

DESIGN STRATEGY APPROACH FOR FLOODING AREA AS A MITIGATION APPROACH, CASE STUDY: GORONTALO CITY

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Submission date: 02-Oct-2018 09:26AM (UTC+0700)

Submission ID: 1012047733

File name: MICCE2015_Paper_Andi_Harapan.pdf (773.02K)

Word count: 4612

Character count: 25921

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ABSTRACT: Gorontalo City is the capital of Gorontalo Province, which located in Sulawesi Island. The city is located on the lowland between a lake and a sea. Its geographic location make Gorontalo City is disaster prone, especially landslide and flood that strike almost every year. Those disasters occurred mainly because of the city planning and urban design approaches are not responsive to the geographic condition of Gorontalo City. Those disasters also overshadow the charm and potentials of Gorontalo City. To prevent recurrent flood and landslide, Gorontalo City should be planned and designed with green design approach based on its physical characteristic. This paper will elaborate some issues related to identify and analyzing problems and potentials of Gorontalo City, strategies and development models to solve the problems of Gorontalo City and to develop Gorontalo City as sustainable and resilient city.

Keywords: Gorontalo City, Flooding Area, Mitigation Approach, Design Strategy.

1. PREFACE

1.1 Background

A city should be planned and built with sustainability principles, which balancing the aspects of environment, social, and economy. Among these three, environmental aspect of a city is the major factor that should adapt the existing social and economy condition. But the environmental aspect should also be supported by the projected social and economy condition. The environmental aspect in planning should be structured and outlined in the city planning vision and applied through city planning principles and design strategies. These three aspects should be considered equal to gain a balanced development of a city. For example, if the city planning only focus on the economy aspect, there will be an imbalance development, that lead the city into unsustainable condition.

A sustainable city development and planning through balancing the environmental, social, and economical aspects should adapt and adjust the physical aspect of the city. Actually, this approach is strongly related to – and somehow is a part of – mitigation planning of a city. Balancing these three aspects are aiming to prevent the negative impact of unsustainable development. Punter (1991) gave an overview how sustainable planning synergy in shape, image, and activities will provide a sustainable place (space) of the city. Otherwise if the city is designed unsustainable, the city will be unsustainable.

Gorontalo City now is facing the result of unsustainable city planning and development. The city has a high-complexity problem in adapting rapid urban development to its physical and natural feature, which is vulnerable to disasters, especially flood and landslide.



Fig. 1: Floods and landslides in Gorontalo City

The topography of Gorontalo City, which is situated in valley, passed many rivers, and has a lake; and uncertain weathers are the primary causes of floods that often hit the city. The uncontrolled land conversion of irrigated agriculture are into urban area is worsening the impact of the floods. The issues mentioned above are correlated with the city planning and regulation regarding the city adaptation for increasing activities. In short, the city planning and development cannot maintain the citizen safety and comfort when the activities increasing. Whereas, Gorontalo City is the Capital of Gorontalo Province – it is should be a productive, sustainable, safe, and comfortable city and be example for other cities in Gorontalo Province.

Environment's physical features, such as rivers, lakes, and topography actually can be a great potential and give positive value for urban development when the urban planning consider the sustainable aspects mentioned before.

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Those features, mainly river and lake, can be a tourist destination, source of water, transportation, source of food, source of energy, irrigation, etc. Like many other Indonesian cities, the development of Gorontalo City seems partially see those potentials. It can be assumed that the economic and social aspect in urban planning and development is overpowering the environmental aspect, which resulted the negative condition in urban environment.

The complexity that Gorontalo City is facing has forced its government to make efforts through structural and non-structural action. Some alternative actions are revitalization of flood-prone areas, river and lake area restoration and improvement. There are also more extensive action, such as spreading public activities center in order to reduce the density concentrated in few urban areas so the impact of coming disaster can be minimized.

Gorontalo City urban development complexity with a variety of activities in few urban areas requires a structured, synoptic spatial planning that can described in the vision and urban planning of Gorontalo City. This plan should also be implemented through urban development principles and strategies. While Gorontalo City continues to grow – demographically, economically, politically, socially, and culturally, today spatial planning in fact has not been able to create a sustainable city development.

The new spatial planning should direct Gorontalo City development from monocentric approach to polycentric approach supported by inter-urban-area synergy. This planning is expected to accommodate the city's growth and make it adaptable to its physical situation. The core action of the planning is creating more city centers that can be a planning-and-development model for other areas in Gorontalo City. In order to be feasibly executed, the planning should consider the cultural-social factor, economical factor, and ecological factor of Gorontalo City and its surrounding regencies/cities. The ecological factor, especially availability of land, is the important factor in this spatial planning.

1.2 Issues in Gorontalo City

Some potential problems regarding to the city of Gorontalo rightnow are:

1. Synergy and structure of urban areas that have not been structured and integrated regarding to mitigation and adaptation to the environment. This problem is including the undefined city order that led to unordered synergy with surrounding regencies/cities.
2. Existing activity centers is still not optimized. It affects to social and economic value in Gorontalo City citizen. There are some areas in the city that built and developed without considering the environment's carrying capacity. For example, some conserved agricultural area that supposed to be a catchment area is transformed into residential area.
3. Spatial planning integrity between Gorontalo City and its surrounding regencies/cities is still not synchronized. It is also partially responding the problems of Gorontalo City, have less strategic plan to increase the efficiency and effectivity to be a more productive and sustainable city.
4. The current development has affected directly the social condition of Gorontalo City citizen, especially who live in poorly developed areas in the city, like Limboto Lake and Botu Area. It shows that not only environment quality has been degraded by current development, but also social quality. For example, this degradation will be a social disaster, if current development is not changed.
5. Recurrent floods that stroke Gorontalo City is affecting the image of this city, disturbing citizen activities, and indirectly lessening the pride of its citizen.

2. THEORY AND CASE STUDY

Some theories regarding spatial and urban planning is considered to support the analysis for spatial planning of Gorontalo City and its surrounding area. Case study is also studied, particularly city which has the similar problem with Gorontalo City (esp. flood mitigation) and applied the approach of studied theory in its city planning.

2.1. City Planning

A city should be planned integrally with a balanced consideration among social, economic, and environmental aspects. Every aspect is affecting each other and should related positively to obtain a sustainable development. The city planning also should considering the elements of city. Shirvani (1985) specifically describe eight elements of city planning that should be considered in the process: 1) land use, 2) building for and massing, 3) infrastructure, 4) pedestrian walk, 5) supporting facility, 6) signage, 7) preservation, including environment preservation. These eight elements, if grouped hierarchically through sustainable development approach, will be three aspects: environment, social, and economy.

2.2. Planning on Waterfront Area (Sea, Lake, and River)

According to Breen & Rigby (1994), a city that has a water potential physical features, such as river, lake, sea, etc., which geographically forms a transition area between a land and water area called as waterfront area. This area should be designed with specific strategy and considering its environment, social, and economic aspects.

2.3. Similar Case Study

- Canal development in Vietnam as flood mitigation.

Many cities in Vietnam flooded in rainy season while some places have already have canals. The causes are uncontrollable density in residential area, poor networks of rivers, and not well maintained canals. The solutions implemented are increasing the number of canals, rejuvenating existing canals, and land use reformation. Building that violate the land use regulation, mostly slums, in riverside area is destructed and the activities are moved into new well-designed area. The riverside area is transformed into green space that functioned as basin riparian area.



Fig.2: Spatial Planning in Vietnam

- City pond development in Taoyuan Metropolitan Area, Taiwan as water catchment area to solve the flood and shortage of water.

Taoyuan is a city located in valley and river basin area. In rainy season, flood strikes regularly because the river is overflowing. While in dry season, the area will be dry that resulted a poor agriculture productivity. The solution implemented is building the ponds as water catchment area. The ponds are located in several spots in the city and connected by rivers and canals.



Fig. 3: Ponds in Taoyuan, located in urban area and agricultural area as a mitigation approach

3. IDENTIFICATION AND ANALYSIS OF GORONTALO CITY AND ITS SURROUNDING AREA

3.1. Location and Administration Border

Gorontalo City is a Capital of Gorontalo province. Its northern neighbor is Kecamatan (District) Tapa of Kabupaten (Regency) Bone Bolango; eastern neighbor is Kecamatan Kabila and Kecamatan Tilongkabila of Kabupaten Bone Bolango; western neighbor is Kecamatan Telaga, Kecamatan Batudaa, and Kecamatan Batudaa Pantai of Kabupaten Gorontalo; and its southern area is contiguous with Tomini Bay.



Fig. 4: Administrative map of Gorontalo City

Gorontalo City is the most populated region in Gorontalo Province, where its population number is 40% of the Gorontalo Province population. The residential and business centers development in this city is increasing rapidly resulting the higher density of Gorontalo City.



Fig. 5: Images of Gorontalo City

3.2. Topography

Topography of Gorontalo City is consisted of mainly lowland and basin (oval-bowl alike) surrounded by mountains and hills. This topography resulting the catchment area of 500.000 ha (50 km x 100 km) that able to accelerate and decelerate the climate activity. On the other hand, the river streamflow in lowland area is slower than streamflow in slopes. In southern part of this city, there are some hills and mountains. While the area that adjacent to Tomini Bay is mainly a flat area. The 0-8% flat area in northern area is the location of Kecamatan Kota Utara, the city's main activity district (urban area)



Fig. 6: Topography of Gorontalo City and its surrounding.

3.3. Hydrogeology

Gorontalo City has three large rivers (Bone River, Bolango River, and Tamalate River), a lake (Tomini Lake), and coast areas (next to Tomini Bay) that connected each other. The topography of Gorontalo City that is basin makes the city as potential area to be a water pool area.

3.4. Spatial Structure

Regional Spatial Planning of Gorontalo City stated that Gorontalo City is consisted of City Service Center as primary civic activity center, City Service Subcenter and Neighborhood Center as secondary civic activity center.



Fig. 7: Spatial structure plan of Gorontalo City

Gorontalo City spatial structure according to the Regional Spatial Planning is consisted of elements that classified into its structure (primary and secondary), function (economy, education, industry), scale (city, regional, national, international), for (office, market, open space, residential), and location.

3.5. Disaster-prone Areas

1. Flood-prone Area

Flood-prone area is identified as area that often or highly potential to be stroke by flood. It covers estuaries, floodplain, alluvial mainly in riverside. The main causes of flood are high rainfall, uncontrolled land coverage in upstream area, lesser streamflow caused by sedimentation, and the topography.

2. Landslide-prone Area

Landslide-prone areas in Gorontalo City can be seen in the map below (based on analysis in Urban Masterplan of Gorontalo City).

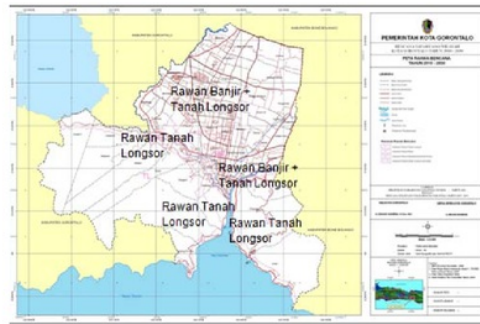


Fig. 8: Disaster-prone area of Gorontalo City

4. DEVELOPMENT ANALYSIS IN GORONTALO CITY AND ITS SURROUNDING RELATED TO FLOOD ISSUE

4.1 Analysis of Planning and Existing Development

The two hills that flank the city give an image of 'welcoming gate' for someone who encounter Gorontalo City from Tomini Bay. While the water physical features – passed by three large rivers, and in between bay (Tomini Bay) and a lake (Limbotto Lake) – give Gorontalo City 'a water city' image and characteristic. These features also should be a main consideration of Gorontalo City planning and development – perceptually and environmentally. In addition, managing the impacts of rainfall is closely related with these features too. The image below shows how rainfall and Gorontalo City topography and hydrogeology affect the condition of the city.



Fig. 9: Topography and Hydrogeology of Gorontalo City

Gorontalo City location in basin area forces a particular planning that ought to consider its unique environmental features: 1) Limboto Lake, 2) Bone River, 3) Bolango River, 4) riparian basin, and 5) slopes. If one of these features is not considered well in the planning process, it is not possible that disaster will strike often in the future. For example, 1) if Limboto Lake's shallowing is still going on – less than 15 m – water from this lake will be overflowing and affecting nearby land; 2) if the Bone River and Bolango River get narrower each year, the river stream will flood its neighbor area, especially in the confluence area; 3) if riparian basin is converted into other land use, the water that originating from hills and slopes will be directly flooding the city. The image below shows the condition – that has already occurred in Gorontalo City – where Limboto Lake contain its water and wet-rice agriculture area (as riparian) is converted into residential area.



Fig. 10: Climate is a significant factor for Gorontalo City

Nowadays, hills and slopes is used as residential and plantation area. Often, this condition is resulting a landslide when rain falls or earthquake strikes, because the ground is not absorbing the flowing water sufficiently. Land use

in this area should be reformed into water catchment area (e.g. forest) and have soil reinforcement in several slopes.

4.2 Analysis of Spatial Data Development

Essentially, the existing spatial planning of Gorontalo City has considering its environment condition, but not the growing population caused by urbanization and increasing birthrate. This growing population needs more residential and commercial areas. The most demanded land uses in Gorontalo City are residential, offices, and commercials. This demand should not violate the existing spatial planning because the carrying capacity is not sufficient.



Fig. 11: Spatial planning of Gorontalo City 2010-2030

Unfortunately, the reality is different. In Kecamatan Dumbo Raya and Kecamatan Hulonthalangi, estuaries as well as confluence areas, some riverside is used as high density housing (see images below)



Fig. 12: Uncontrolled construction in riverside area.

In Bolango River, shallowing and narrowing is going on. This phenomenon lead to decreasing flowing and carrying capacity of the river. The cause is mainly irresponsible sand-mining, where the miners do not recover mine area and they live in riverside area (convert the green spaces into residential area).



Fig. 13: Uncontrolled sand mining in Bolango River in Botu

Some Limboto lakeside area of Kecamatan Kota Barat is used as residential area – even some buildings violating lake protection line. Some tidal parts of Limboto Lake is also used as agriculture area, which lead to shallowing of the lake.



Fig. 14: Uncontrolled housing development in Limboto Lake

4.3 Analysis of Agriculture Area

Agriculture in Gorontalo City cannot relied on extensification approach due to limit its potential area. Whereas some agriculture areas are converted into residential area, infrastructure, and city facilities. In Kecamatan Kota

Utara and Kecamatan Dungingi the new road construction greatly increases the number of housings and commercial building. Tuloli (2013) found that land use conversion – from paddy fields to be built area – in 2006-2010 was massive, nearly 100 ha, especially in Kecamatan Kota Utara and Kecamatan Kota Timur. This conversion led to decreasing number of water catchment areas, recurring floods in Gorontalo City, and decreasing number of agricultural crops.

4.4 Analysis of Topography

Gorontalo City topography is mainly basin, consisted of three features: 1) hills, 2) slopes, and 3) plain. This kind of land surface is landslide-prone and the rivers in this city is easily covered by the landslide. Based on the topography, this city is divided into five areas: 1) plain area – slopes percentage 0-8% – located in every *kecamatan*, mostly in Kecamatan Kota Utara; 2) moderately sloping area – slope percentage 8-15%; 3) strongly sloping area – slope percentage 15-25%; 4) steep area – slope percentage 25-40%; and 5) very steep area – slope percentage >40%, located in Kecamatan Dumbo Raya, Kecamatan Hulonthalangi, and Kecamatan Kota Barat. Satellite images below show the topography of Gorontalo City and its surrounding.

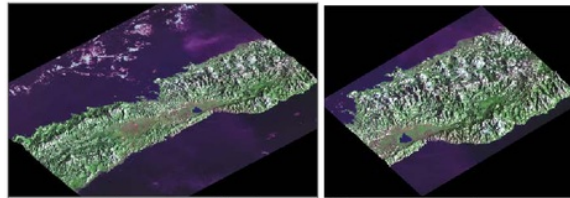


Fig. 15: Satellite images of Kota Gorontalo

5. PLANNING AND DEVELOPMENT STRATEGY

The basic principle used in the proposed planning and development strategy is sustainable development principle that balancing the economic, social, and environmental aspects and making environmental aspect as a core aspect in the process.

Problems in Gorontalo City today is making the city into unsustainable city. The strategy consider the problems as a result of *mismanaged* potentials (e.g. geographical feature) and use undeveloped potentials (citizen, cultural/social values) as generator for rejuvenating the city to be a sustainable city. The strategy will also aim to establish Gorontalo City as a disaster-responsive city.

The strategy is divided into four core actions: 1) land use and border planning, 2) bodies of water conservation planning, 3) infrastructure and transportation system planning, and 4) mitigation planning.

5.1. Land Use and Border Planning

1. Gorontalo City spatial planning will be focus on water stream area: Limboto Lake, Bone River, Bolango River, Tamalate River, and paddy field conserved area.
2. Strengthening the spatial identity and administrative borderline of Gorontalo City through green belt system, based on topography and disaster aspect. There are three areas that planned to be a *green border*: 1) Limboto Lake area, administrative borderline with Kabupaten Gorontalo; 2) Bone River area in Kecamatan Dungingi, administrative borderline with Kabupaten Gorontalo; 3) Bolango River area in Kecamatan Kota Timur and Kecamatan Dumbo Raya, administrative borderline with Kabupaten Bone Bolango.
3. Riverfront development through land use converting into office/commercial areas, green spaces, and public spaces as core action to regulate the river area. Increasing the water catchment capacity of Limboto Lake area through an integrated sustainable planning: mixed use development that also functioned as *environmental controller*.
4. Integrating Limboto Lake planning – as main water catchment area for Gorontalo City – to Gorontalo City spatial planning.
5. Utilizing paddy fields increasing the number of riparian areas as water catchment areas through conservation and regulation.

5.2. Bodies of Water Conservation Planning

1. River normalization and conservation by connecting Limboto Lake, Bone River, ponds, swamps, and coastal area and converting those areas into a green corridor.
2. Increasing the number of ponds as water catchment area in the overflown water area or confluence, especially in conserved paddy field.
3. Utilizing the bordering waterfront areas as linkages between Gorontalo City and its surrounding regencies.
4. Integrating the water management system through constructing dams and canals as flood prevention facilities.

5.3. Infrastructure and Transportation System Planning

1. Considering the land use planning to evaluate the class of existing roads and to develop new transportation network. Number of roads in conserved paddy field should be minimized to prevent further land use conversion.
2. Utilizing rivers, lake, water catchment areas, and sea as transportation network. This transportation network planning should also consider the land use of adjacent area to support Gorontalo's City tourism and cultural activities.
3. Developing water management infrastructure in Limboto Lake area to maintain water quality in this area – regarding its land use as mixed use area.
4. Creating green hub in green belt border area that functioned as interchange transportation hub. This hub will be transportation management controller and a welcoming area that enhancing the image of Gorontalo City as green city. Like most of green belt designed, this hub also designed as waterfront area.

5.4. Mitigation Planning

1. Mitigation-based planning in flood-prone areas, especially 1) Limboto Lake area; 2) Bone River area; 3) Bolango River area; 4) Tamalate River area; 5) conserved paddy field.
2. Mitigation-based planning in landslide-prone areas, especially hills and slopes in Kecamatan Kota Barat, Kota Hulonthalangi, and several other *kecamatan*s, by reducing the number of residential and commercial (esp. office) area and increasing the number of green spaces in these areas.
3. Mitigation-based planning in flood-prone and landslide-prone areas, especially areas in Kecamatan Kota Barat and Kecamatan Kota Timur, by converting these areas into open spaces or conserved forests. Some slopes in these areas need soil reinforcement through retaining wall in order to prevent landslides heading to the river.
4. Mitigation-based planning regarding the earthquake, tsunami, or tidal flood through building heights regulation and coastal zone demarcation. This demarcation used to prevent the residential area construction in coastal zone, so the impact of tsunami or tidal flood will be minimized.

6. ZONING DEVELOPMENT MODEL

There are five zones in Gorontalo City that will be development models based on analysis and planning strategy explained before. Those five zones are 1) Limboto Lake Conservation and Development Zone, including some areas in Kecamatan Kota Barat and Kecamatan Duingingi that have mutual influences with Limboto Lake Area; 2) Gorontalo City Center in Kelurahan Botu, a borderland with Kabupaten Bone Bolango; 3) River Stream Bottleneck Zone, consisted of some areas in Kecamatan Hulonthalangi, Kecamatan Dumbo Raya, Kecamatan Kota Selatan, and Kecamatan Kota Timur; 4) Borderland Riverfront Zone, 5) Conserved Paddy Field Zone, consisted of some areas in Kecamatan Kota Utara, Kecamatan Kota Tengah, and Kecamatan Kota Timur. These five zone are planned and designed to make resilient as well as grand vision of Gorontalo City is realized.



Fig. 16: 5 Zoning development model map

6.1. Limboto Lake Conservation and Development Zone

Limboto Lake is planned and designed according to land use management principle, water management principle, and infrastructure management principle. This zone is planned to be a mixed use development area in order to distribute populations, business activities, and development of Gorontalo City and to reduce the density in overcapacity *kecamatan*s, such as Kecamatan Kota Tengah. The arch-like waterfront design is based on theory of shoreline development. In some tidal areas, the waterfront surface will absorb the tidal water so the waterfront area still can be used.

In the middle of the lake, there will be a gigantic alphabet art installation that glow in the nights. This iconic installation will be a new landmark for Gorontalo City that can be seen from up in the air (airplane or drone).



Fig. 17: Limboto Lake Conservation and Development Zone

6.2. Gorontalo City Center in Kelurahan Botu

As a flood-prone area caused by narrowing of Bone River, this zone will be rejuvenated integrally with water management system. This zone will be center for Gorontalo City civic activities. It is planned to contain green spaces, public open spaces, municipal masjid, and new residential projects. The development will not only cover the riverside areas, but also in central of Botu and its neighbors. Nonetheless, Bone River is still the main focus of development by designing it interestingly and unformally. The design of riverfront area is aiming to cultivate 'interaction' between citizen of Gorontalo City and the river. This 'interaction' is expected to nurture the citizen responsibility over the river and make it an integral part of their life.



Fig. 18: Gorontalo City Center in Kelurahan Botu

6.3. River Stream Bottleneck Zone

This zone is important part of water management system because it is a confluence as well as estuary of River Bone and River Bolango. In this zone, there will be waterponds to contain overflowing water and to process this water so citizen of Gorontalo City is able to use it.



Fig. 19: River Stream Bottleneck Zone

6.4. Borderland Riverfront Zone

This zone is a borderland of Gorontalo City with Kabupaten Gorontalo. Some of its area have been used as municipal offices while there is a lack of public spaces here. Increasing the number of green spaces and waterfront areas that combined with existing municipal offices is the core development strategy in this zone. Some ponds also constructed to contain overflowing water from Bone River.

6.5. Conserved Paddy Field Zone

This zone is a paddy field area that managed to have an additional as water catchment area: some defunct fields are refunctioned and new waterponds are constructed. New waterponds will be a water source for nearby paddy field in dry season. This zone also expected to be main grain-producing area of Gorontalo City.



Fig. 20: Conserved Paddy Field Zone

7. CONCLUSION

Gorontalo City as a Capital of Gorontalo Province has a great opportunity to be a metropolitan city through managing its potentials and detailed and holistic planning process. Some disasters that strike Gorontalo City – especially floods – are happened because of unresponsive spatial planning to its environment condition (topography and hydrology) and rapid urbanization. Located in basin area between Limboto Lake and Tomini Bay and passed by some River, Gorontalo City is a confluence as well as an estuary. To prevent recurrent floods and landslides, there are four strategies to be implemented: 1) land use and border planning, 2) bodies of water conservation planning, 3) infrastructure and transportation system planning, and 4) mitigation planning. The cooperation between government and citizen/private sector is necessary to realize strategies above through zoning development models. This synoptic and integrated planning is needed to build Gorontalo City as a sustainable and resilient city.

REFERENCES

- Arifin, Yuyu Indriati; Kasim, M (2012), Pemetaan Zonasi Banjir Kota Gorontalo untuk Mitigasi Bencana, accessed through <http://repository.ung.ac.id/riset/show/1/221/pemetaan-zonasi-banjir-kota-gorontalo-untuk-mitigasi-bencana.html>, on October 2014
- Arifin, Sri Sutarni (2014), Analisis Kebutuhan Ruang Terbuka Hijau di Kec. Kota Tengah Kota Gorontalo, Jurnal Radial STITEK Bina Taruna Gorontalo, accessed through <http://repository.ung.ac.id/karyailmiah/show/260/analisis-kebutuhan-ruang-terbuka-hijau-di-kec-kota-tengah-kota-gorontalo.html> on October 2014
- Breen, A. & Rugby, D. (1994), *Waterfront, Cities Reclaim Their Edge*, New York: McGraw-Hill Inc.
- Chapin, F. Stuart; Matson, Pamela A.; Mooney, Harold A. (2002), *Principle of Terrestrial Ecosystem Ecology*, New York: Springer
- Lynch, K. (1960), *The Image of the City*, USA: the MIT Press
- Montgomery, J. (1998), Making A City: Urbanity, Vitality, and Urban Design, *Journal of Urban Design* 3:1, page 93-116
- Punter, J. (1999), *Design Guidelines in American Cities: A Review of Design Policies and Guidance in Five West Coast Cities*, Liverpool: Liverpool University Press
- Shirvani, H. (1985), *Urban Design Process*, New York: Van Nostrand Reinhold Company Inc.
- Sorensen, A. dan Okata, J. (2011), *Megacities: Urban Form, Governance, and Sustainability*, Springer
- Torre, L. Azeo (1989), *Waterfront Development*, New York: Van Nostrand Reinhold
- Tuloli, M. Yusuf (2013), *Proses Perubahan Spasial Kota Gorontalo (Konversi Lahan Pertanian Menjadi Terbangun)*, Prosiding Pertemuan Ilmiah Tahunan Ikatan Ahli Geografi Indonesia, Banjarmasin, November 2013
- Zahnd, M. (1999), *Perancangan Kota Secara Terpadu*, Yogyakarta: Penerbit Kanisius

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