



ICOMSET 2017

2nd International Conference on
Mathematics, Science, Education
and Technology

Padang, INDONESIA

October 5-6, 2017



PREFACE

On behalf of the Steering Committee, I would like to thank you for your participation in the 2nd International Conference on Mathematics, Science, Education and Engineering (ICOMSET2017) which has been held at Grand Inna Muara Hotel and Convention Center in Padang, West Sumatera, Indonesia from October 5 (Tuesday) through 6 (Friday), 2017.

This 2nd ICOMSET is organized by the Faculty of Mathematics and Natural Science, Universitas Negeri Padang. The main objective of this conference is to provide an international platform for researchers, Academicians as well as industrial professionals from all over the world to present Their research results in Mathematics, Science, Education, Technology, and other related fields. This conference also provides opportunities for the delegates to exchange new ideas and application experiences, to establish research relations and to find partners for future collaboration.

I would like to express my sincere appreciation to all the participants, financial sponsors, exhibitors, supporting organizations and all the committee members who has made ICOMSET 2017 successful. With these strong support, we are sure ICOMSET will be beneficial to all the participants, and you enjoy Padang.

We are looking forward to meeting you in the next ICOMSET.

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All papers published in this volume of *IOP Conference Series: Materials Science and Engineering* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.



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The Combination of Coastal Resources Potential: Development of Windmill Techno Park in the Context of Edutourism and Hinterland Analysis

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Abstract. There are many coastal cities in Indonesia, among them the city of Padang and Pariaman in West Sumatra with the ownership of the grace of coastal resources, such as stunning coastal scenery and wind energy that can be converted to its potential. These two types of resources need to be combined utilization especially in relation to the development of tourism so as to have an impact on the regional development and the cities growth. This paper discusses of information related to the potential of coastal resources used as a parameter development of windmill techno park in the context of educational tourism. The discussion focuses on locational aspects and consideration of the design and modification for the windmill model to the enhancement of tourist attraction. In addition, it is also studying the presence of the windmill techno park as a development center in the context of hinterland in the regional analysis. Through the measurement results obtained average wind speed (2.5 - 6.5) m/s and meet the standards & criteria as a windmill design variables. While the geomorphology of the region, its location has a breathtaking coastal landscape as a tourist destination. Then through gravity analysis, the location of the windmill techno park development provides optimum strength to the growth of the city of Padang, with the value of interaction strength is higher than other regions. This means as a sub-urban area of the city the existence of windshield techno park later can support economic development and growth of cities around the coast.

1. Introduction

The tourism sector in Indonesia in general, especially in West Sumatera area is still experiencing many problems and challenges, so that the number of potential and variety of existing resources gradually does not continue to stretch and can contribute to become the prime mover role of regional economic growth. Places of visits and attractions are still stagnant and slow moving so not yet a major choice for tourists both nationally and internationally.

The area of natural tourism & coastal areas as part of sub urban can not function optimally as hinterland for development and growth of urban area. As it is known that one of the external factors that will affect the development of a city is its relation with other cities, as well as its relation with its hinterland, including the surrounding rural areas and its linkage to resource potential [1].

In relation to the problems, there should be breakthroughs and solutions to solve the problems faced by introducing an educational tourism model through the concept of windmill techno park in coastal areas and/or on scenic areas, especially on objects that are potential to be developed as nature tourism.



The purpose of tourism development will be successful with optimal when supported by the potential of the area either in the form of natural attractions and tourist attractions man-made. Travel activities in tourism in general, not least educational tours will have widespread impact for economic development in the region, because it can support the economic movement of the people as well as open pockets of art and culture, including the activities of utilization and preservation of the potential of natural resources to be known by every tourist [2].

The windmill techno park concept is based on the terms wind fields and offshore wind parks associated with an area or area for wind power generation, where many conversion installation units consist of various windmills/wind turbines built on vast land, coastal / coastal areas, and windmill rafts floating above sea level or ocean breeze fields [3].

Another aspect of the concept of wind farms (a collection of windmill installations) is to make it a tourist visiting park by modifying the constructs and their functional features, such as introducing a variety of physical models along with the essential functionality of a windmill on potential coastal areas location placement so that it becomes a special tourist attraction, and especially worth the educational content/nuance. Therefore, data and information about the potential of coastal resources in support of windmill techno park development program, as well as how to blend its existence to the development of tourism, especially education tourism and its contribution as hinterland area of urban growth.

2. Research Methods

In general, the approach used in this study is multidisciplinary or a combination of quantitative and qualitative, in accordance with the goals and target achievements in each year of implementation. Particularly in this article is oriented on methods and techniques, exploration, observation, and survey as well as quantitative (field measurement) and documentation studies.

3. Results and Discussion

3.1. Overview of Current Tourist Destination at the Research Location

So far, coastal areas within the study area are as sub urban coastal cities, especially for Padang and Pariaman areas where natural coastal tourist visits, with little physical development touch. There are two locations of visits and forms of tourism located in the area, namely the concept of religious tourism in the form of a tomb of Muslim religious figure "Syech Burhanuddin" located in the area Ulakan-Tapakis and sightseeing tours of the Pantai Tiram. Although both forms and areas of tourist visits have long existed, but has not shown its function optimally for the support of urban growth.



(a) The Tomb of Syech Burhanuddin



(b) Traditional Food Sales Area

Figure 1. Ritual Tour Model "Syech Burhanuddin" Pariaman

Figure 1 shows the tomb garden of Syech Burhanuddin visited on a seasonal basis by his followers of understandings from various regions of Indonesia. They make tourist visits, are seasonal and limited by performing religious/ritual activities called "basafa" traditions. In the villages around the tomb area stood and found traders area of traditional food of the local area.

In addition, in some coastal areas close to tourist destinations are also found some attractions such as beach tourism in the village of Ketaping in Batang Anai District. Specifically this area lies adjacent to the city of Padang and the location where there is an international airport of Minangkabau. Based on community information and observations in the field this area with a number of beach scenery is relatively crowded and visited by visitors and relatively potential to be addressed and developed as a tourist destination.

3.2. The combination of Coastal Resources Potential and Hinterland Analysis

The wind turbine technological park that is introduced is the engineering and the creation (work / artificial) of human being used as a tourist attraction or the attraction of the visit and also serves as a medium of learning/education for tourists, especially for students/students in the context of educational tourism. To need a number of consideration factors or development parameters in support of technical implementation.

3.2.1 Coastal Resources for the Development of Windmill Techno Park

By conducting a number of exploratory studies on coastal / coastal areas close to or as sub-urban areas of urban areas, especially in the surrounding areas of Padang & Pariaman, information about 2 (two) main supporting potentials related to resources endowment, i.e wind power/energy and natural landscape. These two types of coastal resource potential are used as parameter measures in the windmill techno park development plan. Integrating these two types of coastal resources will make it different from other areas / tourist visits.

a. Information on the Speed of the Wind

The characteristics and potential of wind energy resources in the research area in this case are taken into consideration in designing and developing windmill physical models. For that purpose, the livelihood and selection of the area that can be used as the placement area (site) of the development of windmill techno park by setting on the nearest coastline/ lips around the city (Padang and Pariaman Cities).

Table 1. shows the potential of wind resources in coastal areas in villages around Minangkabau International Airport in Batang Anai and Ulakan-Tapakis sub-districts in Padang Pariaman and Purus beaches in Padang.

No	Name of Location / Village	Measurement Time & Wind Speed (m/s)			Average Speed (m/s)
		Morning (8 - 10a.m)	Daytime (10 a.m -2 p.m)	Afternoon (14 - 18 p.m)	
1.	Manggopoh Ulakan	0,0 - 1,5	2,0 - 5,0	5,2 - 6,9	2,4 - 4,46
2.	Tiram Ulakan	0,5 - 2,0	2,2 - 5,5	5,5 - 6,3	2,7 - 4,60
3.	Ketaping Bt Anai	1,0 - 2,2	2,5 - 5,8	6,0 - 6,5	3,2 - 4,83
4.	Purus Padang	0,0 - 1,8	2,0 - 4,5	4,7 - 6,0	2,2 - 4,10

The measured periods of wind velocity are taken / measured in the time lap for 1 week, adjusted to the way / measurement model performed by [4]. The average measurement of wind speed is not much different from the Meteorological Agency report for the surrounding city of Padang is 2.5 - 6.5 m/s. Technically the average wind speed for a windmill engineering technique is normally to move between 2.0 m/s - 6.0 m/s.

Thus, the mean locational selection and placement of wind parks planned to meet the requirements & options for wind turbine construction engineering. That is, the functional variation of wind speed is relatively safe and feasible to be used as a design parameter for the development of a wind power conversion system.

b. Information on Regional Landscape Characteristics

The landscape of nature (natural lanscape) is meant a geomorphological area of various forms of the earth (valleys, rivers, lakes, mountains, sea views, etc.). These landscapes are potential or natural tourist attractions, which can be integrated into their use for tourism development by providing an attractively appealing attraction such as a set of windmill installation units. The Netherlands became famous as the country of windmills, through the attractions with wind fields

and windmill hills so that set every May 13 as the day of the windmill. To support the placement of windmills, giving more impression of the appearance of the background of natural scenery, especially the scenery of the sea and coastal areas, the following are provided snapshots of photo shoots of coastal areas used for the choice of construction sites.

In Figure 2 one of the coastal area with the background of the sea wave scene when the sun with a blazing sun in broad daylight at around 12:00 pm. Coinciding with the beach breeze, not only can reduce the heat of daylight but it is a potential for energy resources that can drive windmill blades.

From the aspect of the beautiful natural scenery, although in hot weather but the impression to the memories & capture the moment like this by sebahagian visitors are highly sought and eagerly awaited his presence. Moreover, the waves whilst enjoying the natural scenery followed by the artificial attraction of the presence of windmills along the coast so that it becomes the impression as a windmill beach tour (the windmill beach).



Figure 2. Landscape Beach Lipscape on the Village of Ketaping Ujung- Pd Pariaman

Furthermore, in Figure 3 shown a natural landscape of the beach when the sun enters the afternoon threshold at around 16:00 pm which is also as one of the location of the location of the park of the windmill. Air condition began to feel a bit cool because the sun's rays have started to fall in intensity. Most visitors usually start a lot of downhill walks along the beach lips set footprints on the sand.

The tourists will be eagerly waiting for the sunset event, so they will come & be in the location while enjoying the natural scenery in the area around the tour long before the event took place. With the construction of the windmill park along with other supporting tourism facilities will give the impression and attraction for visitors, so that will give impact to the growth of the city & economy of society along with the increasing number of tourist visits.



(a) Sand overlays on the beach



(b) The sun sets in western touk

Figure 3. One of the Lanscape Coast Area in Ketaping- Batang Anai

3.2.2. The Tourist Visit Area as a Function of City Hinterland

From the aspect of growth pole theory, tourist destination (TD) or tourist visit area can act as growth centers including its function as a back-area or hinterland for the development and growth of a city. Are cities with one or several tourist areas, such as the coastal city with its natural scenery

will have a special attraction for tourists to make it more memorable and fascinating or a choice of visit and may be developed faster than the cities without the ownership of tourist resources.

To see how far the interaction that occurs due to the construction of windmill techno park to the city area around the development, in this case the use of interaction theory between regions based on the method of gravity. The basic concept of this analytical tool is to discuss the size and spacing between two places, the growth center with the surrounding area, to the extent to which a region that is the center of growth influences and interacts with the surrounding area.

The theory of gravity is the most widely used model to see the magnitude of the attraction of a potential located at a location. The model is often used to look at the potential linkage of a location and the magnitude of the area of influence of that potential. That is why the model of gravity doubles as a location theory and as a tool in planning [5]. The greater the number of interaction between sub-districts as the center of economic growth with the surrounding area shows the closer interaction relationship between the growth center and the surrounding area (hinterland). The formula of determining attractiveness among sub-regions (T_{ij}) is:

$$T_{ij} = k \frac{P_i \times P_j}{d_{ij}^b}$$

where:

- P_i = Population sub-region i,
- P_j = Population sub-region j,
- d_{ij} = distance between sub-region i and sub-region j,
- b = rank is taken 2.0
- k = regional interaction constant, taken 1.0

For the sake of development of educational tourism, the population in this case will be approached with the number of potential trip trips conducted by the number of students and teachers who live in the area around the development of windmill techno park. Based on field information data and secondary data from district documents at sub-district and city level, the result of the analysis is obtained using the formula as in Table 2.

Table 2. Location Data of Techno Park and Interaction Analysis

No.	District / City	Population	Amount of Student + Teacher	Distance Between Regions (km)		Level of city interaction (T_{ij})x10 ⁶	
				Padang	Pariaman	Padang	Pariaman
1.	Batang Anai	46.424	2,346	20	36	5,86	0,56
2.	Ulakan Tapakis	19.431	3,326	35	21	0,08	0,02
3.	Padang	902.413	658,802	0	56	-	(64,67)
4.	Pariaman	86.724	30,817	56	0	(64,67)	-

Source: Survey Result and Document, 2017

Gravitational analysis in this study is used to assess the strength of the relationship (proximity) between two regions, where one region can be regarded as a mass that has an attractive appeal so that will appear the relationship of mutual influence between the two regions. In terms of regional economics, inter-regional relations can be identified as economic interactions between the growth centers and the surrounding areas. The result of this analysis shows that the highest interaction value is between Batang Anai subdistrict to Padang city, with an interaction rate of 5.86 x 10⁶, compared with Ulakan Tapakis subdistrict to Padang city or Pariaman city as its sub-urban area.

High interaction rates indicate a close relationship between growth centers and surrounding areas. Interactions can be characterized through the movement of people, goods and money. In addition, it can be realized in the form of economic and social service relations of the community within the region. With this analysis it can be seen that locational placement & construction of the Windmill Park in the Batang Anai subdistrict area shows strong interaction as hinterland for Padang city, which shows the highest interaction rate compared to other cities.

4. Conclusion

From this research can be concluded as follows:

- a. The combination of two types of coastal resource potential, ie landscape / geomorphology of the region and the motion / kinetic energy of coastal winds can be used as parameters of development planning of windmill techno park within the context of education tourism development.
- b. The selection and location of the optimal windmills for the coastal zone, in the results of this research lies in the coastal area of Batang Anai District with the strongest interaction power to the growth of the city of Padang for 3.86×10^6 units.
- c. With the presence of a windmill techno park at the selected location, it can also serve as a development center & tourist destination that will have an impact on the growth of surrounding cities.

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