Parangtritis Coastal Area: An overview upon conservation and development plan towards pseudo-urban coastal management

T-Y Lin¹, D R Hisbaron², A Retnowati²
¹Department of Geography, National Taiwan Normal University, Taiwan
²Faculty of Geography, Universitas Gadjah Mada, Indonesia
¹aeolin@ntnu.edu.tw, ²emmahisbaron@gmail.com, ²arry_retnowati@ugm.ac.id

Abstract. Yogyakarta coastal areas possess numerous natural, human and cultural resources. The development plan of Yogyakarta is pursuing a noble community via integrating marine and coastal civilization. The southern coastal area is somewhat posing rural characteristics nowadays, however with many development potentials introduced to the area, it might seem the coastal areas is creating pseudo urbanism. The progressing development is mandatory and unavoidable issue in the planning decrees. Trans-region development lanes along the southern coast of Java, particularly via coastal dunes along Parangtritis area, raise an issue of conservation and development. How these phenomena fit into each other? This paper offers argumentation and scientific overview upon conservation and development which had been very much an issue currently at Parangtritis coastal area.

1. Introduction
Numerous natural, human and cultural resources are located in Yogyakarta province. This provincial area surrounded and bordered by volcano, hills, river, and ocean. The beauty of natural and cultural resources put tourism and related services become consideration of Yogyakarta province strategic planning. The provincial government of Yogyakarta and Bantul district government designated master and detail plan of the strategic area of national tourism at the southern coast of Yogyakarta and its surrounding area. The vision of the master plan is to put National Strategic area of Southern Coast Yogyakarta as world class and sustainable culture - eco beach destination. Southern route of transportation has already been built in 2017 and still in progress¹. The government development plan aims to construct marine and coastal civilization together with an agricultural side (among Tani Dagang layer).

Parangtritis village connects western part of Gunungkidul district to Bantul district, Kulon Progo district, and Yogyakarta city. This village is designated as an agriculture-economic, conservation-education, and recreation-entertainment zone according to Bantul tourism ordinance number 18 issued in 2015. Barchan sand dune in Parangtritis is stated as Geoheritage according to the ordinance. Undebatable, conservation and regional development overlapping one another. a scientific overview is currently needed to evaluate the suitability of the area for any said purpose, especially related to conservation, education, and tourism which then lead to spatial planning for the rural-urban area.

¹http://parangtritis.bantulkab.go.id/index.php/first/artikel/49-JJLS-Di-Parangtritis, access 13 June 2018
2. Methodology
This paper applies systematic review based on several published article and formal regulations related to the coastal area of Parangtritis in the southern part of Bantul District. This review paper searches for the answer to a particular question how to define a rural coastal area to be developed as one of tourist area connected to other tourism places outside Bantul district with the possibility to become urbanized in a certain way. Parangtritis which geographically rural area is appointed as corridor access (see Kawasan koridor Tempel-Parangtritis), yet manage the sand dune conservation area (see Kawasan gumuk pair). The position of Parangtritis which connect the southern part of Yogyakarta Province and later connect the other southern coasts of Java is presented in the Yogyakarta Special Province Strategic Plan. The designated district's plans potentially lead to rural development with urban touch inside.

2.1. Research Area
The research area is bordered geographically by coastal alluvial plain in the north, escarpment in the east, the Hindian Ocean in the south, and Opak River in the west. Parangtritis coastal area stretch between 7°59'14" - 8°1'45" S and 110°16'40" - 110°20'22" administratively is part of Parangtritis village, Bantul district, Yogyakarta Special Province [1]. Two different environments, namely beach ridge landform filled with sand dunes and beach area with beach cusps morphology shape and distinguish Parangtritis coastal area. Tropical wet or dry savanna climate (Aw) in the Köppen climate classification system represents Parangtritis area climatic condition. The geographic, geomorphologic, and climatic differences and also demographic situation characterized this coastal area as a rural region.

Bantul district government in its District decree number 18 issued in 2015 set up Kecamatan Kretek, where Parangtritis (village) area located, as one of potential tourism area in the Southern Coast known as Segoro Kidul to be further developed. Parangtritis area is designated as tourism network together with another coastal area mainly Depok, Samas, and Kuwaru. Parangtritis tourism plan is designated based on its natural and cultural uniqueness. The district's plans aim to develop this rural coastal area in agriculture and tourism and broaden the transportation accessibility network.

3. Discussion
3.1. Parangtritis Coastal Dunes
Coastal dunes of Parangtritis is a Geo-heritage. The Barchan dunes in Parangtritis are normally formed in arid climatic zones, but it formed in this area with a humid tropic zone [2]. Coastal dunes of Parangtritis is the result of the aeolian process. Black sand material transported to the sea by the Opak and Progo rivers and deposited in the river mouth where then wave energy and sea current distributed the material. Low wind speed and the existence of physical barrier will push the sand to be deposited forming a specific topography called sand dunes. Verstappen (1983) stated that the east wind direction in this area is close to 325°NE.

Parangtritis coastal dunes are active and inactive type due to wind barriers, namely vegetations and topographic barrier (see Figure 1). [3] classified the Parangtritis coastal dunes into three types namely the Barchan dunes, the linear dunes, and transverse dunes based on Summerfield classification system [4]. Meanwhile, [2] conducted a field test and classified the dunes based on free classification: barchan dunes, barchanoid ridges dunes, and transverse dunes (see Table 1). The Barchan dunes lied in a relatively plain and open area with a relatively strong and stable wind speed. The height of the barchan dunes can reach more or less 10 meters with the back angle of more than 25°. The transverse dunes are parallel with the shoreline and perpendicular with the wind direction.
Figure 1. Sand dunes at Parangtritis surrounded by Escarpment, *Casuarina* tree and barrier building (photo by Retnowati 2016)

**Table 1. The Percentage of Vertical Distribution of Sand in Each Type of Sand Dune [2]**

| Types            | Creep (%) | Saltation (%) | Suspension (%) |
|------------------|-----------|---------------|----------------|
| Barchan          | 83.90     | 16.07         | 0.03           |
| Barchanoid       | 85.48     | 14.50         | 0.02           |
| Active Transverse| 83.87     | 16.10         | 0.03           |
| Inactive Transverse| 88.41   | 11.59         | 0.00           |
| Nebkha           | 83.19     | 16.79         | 0.02           |
| **Average**      | **84.81** | **15.17**     | **0.02**       |

Parangtritis coastal dunes are a unique and rare natural phenomenon which then raise the concern to conserve and protect them and put the area as conservation zone which reflected in Bantul district decrees. The decrees propose conserve zone as well as tourism development, where the southern part of Yogyakarta trend shows the rapid growth of tourism within a decade. Undoubtedly, it is very important to consider and understand the potential interaction and integration between development and conservation in this southern coastal area. The distribution of sand dunes on different height was assessed and mapped by [5]. The research revealed that 2 meters high dune occupied most of the dunes area. The sand dune elevation zone was assessed using Remote Sensing applying DinSAR technique on ALOS PALSAR images. The research suggested three coastal dune Parangtritis conservation zones based on tsunami height and wave directions scenario. The west and south wave directions are applied to determine the coverage area of coastal zone conservation area where the tidal area needed to be conserved southward on its 1 km medium width and 4 km on its westward length.

[6] assessed the ecosystem services provided by the coastal dunes system of Parangtritis in comparison with the coastal dunes of Vietnam and Chile. The highlight of the research is the significant role of dunes for disaster reduction against tsunamis, coastal and wind erosion for the area in the north of the dunes in particular based on [2]. Some illegal dwelling emerges on the dunes area which likely to increase due to transportation development to support tourism sectors. In 1998, ten administrative systems were proposed to the authority to manage the coastal area in Taiwan (ROC) on central and local agencies. That time, Taiwan (ROC) coastal areas were under pressures due to rapid changing development and inharmonious utilization which likely to occur in Parangtritis coastal area.

Taiwan coastal zone management Act (2015) stated about sand dunes conservation and other coastal features and creatures to preserve their habitat and environment. Human activities are also regulated to reach ecological conservation and coastal landform preservation within the coastal zone.
planning in Taiwan. A similar regulation is also issued or Parangtritis coastal zone management. However, there are still irresponsible activities emerge. Illegal sand mining occurs in the conservation coastal dunes of Parangtritis where land status become challenges. Most of the dunes mining takes place on local inhabitants who own legal right of his land status, by which their land actually included in the conservation area (news.detik.com). Most of the coastal dunes mining occur close to and alongside the development of southern road Jalur Jalan Lintas Selatan. Beside sand mining, other inharmony utilization occurs and require many stakeholders consciousness to manage livelihoods yet conservation as well.

Permanent housing and informal housing development hinder the natural process of dunes system (see figure 3). Figure 3 shows how some houses on the wind tunnel of coastal dunes system become a barrier of the sand movement towards dune development (November 2009). The sand movement is affected by monsoonal season, therefore, along coast development need to consider the cyclical natural process. Local people who inhabit the area for more than 30 years understand the knowledge of sand movement and wind direction changes on the certain season. However, this knowledge face economic pressure by the local community find alternative adaptation to their environment on trial and error implementation to manage their agriculture and tourism livelihood in the conservation zone.

Figure 2. Depositional of sand along wind tunnel at Parangtritis beach on different month within the same year (photo by Retnowati, 2009)

Parangtritis sand dunes from 2003 to 2015 decreased by 47.4% according to [7] Wenang (2017) while [8] mentioned that geo-tourism sand dunes Parangtritis in 2014 decreased to 178.13 ha. Wyrtki (1961) in [9] revealed that the surface current pattern along Java south coast during December - June directed to the East, while on August - October to the West. Meanwhile, semidiurnal tide pattern occurs in Parangtritis. [6] stated that Parangtritis coastal dunes system suffers from high degradation due to local sand extraction, dune fragmentation, and vegetation cover loss. Degradation is one issue to tackle as coastal dunes of Parangtritis publicly introduced as Geoheritage within the planning decrees. Aeolian process and the climatic factors are issues to take into account when infrastructure development such as roads, settlements, or leisure points underway. It is important to consider and take into account the morphological and cycle process of dunes system [10] to manage the ecosystem service or value for coastal management. In this case, Parangtritis coastal dunes system as part of conservation and regional development through tourism sector, included in the coastal zone management to reach sustainable regional development.

The natural processes of sand dune ecosystem analysis with the use of remote sensing and geographical information system can contribute to integrated coastal zone management as stated by [11]. Introducing coastal zone management in Parangtritis in administrative and physical features both require scientific adjustment which correlated one another. The physical features adjustment and analysis present the nature of Parangtritis sand dune process on its geological, climatic, biodiversities, and other physical parameters.
3.2. Towards modern rural coastal civilization in the regional and local plan of Bantul District

Bantul regional government has stated several planning documents related to its southern area development that include Parangtritis coastal area. The southern area is also listed in the national and provincial (strategic) plan. Parangtritis is stated as developing the strategic area in Yogyakarta Special Province Spatial Plan 2009-2029. The list of planning regulation issued by Bantul District government related to its southern coastal area among others are:

a) Long-term development plan (Rencana Pembangunan Jangka Panjang) Bantul 2006-2025 stated about sand dune as a strategic area, and the development of roads to Parangtritis area as the way to achieve the emerging of the modern rural area through tourism sector;

b) Medium term development plan (Rencana Pembangunan Jangka Menengah) Bantul 2016-2021 stated also about sand dune as a strategic area, and add cultural services in the tourism interest;

c) Bantul decree (Peraturan Daerah Kabupaten Bantul) No. 04 issued in 2011 about Bantul district Spatial Plan (Rencana Tata Ruang Wilayah Kabupaten Bantul) for 2010-2030;

d) Bantul decree (Peraturan Daerah Kabupaten Bantul) no.12 issued in 2015 about protection and management of environment mentioned that Parangtritis coastal area suffers from coastal abrasion lower than other Bantul coastal area as a result of sand dune protection. This decree expresses that sand dune is significantly important towards environmental and livelihood protection.

e) Bantul decree (Peraturan Daerah Kabupaten Bantul) no. 18 issued in 2015 about Master Plan of Tourism development in Bantul (Rencana Induk Pembangunan Kepariwisataan Daerah) for 2015 - 2025.

f) Bupati decree (Peraturan Bupati) Bantul no. 24 issued in 2006 regulate the space utilization for economic purposes, that include parking lot, along Parangendog to Parangkusumo beach. The decree stated the preservation zone boundary is located along the coastal line up to the north to the pathway determined by the government. Unfortunately, this decree provides no map needed to support the preservation zone area.

g) Bupati regulation (Keputusan Bupati) No. 127 issue in 2004 about Technical Plan of Parangtritis tourism area (Rencana Teknis Obyek Wisata Pantai Parangtritis) which then revised and included into Bantul Tourism Master Plan 2015-2025.

In correlation with the policy stated in the planning documents and district regulation, to reach the modern rural area, the ecosystem should be taken into consideration. Should there be development, site selection is significantly the determinant factor related to density and environmental carrying capacity. Designated development plan and policy should meet the preservation, conservation, and restoration of natural and cultural values which influence Parangtritis inhabitants livelihood. The southern route and tourism designated plan determine the long-term sustainability in Parangtritis. Such issues, for instance, water and sewage problems, have already emerged in the northern coastal route road (jalur Pantai Utara Jawa), which might occur in the southern route roads. The Southern route roads development of National Strategic Plan [12] shows the position of Parangtritis in the development of Java southern route roads known as Pansela (Pantai Selatan).

Human mobility along the southern route roads inevitable use resources and release waste. Such mobility, sectoral economy shift, and waste show rural-urban interconnection in peri-urban distinction. Transportation for accessibility purpose development in the northern part of Parangtritis village which occupied by agriculture will influence space utilization to surround the area where southern part coastal area located. The ribbon type of settlement or buildings tends to grow along the designated southern coast route road Pansela through Parangtritis area. Density along the southern route road correspond to economic shifts and demographic shifts. Economic activities and demographic growth likely show inter-correlation [13].

The village settlements which recently has linear type buildings but not a part of city expansion, possible will create ribbon development. Linear and ribbon type development correlate to land use issues due to space utilization on a variety of economic activities. Linear and ribbon type of buildings emerge and grow prevalent along the road and stemmed from traditional urbanization [14]. When the Pansela been utilized, possible lead to new small urban centers and broader settlements with the elongated pattern. The ribbon development type has been resisted in several European and US
countries. Good transport linkages encourage urban encroachment issues. Road density is used as one of World Resources Institute index of development-related threats to coastal ecosystems. Road density is an indirect measure of access to coastal resources and coastal development as stated by FAO.

The long-term development plan of Bantul District 2006-2025 encourages the emerging of a modern rural area in the coastal area by means of tourism and its related sectors. The strategic plan implements at Parangtritis area will be supported by infrastructure needed to maintain the services for those utilizing the Pansela routes and local communities as well. Parangtritis coastal area becomes Growth point in correlation with new small "urban" center towards southern route roads development. This supported by transportation development of east-west corridor connecting Girijati-Bugel, and also north-south connecting southern coastal area via Parangtritis to Tempel Yogyakarta to Semarang Central Java. Zoning policy in the region appointed Parangtritis as part of the point of local and regional economic growth express the ribbon development research as [14] revealed in Belgium.

The tourism sector is considered as "creative" industry in Indonesia nowadays. Industrialization in the rural area is now emerging and turn to be part of urbanizing rural area or urbanization to gain local development and connect the markets to the producer [15]. Tourism development becomes a vehicle of changing the lifestyle for Parangtritis villagers. Infrastructure and facilities are progressing to be completed in Parangtritis coastal area. Parangtritis village as a cell of development but not an urban fringe to Yogyakarta city neither Bantul. Ribbon development is found in the coastal area Papanasam India as the impact of tourism development [16]. The discussion of the ideal composition of urban-rural integration, in particular, the land elements of the transitional region, is still obscure [17] which mean an open argument still exists toward the new term of the cell. Parangtritis area will no longer become peripheral nor urban fringe, but it is a point of development in the southern part of Yogyakarta Special province. This due to the district, regional, and national planning designated for a southern network of Java.

The modern rural term used by the long-term development plan of Bantul District, in this paper is proposed as pseudo-urban. The pseudo term is used because Parangtritis coastal area inhabits rural features with urbanized lifestyles or urban imitation due to tourism development. The pseudo term is used in Karst issue, applied to explain features that similar to Karst with non-dissolution processes forms terrains analogous to certain types of Karst known as Pseudo Karst [18]. Parangtritis provides urban dwellers recreational space which then requires infrastructures and other supporting items related to urban daily needs. Further research is still required to propose the indicators or parameters of pseudo-urban in Parangtritis coastal area management.

4. Conclusion
This paper offers an open conclusion, in consideration that the development of a southern coastal area of Java is still progressing. The modern rural development goal in the Bantul decree has the potential possibility to create urbanized villagers with shifting cultural socio-economic.

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