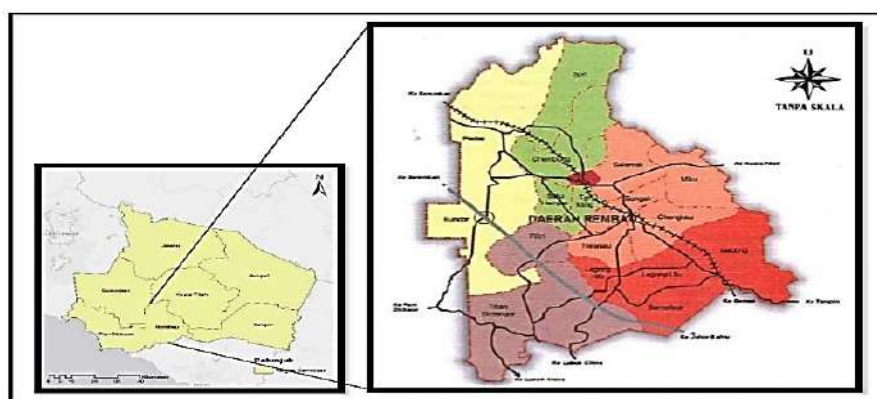
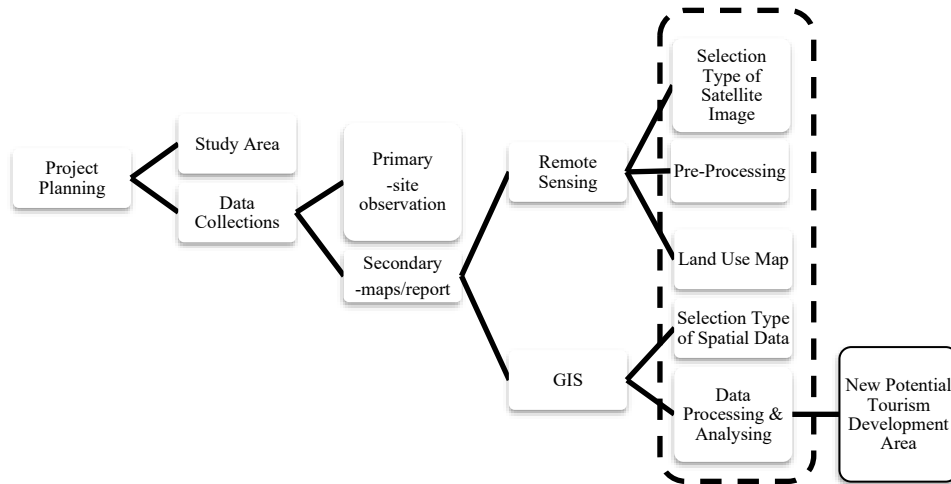


Figure 1: Location of Rembau District

### RESEARCH METHODOLOGY

The research methodology processes start with the identification of potential factors that contributed to the growth of Rembau district, Negeri Sembilan as shown in figure 2. The project planning includes the search on suitable study areas and the data collection from primary and secondary approach. The primary data consist of observation on site, interview session with experts and online questionnaire via google form to get the public response. The secondary data was gathered using Landsat from USGS to produce land use maps for four consecutive years (1990,2000,2010 and 2020), while the base map and route connectivity data is done using the GIS techniques. The result of this analysis is used to produce a new potential development map.



**Figure 2:** Research Methodology Flowchart

## RESEARCH FINDINGS

### *Land use changes in 10 consecutive years*

Several factors influence land-use change in Rembau, Negeri Sembilan from 1990 to 2020. The result obtained from Satellite Image which is Landsat data. Based on figure 3, the land use distribution for Rembau district is dominant with agricultural areas, which is almost 50% for the period 1990 to 2010 and slightly decreased in 2020 to 43%. However, in 2010, agricultural land use in Rembau district was dominated by oil palm plantations. Forest land use in 2010 was found to be declining, a decrease of 5% from 1990, and flattening again in 2020, which remained at 34%. From 1990 to 2020, there was a decrease in Rembau district forest land use because most of the forest area was cleared for agricultural and urban development. The bare soil land use in 1990 was 6888.91 acres.

Changes have occurred in 2020 which is an increase to 14770.7 acres. This is because most forests and agricultural land might be developed by 2020. Urban land use has undergone the slightest change of an increase of only 6%. The progress that has taken place has brought changes to the use of Rembau town. Moreover, in 1990, the housing area only covered the village area. However, in 2010, housing areas included villages, low-cost housing, terrace houses, and bungalows. This shows that urban land use which includes residential areas, industrial areas, institutions, utilities, and facilities is increasing towards 2020. Figure 3 shows the land use changes from 1990 to 2020.

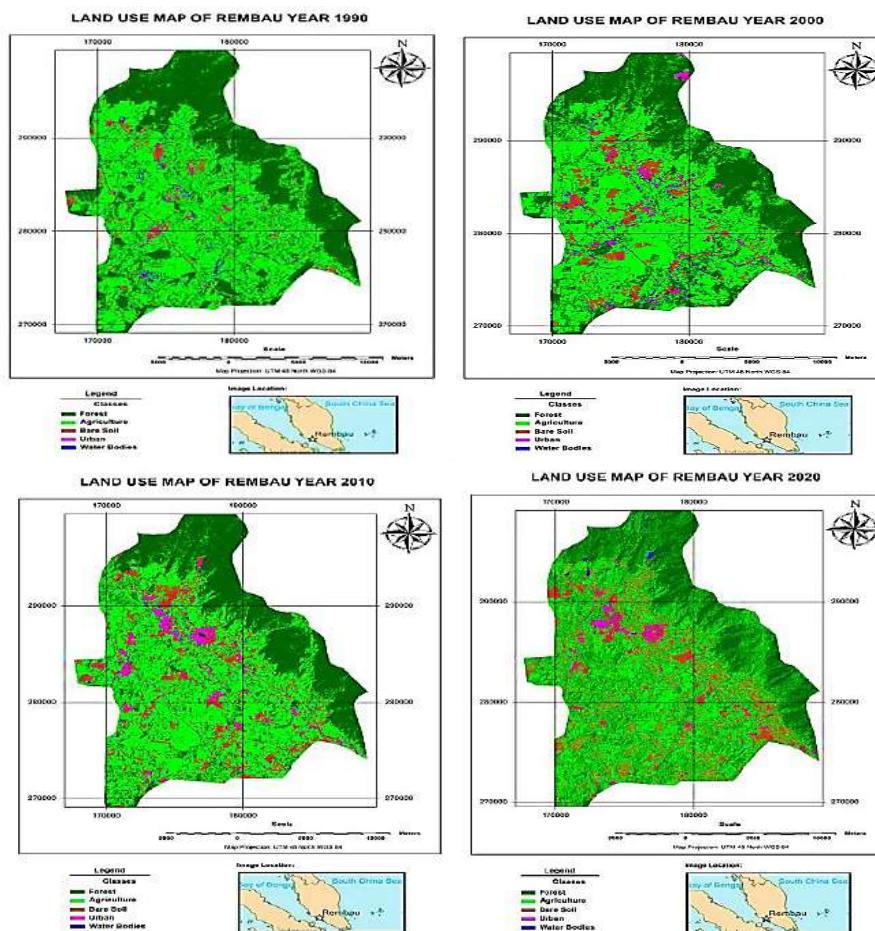








Figure 3: Land Use Map of 1990,2000,2010 and 2020

### *The Accessibility and Connectivity Analysis*

The purpose of this analysis is to look at the accessibility and connectivity between residential places and the Rembau small town area. Most of the residential locations are located within the distance of 1 to 2 km from the town area. The total development area in Rembau is only 7.15 percent from the total area of 40430.165 hectares. Among the areas developed are residential, commercial, industrial, transportation, community facilities institutions as well as infrastructure and utilities. Rembau area is an agricultural area consisting of 67.856 percent of land area. The undeveloped area covers 91.92 percent of the entire Rembau district. Figure 4 shows the development area in each of *mukims*.

<b>Location</b>	<b>Area</b>	<b>Map</b>	<b>Distance (KM)</b>
Bandar Rembau	<ul style="list-style-type: none"> <li>● Taman Sri Rembau</li> <li>● Taman Rembau Utama</li> <li>● Taman Bunga Raya</li> <li>● Taman Rembau Perdana</li> <li>● Primary and Secondary School</li> <li>● Commercial Lot</li> </ul>		0.78
Chembong	<ul style="list-style-type: none"> <li>● Taman Chembong Utama</li> <li>● Taman Sedia Raja</li> <li>● Primary and Secondary School</li> <li>● IKTBN Chembong</li> <li>● Industrial (Factory)</li> </ul>		1.18
Pedas	<ul style="list-style-type: none"> <li>● Desa Permai Pedas</li> <li>● Taman Pedas Perdana</li> <li>● Taman Pinggiran Pedas</li> <li>● Taman Pedas Indah</li> <li>● Primary and Secondary School</li> <li>● ILP Pedas</li> <li>● Pedas Halal Park</li> </ul>		0.38 0.53 0.55
Selemak	<ul style="list-style-type: none"> <li>● Rumah Rakyat Sungai Layang</li> </ul>		0.16
Chengkau	<ul style="list-style-type: none"> <li>● Taman Fajar Harapan</li> <li>● Rumah Rakyat Chengkau</li> </ul>		0.63



Location	Area	Map	Distance (KM)
Kota	<ul style="list-style-type: none"> <li>● Rumah Rakyat Kota</li> <li>● Taman Kota Indah</li> <li>● Rumah Rakyat Astana Raja</li> </ul>		0.17

**Figure 4:** The development area in Rembau District

Based on the study, it was found that the accessibility and road connectivity throughout the districts were in a good plan and there are many lands that could be pushed for future development. The Rembau district has great potential to continue developing as most of the areas are well connected and have good accessibility to neighbouring areas. Rembau was situated in the location between Seremban district and Melaka state, and this could give good chances for Rembau to potentially grow in identified sectors such as the light or medium factories and the tourism industry. Table 1 shows the key element for establishing the tourism places in Rembau and Figure 5 shows the identified tourism places in Rembau District.

**Table 1:** The Key Land Development in Rembau District

Parameter/ Key Development	1	2	3
Accessibility & Connectivity	Improve Road Network	Improving the Quality of Transportation Services	Improving More Efficient Traffic Management
Attraction Places	Upgrade the Tourist Areas	Enhancing Marketing and Product Promotion Efforts Tourism	Reasonable and affordable prices

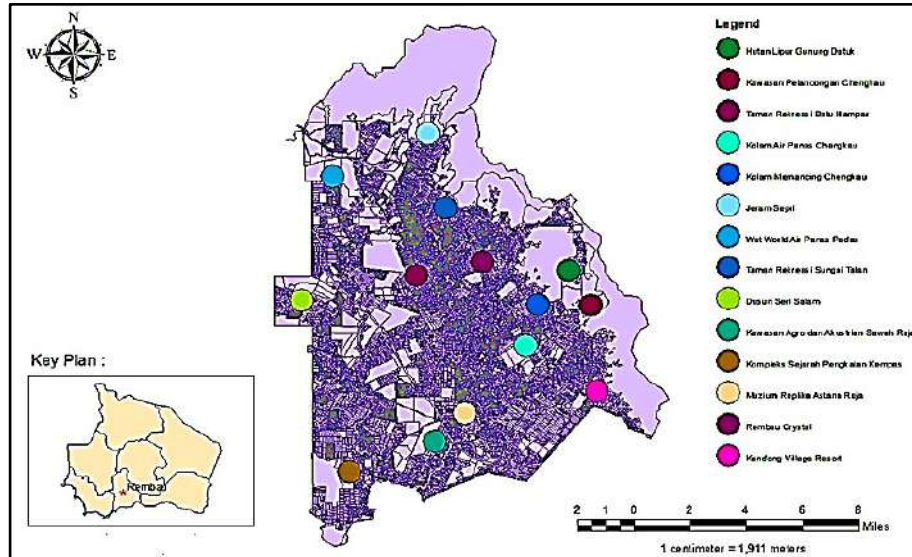
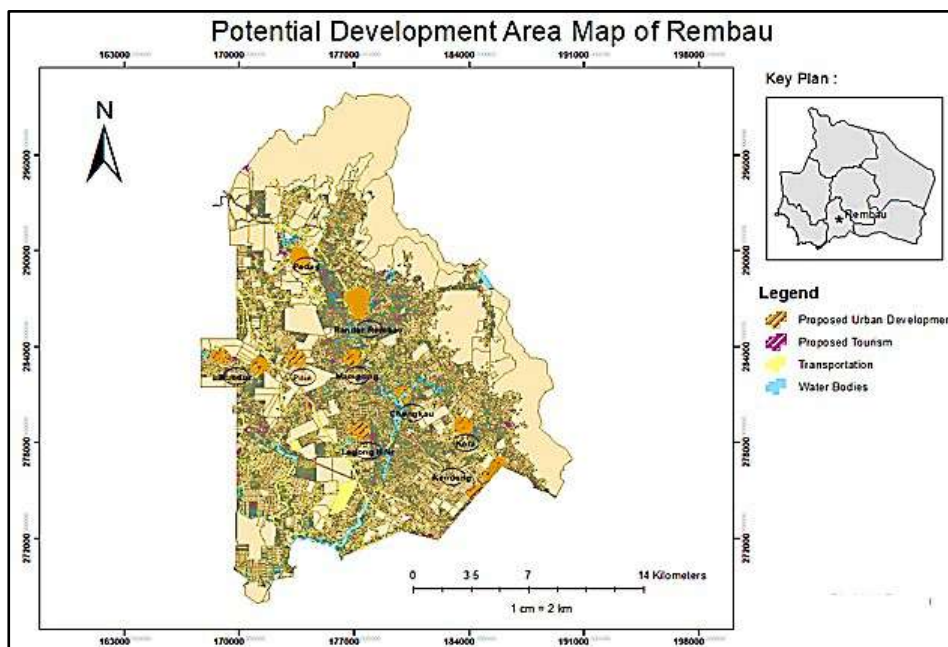


Figure 5: Identified Attraction Places in Rembau

#### *The New Potential Development Area*

Current land use maps are very important to be evaluated before planning future development for an area because to find out about the current situation on the land. The development situation in Rembau is currently deep in an unbalanced situation where development is concentrated only in the town and along the main roads. This Rembau district seems to be developing but the process is too slow. Based on the result that appears in figure 6, the new proposed area for future potential development purposes has been established as shown in orange colour. The growing development areas as identified in the map involve Bandar Rembau, Pekan Pedas, Pekan Chengkau, and Pekan Kota. While the identified attraction places are located at Gunung Datuk, Sg. Talan and Pengkalan nelayan and for agro tourism are at Pedas and Gadong. There are two historical relics of cultural heritage such as Replika Istana, Makam Raja Melewar at Kg Astana Raja. Other than that, Rembau has a water park located at Pedas and Sukabumi at Kendong.



**Figure 6:** New Potential Development Map

## CONCLUSION

Generally, Rembau can be identified as having a slow progress of development in terms of size, speed, and patterns of growth. It is important to identify the factors that could speed up the process of the development to prepare for the needs of a place that can cater the fast-growing development of Seremban and Senawang. Although the distance from Rembau to Senawang, Seremban and Melaka could benefit the growth of Rembau economic activities, it seems the process took longer time. The state of Negeri Sembilan authority should be preparing a good future development for Rembau district to become a tourism place in the near future. This would be useful to introduce the attractive places in Rembau rural areas as well as to express some uniqueness that Rembau could offer.

## ACKNOWLEDGEMENTS

The authors would like to thank the Malaysia Institute of Transport (MITRANS), Universiti Teknologi MARA for funding this publication under the Vanguard Grant 3.0. The wishes also go to Negeri Sembilan Land and Mines office, PLANMalaysia and JUPEM for the assistance in providing the data to this research.

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Received: 24<sup>th</sup> Jan 2023. Accepted: 20<sup>th</sup> July 2023