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DEVELOPMENT AND COASTAL ENVIRONMENT CHANGE, WILL HAVE A MEETING POINT? CASE STUDY OF COASTAL ZONE OF WEST JAVA PROVINCE, INDONESIA

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Abstract: This article covers coastal environments which are globally in threat by anthropogenic impacts, yet how these impacts are determined by economic expansion is not well explicit. The main objective is to highlight recent dataset to measure coastal trends and inspect the role of economic growth in West Java's coastal degradation since the 1989 to 2019. Every coastal human impacts examined increased over time have thus motivated considerable research. This paper describes conflict analysis revealed important relationships between most impacts and economic activities across temporal and spatial scales. In particular, when influences of population growth were addressed by analyzing per capita impacts, and when population density was included as explanatory variables. This study can be considered as a first-step towards developing a multiple coastal area use plan in West Java. However, future coastal use plans will require more information on emerging uses. We suggest that a stronger conservation ethic and shift in thinking from prioritizing short-term economic development to considering how environment services sustain economic growth would promote conservation of coastal environments. Without strict conservation efforts, continuing economic growth will further degrade West Java's coastal environments.

Key words: conflict analysis, coastal environment, economic development, West Java, coastal population

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INTRODUCTION

The coastal environment consequences of dramatic declines or changes in biodiversity have spurred considerable research and tremendous debate that has rekindled most of the major conflicts in ecology, creating a sense of déjà vu. These conflicts include whether environment or community ecology provides better insights into the workings of nature, the relative importance of biotic vs. abiotic factors in governing community composition and structure, the virtues of phenomenological vs. mechanistic research, the relationship between biodiversity and stability, the relative importance of taxonomic vs. functional diversity, and the relative strengths of physical vs. non physical approaches (Crossman and Bryan, 2009; Swaney et al., 2012; Rizal, 2018b) .

Coastal environments of West Java are among the most precious on earth due to their provisioning of environment services (Fan et al., 2017; Rizal, 2018a; Rizal et al., 2020). For example, mangrove belts and seagrass beds buffer shorelines from storm damage and erosion, store carbon, serve as vital nursery grounds for marketable shellfish and finfish, and biochemically process earthly runoff (Fan et al., 2017). Almost half of the world's inhabitants live close to coasts that advantage human society with access to trade, land development, oil/gas exploration, and food production. This is a most important reason for the higher per capita income commonly observed in coastal than in closed in countries (Clayton, 1989; Burgi et al., 2004; Farley and Costanza, 2010; Fan et al., 2017).

Regardless of their value, coastal environments are being swiftly ruined worldwide by human actions, modern overfishing, for example, has caused globally declines and exterminations of predatory fishes such as tunas, sharks, and rays (Motyka and Brampton, 1993; Payne and Sand, 2011; Outeiro et al., 2015); contamination and climate change has driven extensive crumples of coral reef ecosystems, and coastal reclamation for settlementsector and urban sprawl has led to enormous losses of mangroves as fish spawning and nursery ground. Most science on the changes in coastal environments is focused on the role of increasing human population density (NERC, 1994; Paerl et al, 2016; Rizal, 2018b). Although economic growth could have similar or even larger effects (due to increased resource utilization and squander output) (Ramster, 1994; Pendleton, 2008; Rizal and Lantun, 2017), the association between economic development and coastal human impact has been infrequently examined. Moreover, human crashs on coastal environments are largely unexplored in developing countries, which will drive much of the region's future economic growth (Suárez and Rodríguez, 2012; Rizal et al., 2019; Rizal et al., 2020).

The exploitation of the West Java coastal resources in the last decade shows an increasing trend and is approaching maximum utilization, which is the point where exploitation is endangering the preservation of the environment and coastal resources (Rizal, 2018a). Various risks and environmental damage caused by human activities if left unchecked will be a threat to the preservation of coastal resources themselves

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and the surrounding environment.The above conditions occur because, at this time environmental resources such as water, air, land, and biota are considered by the community as common property. Every stakeholder or beneficiary is competing to utilize these environmental resources without any rules restricting them, resulting in massive exploitation of environmental resources (Turner and Adger, 1996; Vallega, 2005; Rizal, 2018a). This is done because every stakeholder or user has an assumption that other people will also use these resources if not utilized to the maximum extent possible. Besides coastal resources, in general, are open access so that it will quickly stimulate the destruction of coastal resources. The implication of this process is the scarcity of resources. In the end, it will have an impact on the reduction of coastal resources and the high price of products produced from coastal resources (Villa et al., 2002; Vallega, 2005; White etal., 2012; Rizal, 2018a).

In this paper, we provide a synthesis conflict of coastal trends and the role of economic growth in the degradation of West Java's coastal environments since the 1989. We compiled an exceptional and inclusive dataset from yearbooks, governmental and non-governmental reports, and secondary literature. We included data on West Java's coastal economy, population, and a range of human impact factors. To monitor trends in West Java's coastal economy and population, we collected data on West Java's gross domestic product in its coastal regions (coastal GDRP), calculated per capita GDRP, and compared yearly increase rates between pre- and post-reforms. To inspect the role of economic growth in accelerating coastal impacts, we first compared pre- and post-economic reform patterns, and then calculated the association between GDRP per capita and human impacts.

MATERIALS AND METHODS

This paper outlined the research in formulating a model of the conflict analysis and resolution followed the general coastal management process (CMP) based on the work of Golledge and Stimson (1997) and Gorre (1999). The terminology of the conflict itself carries a basic understanding of differences in perceptions about the ideal conditions desired by more than one party. According to Golledge and Stimson (1997), individuals are very concerned with the formation of the perception of the desired world (perceived world), while trying to maintain the stability, resilience, and consistency of the shadows produced by that perception. The built environment condition is often considered as a form of translating space from human decision making. Most of these decisions are strongly influenced by the way humans perceive and evaluate spatial elements, as well as their ideal shadow of the potential use of the space (Golledge and Stimson, 1997). The three main steps in the CMP were: 1) defining and analysing present conflicts; 2) defining and analysing future conditions; and 3) developing alternative allocation plans. These steps allowed for the inclusion of stakeholders at different stages of the process (Golledge and Stimson 1997; Gorre, 1999; Villa et al., 2002; Rizal, 2018a). To measure trends in economy and population in coastal West Java over the lastdecades, we extracted GDRP (1989–2019) and population (1991–2019) data from West Java's Regional Database of Statistics (CSA,1990; CSA,1995; CSA,2000; CSA, 2005; CSA, 2010; CSA, 2015; CSA, 2019) for each of the 10 coastal districts: Bekasi, Karawang, Subang, Indramayu, Cirebon, Sukabumi, Cianjur, Garut, Tasikmalaya, and Pangandaran (Gross Domestic Regional Product/GDRP and population data of other districts and the total of West Java were also extracted for use in following sections). Coastal GDRP (converted IDR to USD) and population were calculated as the sum of the coastal districts. We defined coastal GDRP and population on the basis of district, rather than within some distances of the coast, because those data were better developed on a per district basis. Long-term GDRP data of specific marine industries were unavailable (available only for recent years), precluding analysis of those data. We estimated yearly average increases in coastal GDRP and population in two periods: pre- and post-reform in 1998.

RESULTS DISCUSSIONS

Although there is no agreement on the definition (boundary) of coastal zones (coastal zone) at the national or world level, there is general agreement that the coastal area is a transitional area between the land ecosystem and the marine ecosystem. When viewed from the coastline (coastline), then a coastal region has two types of boundaries, namely: a boundary parallel to the coastline (longshore) and a boundary perpendicular to the coastline (cross-shore). For management purposes, the establishment of coastal boundaries that are parallel to the coastline is relatively easy (UNEP, 2011; White et al., 2012; Rizal, 2018b). However, the determination of the boundaries of coastal area perpendicular to the coastline, so far there has been no agreement. At present, there are seven types of boundary coastal areas perpendicular to the coastline that have been referred to by countries in the world (Figure 1). On one hand, it is determined that a coastal region is a transitional area between land and sea which is very broad, towards the sea includes the outer boundary of a country's exclusive economic zone that is 200 nautical miles (320 km) from the most landline limit of continental shelf exposure, and towards the land includes the headwaters of a watershed or the influence of the marine climate such as sea breezes. Another extreme stipulates that a coastal region is only a transitional area between land and sea that is narrow, towards the sea including the outer boundary of the territorial sea (12 nautical miles from the coastline at the lowest ebb), and towards the land includes the uppermost boundary from geomorphology of coastal lands, such as mangrove forests.

Ecologically, the boundary towards the sea of a coastal area is to cover areas of seawater that are still affected by natural processes (such as freshwater flow from rivers or run-off) as well as human activities (such as pollution and sedimentation) that occur on land. Meanwhile, the land boundaryis to cover land areas that are still affected by marine processes, such as the extent of tidal influences, seawater salinity, and seabreezes. Therefore, land and sea boundaries of a coastal area are very site-specific or depend on the biogeophysical conditions of the area in the form of coastal topography and geomorphology, tidal and wave conditions, watershed (Watershed) conditions, and development activities that are in the upstream area (Rizal, 2018a; Rizal, 2018b; Vera et al., 2019; Aliyeva et al., 2020).

The question is how do we choose the right coastal area boundaries. For management purposes, it is less important to set rigid physical boundaries of a coastal area. It would be more meaningful if determining the boundaries of a coastal area isbased on factors that influence the development (utilization) and management of coastal resources along with all the ecosystems in them, as well as the objectives of the management itself. For example, deforestation and agricultural activities on upper land that do not heed the conservation ruleswill cause changes in the hydrological regime of a watershed and increase erosion rates, which can eventually lead to changes in salinity and sedimentation regimes in coastal areas (Clayton, 1989; Beatley et al., 1994; Burgi et al., 2004; Farley, 2008; Chi, 2010; Crossman et al., 2011; Fan et al., 2017). Thus, although for the sake of day-to-day management, development activities on land or on the high seas are usually handled by separate agencies, for the benefit of coastal area development planning, all these effects or links must be included when planning. Therefore, coastal boundaries on one side are more suitable for planning purposes, while other restrictions are more suitable for the interests of the day-to-day management of coastal areas.The coastal and marine sector in the current assessment is taken to mean the 'coastal zone' defined by the United Nations Environment Programme (UNEP, 2011) as 'the area of land subject to marine influences and the area of the sea subject to land influences'. The coastal is the place where sea and land meet. A coastal area is defined as a transitional area between the sea and land, in the direction of land covering areas that are still affected by seawater or tidal sparks, and in the direction of the sea covering continental shelf areas (Beatley et al., 1994). Geographers, geologists and biologists unanimously acknowledge the unique properties of coastal zones as the contact zone between the lithosphere and the hydrosphere. This interface is represented on geographic maps as a thin coastline (Pendleton, 2008; Payne and Sand, 2011).

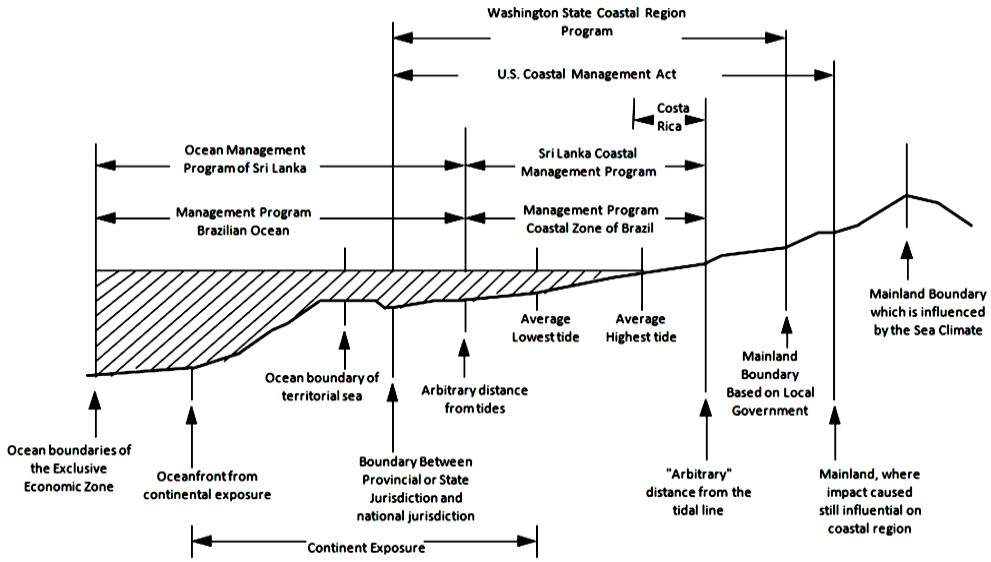

Figure 1. The boundary of Coastal Areas Management Programs and Ocean Management Programs Current and Future (Source: Modified from Sorensen and Mc Creary, 1990)

Ecologically, coastal areas are transition zones, which in ecological terms are known as ecotones, which lie between the terrestrial and oceanic systems. According to Hansom (1988) as quoted by Beatley et al. (1994): "The Coastal areas include land-sea-air transition zones around continents and islands that are defined as stretching from the inside boundary indented to the extent of tidal influence and energy from the sea, and protruding outward to the continental shelf boundary (Beatley et al., 1994; Evans et al., 1996). One of the main features of the coastal region as a transition zone associated with the problem of conflict is the length of the interrelation between the impacts that occur in this region as a result of human intervention. The description of the physical boundary as stated above is only a physical boundary of the transition area. Whereas the area of influence and those influencing the process in this transition zone can reach even greater distances towards land, or to the ocean (Huff and Lust, 1979; Humphreys et al., 1996; Fan et al., 2017; Rizal, 2018a).

With the physical complexity of the West Java coastal areas, as seen from the dynamics of the formation of several major habitats such as beaches and barrier islands, estuaries, coastal wetlands, and coral reefs, it is very clear that the coastal areas are physically the result of interaction (one might say competition) from two coastal regimes (Rizal, 2018a). From a social standpoint, the West Java coastal region has historically also been an area of interaction between inland native communities and immigrant communities that enter and settle from the coastal region. Changing patterns of coastal land use from just settlements and agriculture, to a number of other uses such as tourism, conservation, and industry has also increased the complexity of the economic interests of spatial use. Above the various physical, social and economic complexities above, the administrative jurisdiction boundaries of various levels and sectors of government in the West Java coastal region are also highly fragmented. Looking at some of the facts stated above, it is quite clear that naturally, conflicts are already part of the conditions that occur in West Java coastal areas. As a zone of physical, social, and economic transition, the complex dynamics of coastal and human life are reflected in the form of various cycles of change that occur in West Java coastal areas. Some of the various change cycles, often can not return to the initial conditions that allow the cycle to repeat in the next time period (Budiyantini and Pratiwi, 2016; Rizal, 2018a). Damage to mangrove habitat due to changes in salinity and sedimentation of industrial waste, for example, can result in the loss of ecosystems along with various chain-forming organisms from these ecosystems. The situation can harm the economic chain of the utilization of various related coastal resources. Recognizing the nature of the inherited conflicts of interest in the West Java coastal area, the coastal resource management system adopted in this area also needs to be built based on understanding and aligning these various interests. Management systems that are physically implemented in space in the form of types and limits of utilization, need to be prepared based on the concept of resolution of various conflicts that have or are expected to occur. For this reason, conflict resolution must become a standard part of the regulation of spatial use, especially in complex areas such as the coast.

Anatomy of the West Java Coastal Area Conflict

Understanding conflicts in the use of the West Java coastal resourcesis usually associated with unequal distribution of access to resources from various users (Gorre, 1999; Rizal, 2018a; Rizal 2018b). The terminology of the conflict itself carries a basic understanding of differences in perceptions about the ideal conditions desired by more than one party. According to Golledge and Stimson (1997), individuals are very concerned with the formation of the perception of the desired world (perceived world), while trying to maintain the stability, resilience, and consistency of the shadows produced by that perception. The built environment condition is often considered as a form of translating space from human decision making. Most of these decisions are strongly influenced by the way humans perceive and evaluate spatial elements, as well as their ideal shadow of the potential use of the space (Golledge and Stimson, 1997).

From the description above, it can be understood that the conflict over the use of the West Java coastal resources is a reflection of differences (conflict) perceptions about the space idolized by users of one another. In the West Java coastal areas, conflicts can be found that can be categorized in 1) user conflicts and 2) conflicts of management jurisdiction (Gorre, 1999). These conflicts can occur at different levels starting from the latent stage, the stage of the developing process, to the visible stage. Latent conflict is a conflict characterized by the presence of tension and disagreement between users at a level that is not yet raised to a dispute of opinion.

Not infrequently, users of different understandings are not yet aware of these differences. Conflicts that develop are characterized by the recognition or understanding of different interests (Gorre, 1999; Capello, 2016). However, a way out of these differences of interests has not been obtained. Whereas open conflict is a dispute that is in the process of finding a solution, both in the form of negotiations and in the form of actual physical disputes.In the West Java coastal resource utilization practices, conflicts can occur for a variety of reasons, including because 1) relationship problems, 2) data differences, 3) differences in interests, 4) structural problems, and 5) differences in the value system used. Figure 2 shows the various causes of conflict and the factors that influence it.

Figure 2. Growth population in the West Java Coastal region (Source: Rizal doc, 2019)

Relationship problems are usually the starting point and the mildest level of conflict, namely differences in perception due to strong emotional factors, assumptions of other parties' behavior (stereotyping), lack of communication, and experiences of repetitive negative behavior. Although the level is mild, conflicts due to relationship problems are often the cause of policy conflicts that confuse and harm the public of coastal resource users. Conflicts that start with data generally occur because of the lack of a standard basis for various data collected by different users. The fundamental problem that often causes conflict because of data is the lack of understanding of data users about the perceptions used in the process of collecting, processing, and presenting the data.

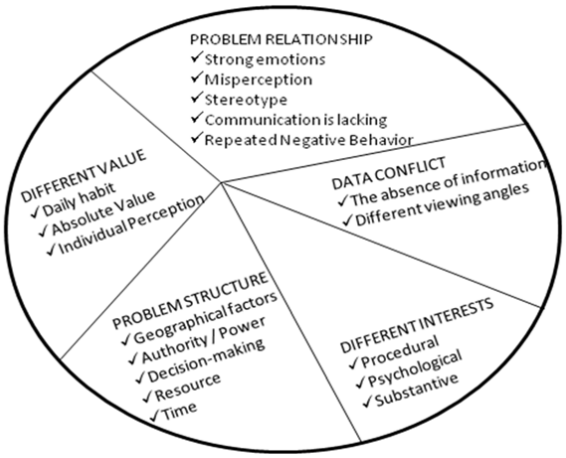

Figure 3. Sources of conflict (modified from Gorre, 1999)

However, conflicts that occur can be a result of differences in real interests such as differences in interests between development priorities in one field from another. In cases like this, differences in data can instead be indicators of differences in interests between the sector agencies that produce each data.

In the last decade of free-market era, data is a commodity that is determined by market needs and is also fulfilled by the market (Capello, 2016). However, the government as the guardian of the public interest can set data collection standards for the benefit of public decision making (Knox, 1991; Erb, 2012; Koshim et al., 2020). Conflicts that occur due to differences in interests are usually motivated by differences in needs between multiple users of the same coastal resource. In this case, the final decision taken must be based on choices that represent the interests of the majority of users, while at the same time giving choices or compensation to users whose interests cannot be fulfilled.

In some cases, there can also be a compromise between several interests, by finding solutions that do not evenly meet the ideal expectations of parties with different interests (Knox, 1991; McDonald, 2006; Long et al., 2007). Resolution adopted for this type of conflict can be in the form of restrictions, rotation, division of roles, or cooperation in the use of coastal resources that are equally needed.In structural conflicts, differences in interests cannot be resolved because of the inability of one or both parties due to external matters which are beyond the control of these parties. The limited mandate or jurisdiction of parties with different interests to make an ideal decision is an example of this structural conflict (McDonald, 2006; McGarigal, 2014). In cases, the path of public decision making through legislative mechanisms is the most ideal solution. Value conflicts are the result of differences in the value system used by one user and that used by other users. Conflicts usually occur if one party tries to force the application of the values, it uses to the other party. The way out of this kind of conflict is through mediation to look for harmonization of a value system that can run in harmony, as well as mitigating the possibility of clashing of conflicting value systems. For cases of conflict like this, the arrangement of the use of space can be an effective instrument for achieving harmony and avoiding the earlier conflict.

The conflicts stated above, are the types that occur in different interests in the use of the West Java coastal resources that occur at the same time. Besides the types of conflicts above, there are also types of conflicts that occur because of differences in interests that occur at different timescales. In this type of conflict, users of conflicting interests may consist of the exact same group, or the same group but from different generations. The occurrence of surface water pollution in the long term as a result of intensive agricultural activities is an example of this type of conflict. The resolution that can be taken is by conservative utilization patterns, or by allocating a portion of the wealth obtained in the present for the purpose of handling the impact and finding alternative uses in the future.

Conflict coastal economy and population

Like other coastal areas in Indonesia and even the world, the coastal area in West Java becomes a center of growth for urban development. The growth of coastal cities in West Java is driving increasing urbanization. The process of urbanization of coastal cities in West Java is closely linked to the process of population growth and concentration in certain coastal areas. At the beginning of the process of urbanization in coastal cities is characterized by an increase in the rate of population growth which is then usually followed by the simultaneous development of economic growth from the process of urbanization, although then the rate of population growth will slow down in subsequent periods. In this context, various studies also explain that concentration and agglomeration are very influential in the early days of the process of economic growth and urbanization of the population.

Under these conditions, production efficiency requires spatial concentration. However, when infrastructure services and the accumulation of human capital and capital increase due to concentration and agglomeration, spatial expansion becomes a solution to the problem of externalities brought about by congestion that occurs in concentration centers (Knox, 1991; Miao and Zhao, 2005; Koshim et al, 2020). Similar to the opinion of Fujita and Thisse (2002) who said that agglomeration always runs side by side and conducive to growth, Baldwin and Martin (2003) said that spatially, especially at a certain level in economic policy that prioritizes growth, complementary relations between agglomeration and growth will create a "spillover" that encourages the physical extensification of the existing agglomerations. This extensification expands the spatial concentration of population and urban activity in the process of urbanization.

In the case of many developing countries, the urbanization process triggers complex spatial processes and developments (Fujita and Thisse, 2002; Miao and Zhao, 2005; Buhaug and Urdal, 2013), both internally and externally. This development then brought a change in the spatial configuration of coastal cities, in the context of spatial organization, utilization and intensity, as well as the relationship, flow and linkages between parts of the region, both internally and externally among the cities that was constantly developing. Spatial development of urban concentrations also has implications for a process of transformation of coastal cities, namely changes from coastal areas to urban areas, both on the periphery of an urban concentration area that expands existing urban areas or in other areas that trigger the emergence and development of new urban areas (Sahely et al, 2005), both in the context of the physical environment, as well as in the social and economic context.

Prior to the 1998 economic reform policy of the contribution of the coastal-based sectors to the West Java regional economic in 1996 was 5.4 percent. What is noteworthy during the monetary crisis is that the maritime sector GDRP continued to grow positively by 0.83 percent per year and its contribution rose to 17.3 percent in 2000. On the other hand, employment in the coastal-based sectors in the 1990-1998 period decreased 41 percent in absolute terms in 1998. However, after 1998-2008 those sectors absorbed surplus labor to 45%. This indication displays the increasing use of coastal resources in West Java after 1998 (World Bank, 1999; Irawan and Hanning, 2000).

The policy on the utilization of coastal resources after the reforms after 1998 has been applied well by several districts government in the West Java Region. Coastal resource utilization policies use a combination of excess labor and the application of advanced technology, so natural resource-based sectors from the coast region are the saviors to get out of the economic crisis. With this policy the economic growth of coastal districts is high enough to act as a driver of economic growth in West Java.

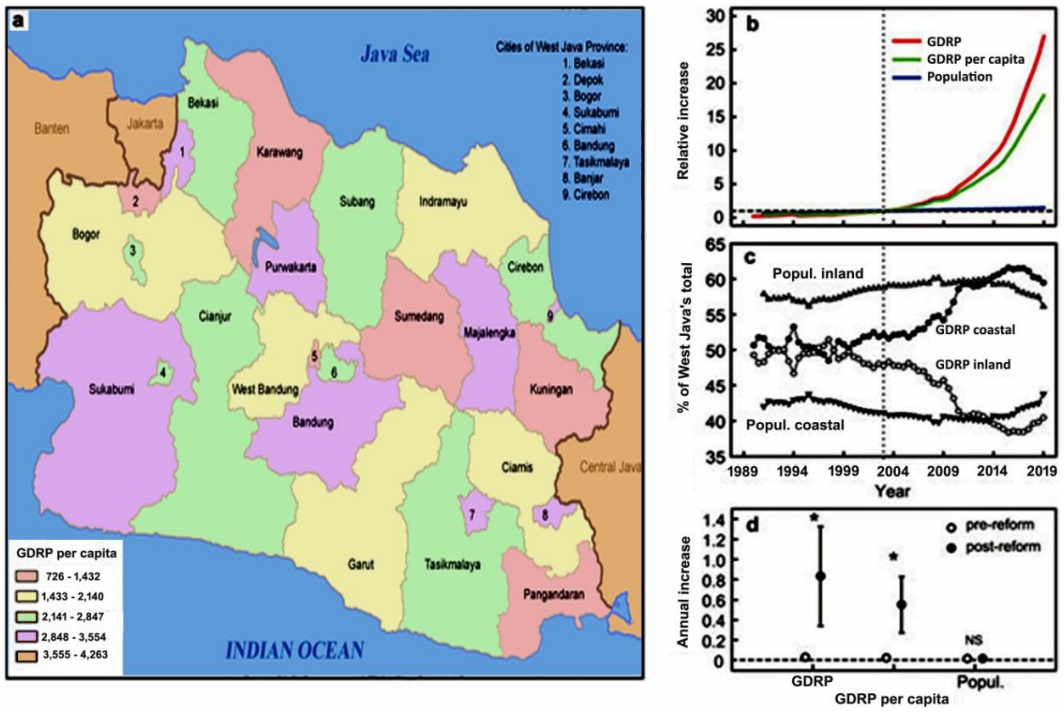

Figure 4. Trends in economy, population in coastal West Java

(a) West Java's coastal provinces examined in this study and their GDRP per capita in 2019 (constantprice based); (b) Relative increase over the last decades; (c) Trends in coastal GDRP and population as percentage of West Java's total (also shown relative to inland); (d) Yearly average increases in pre- and post-reform periods. Dashed vertical and horizontal lines indicate the start of economic reform and the relative impact (= 1) in 1998, respectively

West Java's coastal GDRP remained low and grew annually by ~2.2 billion USD between the 1989 and 1998 (Figure 4). National economic reforms then triggered coastal GDRP growth between 1998 and 2019 greater than two orders of magnitude. The coastal GDRP accounted for ~50% of West Java's total before 1998, but grew to ~60% between 1998 and 2010 (Figure 4c). West Java's coastal population increased from 3.2 million in 1989 to 6.4 million in 1998, and to 28 million in 2019. But in contrast to coastal GDRP, the rate of population growth did not increase with economic reform (Figure 4d) due to population control policies. The coastal population accounted for 40–43% of West Java's total population in all years (Figure 4c). Thus in contrast to GDRP, West Java's population did not concentrate on the coast over the last decades. Coastal GDRP per capita (GDRPpc) increased less than two-fold between the 1989 and 1998, but over three-fold

between 1998 and 2019 (Figure. 4b). Approximately 15% of the coastal GDRP in 2019 was from marine and marine-related industries, and 6% from industries directly consuming marine species and environment services, e.g., fisheries, transportation, tourism, and oil/gas production.

Resolution of Conflict of Utilization through the Managementof Coastal Activities

The physical environment of the West Java coastal zone is its fundamental resource. The opportunities that the West Java coastal zone provides for colonisation and exploitation by the living world are a consequence of that physical environment. We perceive a variety if assets in the coastal resource. The West Java province are increasingly and rapidly developing, exploiting and otherwise affecting the opportunities presented by those assets, sometimes with enhancement, though often to the detriment, of the quality of the coastal environment (Lavigne et al., 2007; Rizal, 2018a; Rizal et al., 2018).

Historically the West Java coastal zone has provided sites for industrial development, particularly those industries for which marine transport links were essential – shipbuilding, chemicals production, smelting and oil refining. More recently the coast has provided sites for power generation, all commercial industry power plants in the North West Java having been constructed on coastal land (Lavigne et al., 2007; Fan et al., 2017; Rizal, 2018a). The inshore waters have traditionally supported fisheries, while the West Java littoral has, over the last 20 years or so, become a place of recreation for urban populations and of retirement for the well-to-do. In recent decades, recreational use of the coast has increased greatly, not least with the growth of small boat ownership and related marine aquatic pursuits.

These opportunities and this development are consequences of the existence of a particular physical environment, one which has provided, to greater or lesser extents, the necessary specific assets and attributes for exploitation (Figure 5). While management of the coastal zone is about safeguarding those assets, an overarching objective in coastal planning is to protect the wider physical environment itself from degradation. Thus the resource assets which the coastal environment provides can be protected and the opportunities that they present to the coastal ecosystem at large, and to ourselves in particular, can be sustained. The benefits gained from the coastal resource assets can be maximised and the pressures on, or threats to those assets minimised.

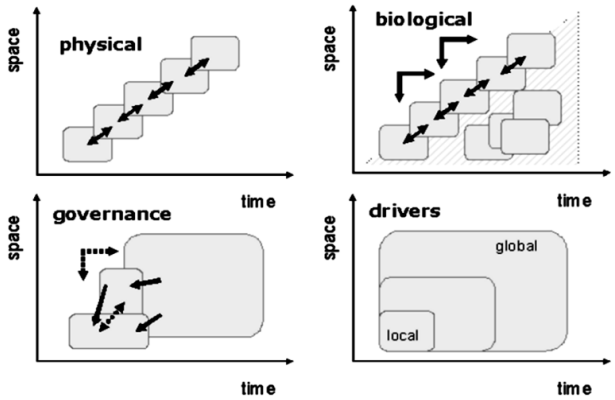

Figure5. Relationships between time and space scales for a) physical factors, b) biological factors, c) governance and d) drivers of ecosystem change in coastal waters and watersheds (Source: Swaney et al., 2012)

The options for management response in the West Java coastal zone need to be considered in the light of the impacts of proposed developments on specific, local (district) coastal assets as well as the coastal physical environment as a whole. The implementation of specific response measures may not necessarily impact positively on all the perceived coastal assets, there are likely to be losers as well as winners among the various West Java coastal stakeholders. Overall, however, our aim should be to achieve a net benefit, encouraging appropriate development of the West Java coastal assets in a sustainable way, taking full account of the physical environment and its variability with time. Because resources in the West Java coastal area are not unlimited in number and distribution, in the process of utilization by users with various interests there must be a system of utilization arrangements that can guarantee the continuity and fulfillment of priority interests. In a coastal region, as stated above, a complex composition is found between the dynamics of physical, social, and economic sub-systems that occur in a landscape that has a transitional character.

The basic fact that we encounter in West Java coastal area is that these various sub-systems often work in the same span of space and time span. In other words, space is a place where various sub-systems interact and interact. The characteristics of physical, social, and economic systems in a large spatial range are likely to be mutually influential and related. So that in each spatial landscape we can observe patterns and processes of these interactions, both in harmony (synergistic), and those that are not in harmony (conflicting).

If we return to the discussion of the conflict of interest, then what happens in space is a reflection of the conflict of interest that may occur, it may still be at a latent stage, or it may already be at an open level. On the other side of the same coin, space can also be used as a means to avoid conflict and to work for synergy. This can be achieved if in the space there is a regulatory process such that conflicting interests are not involved in the conflict, and non-conflicting interests can work together. Basically, space is a meeting place for various interests so that space can be used as a means to implement a resolution of conflicts that occur in a certain period of time. The basic principle used in various spatial arrangements or arrangements is the harmonization of utilization activities. In this framework, spatial planning is made as a product of the process of translating the wishes of the local public in the form of a determination regarding the direction of utilization in accordance with the expected development conditions. This direction of utilization includes choices of future conditions (use plans), and alternative ways (guidance systems) to achieve these conditions (Chapin and Kaiser, 1985; McCave, 1987; Fan et al., 2017).

Based on the perspective of integrated coastal spatial planning, the management of coastal area resource utilization is basically how to manage all development activities in an area related to the coastal area so that the total impact does not exceed its functional capacity. Each coastal ecosystem has 4 (four) main functions for human life: (1) life support services, (2) comfort services, (3) coastal resource providers, and (4) waste recipients (Ortolano, 1984; Olmedo, 2008; Rizal et al., 2019).

From the four functions of the coastal ecosystem, it is understandable that the ability of the first two functions is very dependent on the latter two functions. This means that if the ability of the last two functions of a coastal ecosystem is not damaged by human activities, then its function as a life support and convenience service provider can be expected to be maintained. Based on the four ecosystem functions above, ecologically there are three requirements that can guarantee the achievement of sustainable development, namely: (1) spatial harmony, (2)

assimilation capacity, and (3) sustainable use. Spatial harmony (spatial suitability) requires that in a development zone it has three zones, namely the preservation, conservation and utilization zones, or in other words a development area should not be all designated as a utilization zone, but also allocated to a preservation zone and conservation. Examples of preservation areas are spawning ground and beach green lanes. In this preservation zone development activities are not permitted, except research. Meanwhile, some development activities, such as coastal tourism, sustainable use of mangrove forests and fisheries (sustainable basis) can take place within the conservation zone (Chapin and Kaiser, 1985; Ortolano, 1984; Olmedo, 2008; Rizal et al., 2019; Rizal et al., 2020).

The existence of conservation and conservation zones in a development area is very important in maintaining various life support processes, such as the hydrological cycle and nutrients; clean waste naturally; and sources of biodiversity (biodiversity). Depending on the coastal conditions, the optimal area of preservation and conservation zones in a development zone should be between 30-50% of the total area.Furthermore, every development activity (industry, agriculture, aquaculture, settlement, and others) in the utilization zone should be placed in a biophysically appropriate location, thus forming a harmonious mosaic. Placement of each activity in this utilization zone should pay attention to (1) suitability of the land or water unit for each development activity; (2) the influence (impact) of development activities on land, especially in the form of pollution, sedimentation, and changes in the hydrological regime; and (3) compatibility between development activities.

The suitability of land/water units for development activities basically requires that each development activity be placed in an ecologically (biogeophysical-chemical) location in accordance with the intended development activities. For coastal areas that receive negative impact shipments (negative externalities) in the form of pollutants, sediments, or changes in the hydrological regime, either through river flows, runoff, or groundwater flows, the impact of these activities should be minimized. Thus, activities in the coastal area can still tolerate all the negative impacts. For example, if a coastal area has been designated for tourism, aquaculture, mariculture, or conservation areas, the negative impacts (pollution, sedimentation, or changes in hydrological regime) resulting from development activities on land should be minimized or where possible eliminated.

To test whether the two activities can be harmoniously aligned, it can be achieved by compiling a matching matrix (Table 1). This matrix is arranged based on the likelihood of impacts caused by an activity, and the responsiveness of the activities that co-exist in dealing with the intended impact. For example, shrimp farming cannot possibly coexist with a chemical industry that releases waste without being treated first.

Second, the utilization of coastal resources that can be recovered (fish, shrimp, mangrove wood, seaweed, etc.) should not be done to exceed its sustainable potential. Meanwhile, the utilization of coastal resources that cannot be recovered needs to be done efficiently, economically until the substitution resources can be found, and the impact is minimized. Third, when coastal waters are used for waste storage, the type of waste disposal must not contain Toxic and Hazardous Materials. In addition, the amount of waste discharged into it must not exceed the assimilative capacity of the coastal waters concerned. Fourth, if conducting coastal engineering activities (coastal engineering, construction, and development), then changes in ecological or oceanographic processes and landscape caused should still be tolerated by the West Java coastal ecosystem. In other words, development activities (such as reclamation, jetty making, breakwaters, etc.) should adjust to the characteristics and dynamics of nature (design with nature principles).

Table 1. Compatibility Matrix between Development Activities in The West Java Coastal Areas

No	ACTIVITIES	ACTIVITIES												
		A	B	C	D	E	F	G	H	I	J	K	L	M
1	Wildcatch fisheries (A)		S	S	S	S	S	S	S	S	S	S	S	S
2	Pond fisheries(B)	S		S	S	S	S	K	K	K	S	S	S	S
3	Mariculture (C)	S	S		S	S	K	S	S	S	S	S	S	S
4	Agriculture (D)	K	K	K		S	S	K	K	K	S	S	S	S
5	Forestry (E)	S	S	S	S		S	S	S	S	S	S	S	S
6	Transportation (F)	S	K	K	S	K		K	K	K	S	S	S	S
7	Diving Beach Tourism (G)	S	S	S	S	S	S		S	S	S	S	S	S
8	Sandy Beach Tourism (H)	S	S	S	S	S	S	S		S	S	S	S	S
9	Swimming and surfing tourism (I)	S	S	S	S	S	K	S	S		S	S	S	S
10	Oil and gas mining (J)	K	K	K	K	K	K	K	K	K		K	S	S
11	Mineral mining (K)	K	K	K	K	K	K	K	K	K	K		S	S
12	Port (L)	S	K	K	S	K	S	K	K	K	S	S		S
13	shipbuilding yard (M)	S	S	S	S	K	S	S	S	S	S	S	S	

Information:

* Table reading from left to right
* S = Development activities on the left do not have a negative impact on development activities on the right
* K = Development activities on the left have a negative impact on development activities on the right

The next thing to note is that in every planning of an activity (single activity) such as opening a Shrimp pond on a mangrove land, it is also necessary to apply the rules of sustainable development. As is known, that the mangrove forest area has a very important function, not only ecological functions but also economic functions. Therefore the mangrove forest area needs to be maintained. However, if a mangrove forest area is to be converted as a pond, the ponds should be placed behind the mangrove area, or at a certain distance from the coastline as outlined in Ministerial Regulation KP No. Per.30/Men/2010. For example, in an area with the highest tidal difference with the lowest annual ebb of 2.31 m, the mangrove forest area that must be maintained (coastline) is 130 x 2.31 meters = 300 m. While the mangrove forest area along the river (river border) that must be maintained is a minimum of 100 meters. For areas that have a mangrove thickness of fewer than 300 meters, the placement of pond plots must still refer to the 300-meter distance.

Even better, on the land behind the mangrove, planted with mangrove tillers. In Figure 3 an example of a sketch plan is provided for the placement of shrimp ponds in a mangrove area. In the picture, it appears that the shrimp farming area is behind the mangrove forest area. Water needs, both sea, and freshwater are done by making water channels, through the cracks of the mangrove forest area.

The arrangement of laying shrimp ponds in such a position has several advantages, especially for efforts to conserve mangrove areas. However, in fact, if management is carried out properly, the placement of such positions can also provide benefits to the shrimp pond cultivation business itself. Some of these advantages are:

1. The beach will be protected from waves and abrasion erosion of the beach.

2. By protecting the coast from abrasion, it will indirectly reduce the cost of pond production, especially in making dike or embankment to prevent abrasion. In ponds that are directly facing the sea, pond embankments must be strengthened (requires additional costs separately) and even need to make protective embankments to prevent coastal abrasion.

3. Prevent ecological and economic damage to the environment around mangroves and ponds, namely:

a) maintaining biodiversity within the mangrove forest area. In the mangrove forest area, the study area there are still found various types of animals, including crocodiles, wild boars, monitor lizards, snakes, and birds.

b) Prevent the occurrence of saltwater intrusion on land. With the mangrove area, the tide can still be blocked by mangrove trees, so that it will not go far inland, which also prevents saltwater intrusion into the ground. As is known, the land behind the mangroves in the study area, is much cultivated by residents as agricultural fields and gardens. If a saltwater intrusion occurs in the plantation area, it can result in death or decline in the production of community plantations outside the pond. Another disadvantage of saltwater intrusion is the impact of freshwater sources on the population by saltwater. If that happens, the community will be very disrupted.

Hopefully, with the system of spatial planning in the mangrove forest area associated with shrimp aquaculture, the ecological sustainability of the mangrove forest can be maintained. In addition, the cultivation of shrimp farming which is a national asset, as a producer of the country's foreign exchange is still being carried out. Spatial planning itself is a framework for coordinating the activities of all sectors that have been and are developing in an area. In this effort, the elements for evaluating alternative spatial plans will be chosen, namely, (a) productivity, (b) economic viability, (c) protection of the physical environment, (d) economic equality and welfare, (e) can be accepted by all or majority of stakeholders. Productivity criteria can be interpreted that the changes in spatial use recommended in planning must have higher efficiency when compared to current conditions of use. Besides the choice of changing conditions to be efficient, it must be economically viable for the long term, both by private investment and the Regional Government (economic feasibility criteria). For development and its results to be enjoyed by future generations, attention to physical environment damage needs to be required in the assessment of spatial planning recommendations. So that the utilization of coastal resources in coastal areas that are directed in spatial planning will be able to guarantee sustainable economic activities which are key in efforts to improve the welfare of the community both now and for generations to come.

CONCLUSION

It is probable that competition for increasingly scarce resources in the years to come will create conflicts between ranges of different actors in coastal regions such as those in West Java coastal region. As such the development of conflict management mechanisms adaptable to the particularities of these conflicts should be developed. The coastal management framework applied here provides a useful tool for analysing, qualitatively and quantitatively, conflicts over coastal resource use and facilitating informed decisions when exploring interactions among resource users. Its significance for the future of coastal zone management is to provide the needed platform for participatory involvement in order to minimize user conflicts.

We have illustrated that the coastal management framework can be used in managing, and potentially resolving, conflicts in the West Java coastal areas because it allows competing users to: 1) specify their concerns and interests that can be directly mapped; 2) elicit preferences; 3) compute a ranking for conflict hotspots and display as maps); 4) predict future conflicts; and 5) allocate spaces to competing users. It is therefore a useful tool for coastal managers and stakeholders for decision-making in coastal areas where conflicts are known to exist. This study can be considered as a first-step towards developing a multiple coastal area use plan in West Java. However, future coastal use plans will require more information on emerging uses such as oil and gas exploration areas, port development, and communication infrastructure development such as fibre optic cables. The feasibility of applying this methodology in other coastal areas will depend on a number of important factors such as stakeholder involvement, availability of data and knowledge base.

Moreover, West Java's environmental protection laws/regulations are not comprehensive or strict enough, and in many cases the laws/regulations that existed are ignored, therefore being ineffective in protecting the environment. Last but not least, a systematic, national system of environmental management in the coastal zone of West Java has been lacking. We suggest that a stronger conservation ethic (including a long-term and systematic plan) and shift in thinking from prioritizing short-term economic development to considering how environment services sustain economic growth would promote conservation of coastal environments. To balance economic growth and the capacity of West Java’s coastal environments to sustain progress, innovative, integrated assessments of the health of coupled human-ocean environments would be an important next step. To sustain its economic ascendance, West Java needs innovation and leadership that will allow it to depart from the trend of devaluating coastal resources that historically has plagued developing regions.

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