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Environmental Education and Community Participation: The Importance of Conservation Lessons in Teaching and Learning for Environmental Conservation Efforts in the Region of Sagara Anakan

ABSTRACT: Conservation, as an attempt of sustainable maintenance and preservation of the environment, requires community participation. This research tries to analysis of: (1) the characteristics of Sagara Anakan watershed and territory; (2) the conducts of environmental conservation and community participation; and (3) the relevant of conservation subject for teaching and learning in Senior High School. The method employed was survey with analysis on forms of conservation and farmers' participation. The results show that Sagara Anakan region serves for various activities, such as fishery, tourism, sport, and transportation. Conservation in the form of reforestation has not been conducted, because it is thought to cause low production of the crops. The subject of conservation is less relevant to the teaching and learning materials on environmental conservation. Fortunately, various forms of conservation have been done by the community. The forms of conservation are different for each part of the watershed, depending on the physical conditions and the possibility for land cultivation. On the other hand, to develop the teaching and learning materials, the local environment should be the resources for student learning. By this way, students will be encouraged to engage in problem-solving pertaining to the environmental conservation.

KEY WORD: Forms of conservation, community participation, environmental damage, teaching and learning, Sagara Anakan region, and environmental education.

RESUME: Artikel ini berjudul "Pendidikan Lingkungan Hidup dan Partisipasi Masyarakat: Pentingnya Pelajaran Konservasi dalam Pengajaran dan Pembelajaran untuk Upaya Konservasi Lingkungan di Daerah Sagara Anakan". Konservasi, sebagai upaya pemeliharaan dan pelestarian lingkungan yang berkelanjutan, memerlukan partisipasi masyarakat. Penelitian ini mencoba menganalisis: (1) Karakteristik daerah aliran sungai dan wilayah Sagara Anakan; (2) perilaku konservasi lingkungan dan partisipasi masyarakat; serta (3) Relevansi subjek konservasi untuk pengajaran dan pembelajaran di Sekolah Menengah Atas. Metode yang digunakan adalah survei dengan analisis bentuk konservasi dan partisipasi petani. Hasil penelitian menunjukkan bahwa daerah Sagara Anakan berfungsi untuk berbagai kegiatan, seperti perikanan, pariwisata, olah raga, dan transportasi. Konservasi dalam bentuk reboisasi belum dilakukan, karena diduga menyebabkan rendahnya produksi tanaman. Subjek konservasi kurang relevan dengan pengajaran dan materi pembelajaran tentang konservasi lingkungan. Untungnya, berbagai bentuk konservasi telah dilakukan oleh masyarakat. Bentuk-bentuk konservasi yang berbeda untuk setiap bagian dari daerah aliran sungai, tergantung pada kondisi fisik dan kemungkinan untuk pengolahan tanah. Di sisi lain, untuk mengembangkan pengajaran dan pembelajaran, materi muatan lokal harus menjadi sumber pembelajaran bagi siswa. Dengan cara ini, siswa akan didorong untuk terlibat dalam pemecahan masalah yang berkaitan dengan pelestarian lingkungan.

KATA KUNCI: Bentuk konservasi, partisipasi masyarakat, kerusakan lingkungan, pengajaran dan pembelajaran, daerah Sagara Anakan, dan pendidikan lingkungan.

INTRODUCTION

The environment, where we live in, is the resources that we have to conserve in order to be sustainable, because it supports

our lives. The environment plays significant roles and functions for the sustainability of human life, especially in fulfilling the needs for food, clothing, and housing. Hence,

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human beings are inseparable from the influence of natural and social environments. The fulfilment of human needs of life depends on the ways of utilizing and maintaining the environment.

C.A. Tisdell (1993:2) stated that the major portion of the dominant theory of welfare economics is based upon the view that the wants of individuals are to be satisfied to the maximum extent possible by the allocation of resources. Human satisfaction, in fulfilling the needs, is made possible by utilizing the resources in a single space. The Law of the Republic of Indonesia No.32 of 2009, concerning on "Environmental Protection and Management", defines the environment as a totality of space with all materials, resources, situations, and creatures, including human and their behaviour that influence the nature, continuation of livelihood, and human welfare as well as other creatures. This translates as the welfare of a society in fulfilling its needs is highly influenced by the utilization and exploitation of the resources in the environment (Jaya, 2004).

Excessive utilization and exploitation of the resources will result in damages. Nursyid Sumaatmadja (2005:129) explained that various environmental damages are not merely resulted from natural disasters; rather, they are closely related to the community's attitude that ignores the law of nature. To reduce environmental damages needs good natural resource management, including both genetic resources on land (forests) and the coast (Supriharyono, 2008:13). Then, R.E. Soeriaatmadja (1997:59) has also noted that the forest has a significant impact on three interrelated environmental factors, namely: climate, soil, and water procurement in various territories.

ENVIRONMENTAL DAMAGES AND CONSERVATION AWARENESS

Environmental damages, caused by changes in land utilization, have occurred in the environment of Sagara Anakan, because Sagara Anakan is a small sea protected by Nusa Kambangan island and drained by the streams of Citanduy and Cibeureum rivers

that carry with them materials of erosion which get collected in the seabed. In Y. Sukardi's report (2010), it is described that the area of Sagara Anakan sea has changed from 2,906 hectares in 1984 to 1,575 hectares in 1994, and to only 600 hectares in 2003.

The change in the waters' area is a threat to the preservation of mangroves and fish and shrimp production (Satyana, 2010). Further, I. Sukmawardani (2006:65) also explained that mangroves are potential and economically, ecologically, and biologically significant natural resources for the community. BPKSA (*Badan Pengelola Kawasan Sagara Anakan* or Sagara Anakan Area Management Agency) in 2007 reported that the area of mangrove forest in 1974 was 15,551 hectares, and in 2003 it decreased to 8,506 hectares. P. Erftemeijer, B.V. Balen and E. Djuharsa (1988:35) also reported that the 13,500 hectares mangrove forest in Sagara Anakan has experienced shrinkage due to land reclamation and mangrove cutting.

Conservation is a method consisting of stages of community activities in realizing sustained utilization of the environment. If the method is not well-executed, damages will occur. W.B. Meyer and B.L. Turner (1998:239) said that land cover changes can have major direct (or first-order) impacts upon the hydrological cycle and water quality; they can cause floods, droughts, and changes in rivers and ground water regime; and they can affect water quality. Furthermore, Nugroho (1999:7); Kurnia (2000:157); and Darsiharjo (2010:16) noted that in Indonesia, land and water damages have continued to increase, especially in the upstream river area that has been turned into agricultural area.

The information explains that human activities in utilizing the land have a direct impact on the cycle and quality of water, flood, and soil water system. This is in accordance with the report of S. Yasushi and S. Hardjosuwarno (1994) that the significant changes resulted from sedimentation process in Sagara Anakan are caused by the materials of erosion carried by the flow of Citanduy river as a result of community activities in cultivating the land

in the upstream and farm land extension in the slopes. To fix the damages, there needs to be an attempt of re-maintenance through conservation. B. Saragih (1993:77) has said that conservation is a technological package of agricultural business aimed to improve production and farmers' income, and preserve soil and water resources.

According to A. Sinatala (1989:113); Suripin (2004:101); and Kartasapoetra (2005:95), conservation can be divided into three methods, namely: (1) Vegetative method through the use of plants and their remains in order to reduce the destructive force of rain; (2) Mechanical method, which is mechanical-physical treatment given to soil and the construction of a building to decrease surface flow and erosion; and (3) Chemical method, which is soil treatment by means of chemical preparations.

Conservation as an attempt of preserving and protecting the environment is tightly linked to the community. Sastropoetro (1995) has explained that participation is spontaneous engagement with full awareness and responsibility oriented towards the group's interest in order to reach collective goals. While Darsiharjo (2010:138) added that to maintain profitable agricultural business, there needs to be sustainable conservation that engages the community.

The environment is exploited by the community and, therefore, has to be maintained by the community. S. Kaplan and R. Kaplan (1999) explained that human beings are basically creatures able to optimize their roles in managing the environment in various positions, such as: (1) encouraging the community to be more caring; (2) creating environmental benefits in environmental exploitation; and (3) designing solutions to problems that can satisfy all parties.

From the explanations above that, it can be inferred that human beings need to improve their roles in maintaining and managing the environment, because the environment only provides alternatives of choices; and human beings are the ones to make the choice in order to fulfil their needs

without excessive exploitation. Excessive exploitation of resources will have a negative impact on the environment.

Community participation in land utilization has to be suited to the condition of the environment. According to Hadi (1995:101), there are two factors hindering participation: social factor and cultural factor. The two factors will influence the level of participation to the extent that they will inhibit the community from thinking rationally about the impacts of their actions. Participatory model needs to be further developed, because it can result in society economic empowerment, stakeholder empowerment, nature protection, and the enforcement of environmental law in the framework of sustainable environmental management (Suryanto, 2004:94).

Participation can be in various forms and should be done actively. The participation or engagement meant here is not a passive one, but it should be actively shown by engaging in a program (Mardikanto, 1994). This is so because when community participation tends to be a passive one, it will cause failure in the conduct of conservation. Kartasasmita (1997) noted that failure in the development is due to a lack of participation caused by the following reasons: (1) the development only benefits a minority of people; (2) the development is for the people's interest, but the people fail to understand; (3) the conducts are not in line with the people's understanding; and (4) the people are not involved.

A. Sutrisno (1997) mentioned that the obstacle faced in an attempt of conducting a participatory development is that the meaning of the concept of participation has not been well understood by the planners and implementers of the development. Community participation serves an important role in conservation; therefore, the members of the community need to be involved in all stages, starting from utilization, to maintenance, to planning, to administration, and decision making.

T. Supriatna (1997:73) explained that developing community's active participation is aimed to solve, formulate, plan, and

execute the activities collectively in an effort of creating social and economic welfare of the community. Pasaribu and Simanjuntak (1986:265) classified participation into five types, namely: (1) Insights, which are expressions of ideas or thoughts; (2) Power, in the form of action to support a program; (3) Properties, in the form of donations; (4) Skills and expertise to do various activities; and (5) Social participation in various activities.

Due to the significance of conservation, materials on the topic should be applied in the teaching and learning in school. In School-Based Curriculum, environmental conservation is a part of geography teaching and learning materials that be taught to students of the eleventh grade (Senior High School) with the Competence Standard of analysing the utilization and preservation of the environment. Meanwhile, the Basic Competence is translated into the Competence Standard as analysing environmental conservation in its relation to sustainable development, and with an indicator of conservation and utilization of the environment in its relation to sustainable development has developed materials on the teaching and learning of conservation with an allocated time of 5 x 45 minutes in five lessons (Widodo, 2011).

Environmental damages that occur in the watershed caused a decrease in the activities in the estuary of the watershed, namely Sagara Anakan territory, such as fishery, tourism, sport, and transportation service. Conservation has been conducted because there have been indications of erosion, shallowing, and narrowing of Sagara Anakan waters. In this research, the questions addressed are: (1) What are the characteristics of Sagara Anakan basin and territory?; (2) How are the conducts of environmental conservation and community participation at Sagara Anakan basin and territory?; and (3) How relevant the subject of conservation to the teaching and learning materials on conservation in Senior High School?

Conservation in this research is defined as an attempt of restoring the watershed environment and Sagara Anakan territory

in order to provide sustainable benefits. Hence, the aims of this research are: (1) to analyse the characteristics of the basin and territory of Sagara Anakan; (2) to analyse the environmental conservation and community participation along the basin and territory of Sagara Anakan; and (3) to analyse the relevance of the subject of conservation to the teaching and learning materials of conservation in Senior High School.

Shallowing and narrowing of the area of Sagara Anakan sea are caused by the ways the community utilize the environment. The environment, as an ecosystem, is the resources for the community to satisfy their needs. Thus, community as one of the elements of the environment must consider balance in managing the land. The community has tried to conserve, but erosion and shallowing always occur, causing the function of the watershed's estuary, Sagara Anakan sea, to decrease.

METHOD

The region under research is the basin whose streams flow to Sagara Anakan. Among the basin are those of Citanduy, Cibeureum, and other small rivers. But, the research focused on Citanduy and Cibeureum rivers as well as the coastal of Sagara Anakan. According to Indonesian Topographical Map Series in 2001, the regions are geographically located between 108° 01'15.66" E - 109° 00'00" E and 7° 01'12.96" S - 7°46'44.4" S. The basin of Citanduy and Cibeureum rivers that drain into Sagara Anakan are then called Sagara Anakan environment. The streams in the watersheds of Citanduy river with the upstream in Garut regency; and Cibeureum river with the upstream in Brebes regency, both drain to Sagara Anakan estuarine (Sugandi, Jupri & Trianawati, 2008).

The area under research consisted of Citanduy and Cibeureum river basins that directly impact Sagara Anakan. The territory of Sagara Anakan is classified into four areas of sub-watershed, namely: upstream, middle-stream, downstream, and coastal watersheds. Meanwhile, the population of respondents included the community

managing the land in the watershed of Citanduy and Cibeureum rivers, and the coastal areas.

To gain data on the conducts of conservation and community participation, the community taken as sample of the population should represent the four sub-basins. Therefore, the sample consists of farmers/fishermen spread in the upstream, middle-stream, downstream, and coastal watersheds. The number of samples taken was based on a consideration that respondents have to be representative of each part of the watersheds, where each part of the watersheds shares similarities. There were 240 respondents as representative of the farmers and fishermen in upstream, middle-stream, downstream, and coastal basin of Sagara Anakan.

To gain data from the respondents, the followings were employed: (1) Questionnaires – to obtain data on the ways the farmers cultivate the land and the methods of conservation practiced; (2) Documentary study – to support the conservation; and (3) Literary study – to collect supporting secondary data. Further, the independent variables in this research is physical condition, conservation, and participation; while the dependent variable is teaching and learning materials on conservation.

The data gained from the respondents help to see and study the methods and forms of conservation practiced by farmers and fishermen, both in the land and water body managed by them. Checklists were used as data collection technique. The research is concerned with the ways both farmers cultivate their lands and fishermen protect Sagara Anakan. This means that the data gained from the respondents included the methods and forms of conservation conducted by both farmers and fishermen. Hence, the research method appropriate for the nature of this research is survey because it relates to the basin and coastal areas.

RESULTS AND DISCUSSIONS

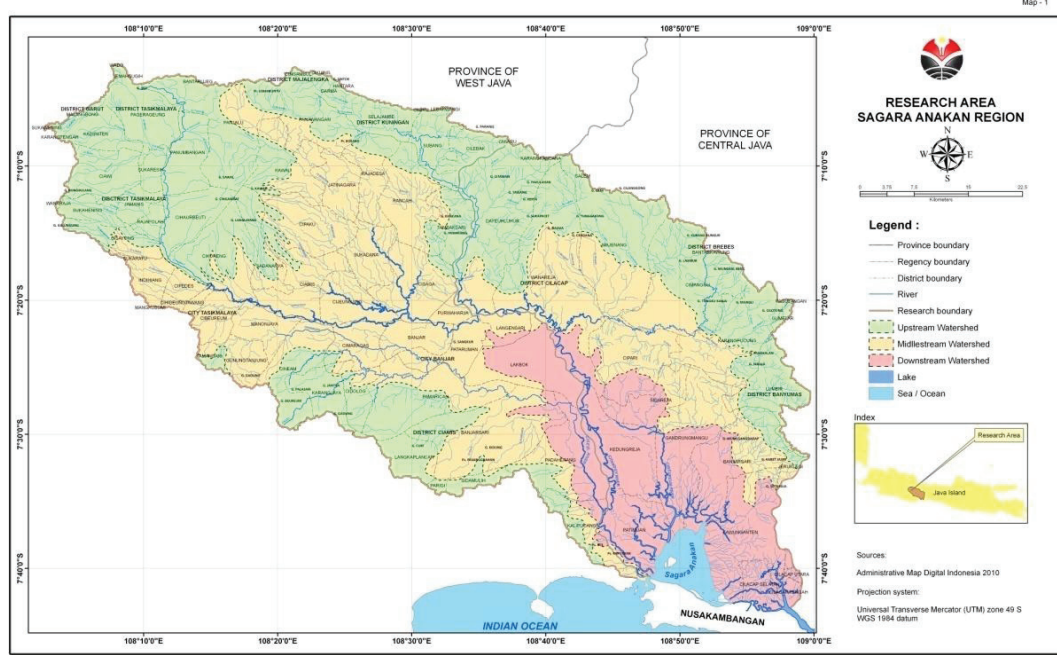
Sagara Anakan is a coastal lagoon protected from the waves of the Indian Ocean by a barrier of Nusakambangan

island and is the estuary for Citanduy and Cibeureum rivers. The existence of this coastal lagoon is influenced by the watershed, because along the watershed erosion frequently occurs; and the eroded materials are transported by the river and collected in the estuary, and Sagara Anakan lagoon is shallowing the lagoon and forming deltas. These deltas are occupied by the community whose main source of income is fishery, and the community is later developed into a district known as Kampung Laut District.

The farmers along the watershed are indirectly impacted by land management; however, the community along the estuary is directly impacted by the shallowing and narrowing of the coastal body of water. Hence, the sustainability of the lives of these farmers and fishermen influence the sustainability of the fulfilment of their daily life necessities. In this case, there need to be efforts of reducing problems by diminishing the levels of erosion, shallowing, and sedimentation through an integrated environmental conservation.

Geographically, the area under research has a tropical climate with a level of precipitation of 1,500 mm a year and an average weather below 18^oC. According to data from Department of Agriculture and Livestock and Citanduy River Basin Organization in 2011, the area has a high level of precipitation of 2,219 mm a year, which can strongly erode the soil. Furthermore, based on the distribution of rainfall, the seasons can be classified into two: Rainy season that lasts from October to April; and dry season, from May to September. The farmers cultivate their land based on this rainfall distribution, so that harvests can be done twice a year (cited in DPP, 2011).

Sagara Anakan environment are compilation from 4 sheets of geologic map. The types of rocks that can be found in Citanduy and Cibeureum rivers and deltas at estuary, according to S. Supriatna *et al.* (1992); T. Budhistrisna (1986); Kastowo and N. Suwarna (1996); and Simanjuntak and Surono (1992), can be categorized into the following:



Map 1:
 The Location Under Research

First, Qvs are rocks derived from the eruption of young volcanic mountain spread around the peak of Galunggung Mountain. The materials produced by the eruption are volcanic breccia, lava, and tuff; composed of andesite and basalt.

Second, QTv are rocks derived from the eruption of old volcanic mountains that can be divided into QTvs, QTvk, QTvb, QTvd, QTvr, QTvc, and QTvt, with materials consisting of volcanic breccia, lava, and tuff; composed of andesite and basalt.

Third, Qa and Qf are rocks formed because of the process of sedimentation with smooth materials, such as clay, sand, and gravel.

Fourth, Tpt are categorized into Tapak formation, composing of materials, such as grayish-rough sandstone and interspersed with marl-sand; the rocks are yellowish, greyish, and easily eroded.

Fifth, TmpH are classified into Halang formation with turbidite, a combination of sandstone, clay stone, silt, with materials consisting of volcanic breccia and limestone (soluble).

Sixth, Tmpk are categorized into

Kumbang formation with materials of volcanic breccia, lava, dikes, and tuff; composed of andesite and basalt which are resistant to erosion.

Seventh, Tmnt are included under Nusa Kambangan formation with materials of tuff, lapilli tuff, tuff sand, and gravels interspersed with sandstone; they are resistant to erosion.

Eighth, Tmkl are categorized into Kalipucang formation with materials derived from the fossils of coral reef animal consisting of limestone reef. These rocks are resistant to temperature, but they are soluble, so that erosion can be expedited by human's activities.

Ninth, Tmr are categorized into the formation of Rambatan, consisting of sandstone, limestone, and conglomerate; interspersed with marl layer and flakes on the bottom. The property of the flakes and marl is that they are prone to erosion, while limestone is soluble.

Tenth, Tml are classified into Lawak formation with materials of greenish marl, interspersed with limestone. The upper part composes of globigerina marl with insertion

Tabel 1:
Large of Slope Gradient at Citanduy and Cibeureum Basins

No	Class	Percentage (%)	Large (km ²)
1	I	0 - 8	2,092.00
2	II	> 8 - 15	878.60
3	III	> 15 - 25	912.20
4	IV	> 25 - 40	454.20
5	V	> 40	80.23
Citanduy and Cibeureum Basins			4,417.23

of sandstone, and the properties of the material are prone to erosion and soluble.

Eleventh, Tpc are classified into Cijulang formation, consisting of volcanic breccia, lava, and dikes; consisting of andesitic tuff and sandstone tuff. The materials are resistant to water, so that the potential for erosion is low.

Twelfth, Tmhg are categorized into Gunung Hurip formation composed of turbidite, volcanic breccia, sandstone, flakes, and conglomerate; and they are resistant to erosion.

The geology of the area under research is illustrated that material from marl and flakes prones to erosion, while limestone is soluble. These stones easily to erosion and carried out by surface runoff. Those material as production erosion would be sedimentaet at low land, especially at estuary Citanduy and Cibeureum rivers. Sedimentation would be formed Sagara Anakan to be narrowed and shallowed, then formed many deltas. This would effect to existent life resources.

The researched area has many different slope and slope area that is effected to erosion. The slope gradients in Sagara Anakan environment can be classified into five classes: *Class 1*, with a slope gradient between 0 - 8%; *Class 2*, with a slope gradient between > 8 - 15%; *Class 3*, with a slope gradient between > 15 - 25%; *Class 4*, with a slope gradient between > 25 - 40%; and *Class 5*, with a slope gradient of > 40%. The gradients can be made a basis to divide the basin into the upstream, middle-stream, downstream, and coastal area. From 5 classes of slope gradient have different large is shown by table 1.

From the above table, it can be seen that flat slopes cover quite a large area,

where the slopes experience a process of sedimentation. Meanwhile, the watershed is bordered by hills and mountain peaks, which in turn influence soil formation along the watershed.

Soils in Sagara Anakan environment, according I. Darmawidjaya (1990) and S. Hardjowigeno (2003), were reported that the types of soil found in the basins of Citanduy and Cibeureum rivers consist of: (1) *Alluvial*, soil formed by sedimentation in areas with higher altitudes; (2) *Regosol*, soil consisting of unconsolidated material with a high porosity; (3) *Andosol*, developed in mountainous areas with an altitude up to 3,000 m and easily transported by water; (4) *Gleysol*, soil formed by the process of sedimentation and is spread on land; (5) *Organosol*, dominated by fossil materials and found on land; (6) *Grumusol*, developed in wavy and hilly slopes; (7) *Latosol*, soil that has experienced washing; and (8) *Mediterranean*, soil developed mainly from lime stones.

The major tributaries of Citanduy include Ciseel and Cikawung. These tributaries drain into Sagara Anakan, which has a slope gradient of 0 - 8% (flat). The river stream that carries eroded materials is inhibited by the flow from the Indian Ocean and got collected in the coastal lagoon. The strong and long-term stream causes Sagara Anakan to shallow, forms deltas, and narrows the waters. The river stream is dammed to form Manganti Dam. The dam is located on the borders of Cilacap and Ciamis regencies and is used to irrigate the paddy fields in Cilacap and Ciamis regencies, with areas of 22,417 hectares and 4,537 hectares respectively (Sugandi, Jupri & Trianawati, 2008).

The lands along the watersheds are used

Table 2:
 The Area and the Number of Population in the Area under Research

No	Regencies / Municipalities	The Number of Districts	Area (km ²)	The Average of Density/km ²	The Number of Population
1	Garut Regency	3	104.17	783.39	81,606
2	Majalengka Regency	5	223.30	968.85	216,344
3	Sumedang Regency	2	19.28	716.93	13,822
4	Kuningan Regency	12	274.16	880.35	241,357
5	Tasikmalaya Regency	12	338.49	653.65	221,254
6	Ciamis Regency	25	1,761.91	598.95	1,055,296
7	Cilacap Regency	21	1,377.04	760.71	1,047,528
8	Brebes Regency	4	98.97	1,609.21	159,264
9	Banyumas Regency	2	59.50	1,132.32	67,373
10	Tasikmalaya Municipality	4	36.13	3,697.97	133,608
11	Banjar Municipality	4	124.37	1,524.08	189,550
Total			4,417.32	13,326.41	3,427,001

for various activities. BAKOSURTANAL (*Badan Koordinasi Survei dan Pemetaan Nasional* or National Coordination Agency for Surveys and Mapping) in 2001 classified the land use into the followings: (1) *Forests and mangroves* – function to keep the ecosystem balance, spread in the upstream, middle-stream, downstream, and the coastal areas; (2) *Plantations* – managed by the community, government, and private, spread in the upstream and middle-stream of the watershed; (3) *Dry land agriculture* – dry farming land area cultivated with seasonal crops; (4) *Residence* – spread in the watershed and coastal areas; (5) *Paddy field* – terraced land spread in the watershed and coastal areas; and (6) *Bushes* – uncultivated by the community. Table 2 presents data on the population in the basins.

Kampung Laut district covers four village administrative units separated by a strait, so that transportation has to be by means of boats and ferries. Because of shallowing and narrowing, transportation can only be accommodated by motorboats, connecting Majingklak and Cilacap to the four villages only once in a day. Meanwhile, the trip from Cilacap to Majingklak and the reverse can only be done with chartered boats (Dishub, 2004).

Data from the field provide a description

on how the farmers cultivate their land differently. The differences are based on the properties of each part of the watershed. Vegetative method with the forms of conservation, namely: Land closing (Lc), Crop rotation (Cr), Strip farming (Sf), Contour farming (Cf), Litter-fall (Lf), and Reforestation (R) in the basin are shown in table 3.

The mechanical method, with forms of conservation, consists of: Contour (C), Ridge and channel (R), and Terrace conservations (Tr) are shown in table 4.

Meanwhile, the forms of chemical conservation applied by the community consist of: Polymerisation (Pol) and Hydrolysis (Hyd), as demonstrated in table 5.

As for the teaching and learning materials of environmental conservation, the followings were found: the Basic Competence developed from Competence Standard is translated into an indicator with a five-hour allocation of time. S. Widodo (2011) has developed the indicator in the form of his *Rencana Pelaksanaan Program untuk Materi Pembelajaran Konservasi di SMA* (Program Implementation Planning for Teaching the Subject of Conservation in Senior High School). This indicator becomes the guideline in discussing the content of teaching and learning as shown in table 6.

Physically, the condition of the watershed

Table 3:
 Differences in the Forms of Vegetative Conservation

Upstream	Lc	%	Cr	%	Sf	%	Cf	%	Lf	%	R	%
Never	30	50	0	0	0	0	48	80	40	66.67	50	83.33
Sometimes	1	1.67	2	3.33	4	6.67	13	21.67	12	20	4	6.67
Very often	29	48.3	58	96.7	56	93.3	9	15	8	13.33	6	10
Total	60	100	60	100	60	100	60	100	60	100	60	100
Middle-Stream	Lc	%	Cr	%	Sf	%	Cf	%	Lf	%	R	%
Never	30	50	0	0	0	0	28	46.67	30	50	29	48.33
Sometimes	1	1.67	1	1.67	3	5	2	3.333	0	0	3	5
Very often	29	48.3	59	98.3	57	95	30	50	30	50	28	46.67
Total	60	100	60	100	60	100	60	100	60	100	60	100
Downstream	Lc	%	Cr	%	Sf	%	Cf	%	Lf	%	R	%
Never	29	48.3	0	0	0	0	30	50	30	50	29	48.33
Sometimes	3	5	3	5	1	1.67	2	3.33	2	3.333	2	3.33
Very often	28	46.7	57	95	59	98.3	28	46.67	28	46.67	29	48.33
Total	60	100	60	100	60	100	60	100	60	100	60	100
Coastal Areas	Lc	%	Cr	%	Sf	%	Cf	%	Lf	%	R	%
Never	31	51.67	60	100	60	100	45	75	45	75	30	50
Sometimes	20	33.33	0	0	0	0	5	8.33	15	25	12	20
Very often	9	15	0	0	0	0	10	16.7	0	0	18	30
Total	60	100	60	100	60	100	60	100	60	100	60	100

Table 4:
 Differences in the Forms of Mechanical Conservation

Types	Upstream Basin						Middle-Stream Basin					
	C	%	R	%	Tr	%	C	%	R	%	Tr	%
Never	0	0	15	25	23	38.33	0	0	7	11.67	1	1.67
Sometimes	0	0	16	26.67	17	28.33	0	0	5	8.33	3	5
Often	60	100	29	48.33	30	50	60	100	48	80	56	93.33
Total	60	100	60	100	60	100	60	100	60	100	60	100
Types	Downstream Basin						Coastal Areas					
	C	%	R	%	Tr	%	C	%	R	%	Tr	%
Never	0	0	26	48.67	17	28.33	55	91.67	55	96.61	57	95
Sometimes	31	51.67	11	16.92	23	38.33	5	8.33	2	3.39	3	5
Very often	29	48.33	23	35.41	20	33.33	0	0	0	0	0	0
Total	60	100	65	100	60	100	60	100	60	100	60	100

influences the occurrence of erosion. Heavy rainfalls from October to March cause the stones and soils on the slopes with middle to high gradient to be unable to absorb surface water, thereby triggering erosion to occur. The stream will trigger erosion

along the watershed. In the upstream and middle-stream watersheds, the land is used for farming, especially dry farming. Inappropriate physical condition and land use will expedite the occurrence of erosion, even though conservation is practiced.

Table 5:
 Differences in the Forms of Chemical Conservation

	Upstream Basin				Middle-Stream Basin			
	Pol	%	Hyd	%	Pol	%	Hyd	%
Never	0	0	0	0	0	0	0	0
Sometimes	1	1.67	7	11.67	1	1.67	6	10
Often	59	98.33	59	98.33	59	98.33	54	90
Total	60	100	60	100	60	100	60	100

	Downstream		Basin		Coastal		Areas	
	Pol	%	Hyd	%	Pol	%	Hyd	%
Never	0	0	0	0	41	68.33	60	100
Sometimes	1	3.33	7	11.7	19	31.7	0	0
Very often	59	96.67	53	89.33	0	0	0	0
Total	60	100	60	100	60	100	60	100

Table 6:
 The Indicator of Environmental Conservation for Teaching and Learning

Basic Competence	Indicator	Time Allocation
3.2. Analyzing the conservation of the environment in its relation to sustainable development.	Environmental conservation.	1 hour
	Environmental exploitation in its relation to sustainable development.	4 hours

Conservation in the form of reforestation has not been applied due to land productivity consideration.

In the upstream basin, Lc (*Land closing*) has never been conducted because it can disturb the crops. Cr (*Crop rotation*) and Sf (*Strip farming*) were frequently done, adjusted with the needs. Cr has never been done, because the land has already been cultivated. Lf (*Litter-fall*) has never been practiced because the remnants of a crop-harvest (hays) have always been used to feed livestock, and R (*Reforestation*) has never been conducted because, similar to Lc, it can disturb the crops. In the middle part of the watershed, Lc has never been conducted for the same reason.

Cr and Sf have frequently been practiced to fulfil the needs. The same is true for Sf, which has frequently been conducted in order for the seasonal crops to grow. Lf has often been done to make the soil fertile, whereas R has never been done because it will result in low sunlight. In the downstream watershed, conservation in

the form of Lc has never been conducted because it can disturb the crops and soil stability. Cr and Sf have often been practiced in accordance with market demands.

Meanwhile, Sf has never been applied because the land has already been cultivated. The same applies to Lf, which has never been applied, because the remnants of a crop-harvest (hays) have always been used to feed livestock, and R has never been conducted because it can disturb the crops and cause a lack of sunlight. Because the coastal areas are deltas, with slopes and inappropriate water salinity, conservation in the forms of Lc, Cr, Sf, Cf, Lf, and R has never been conducted. The condition of the land which is vulnerable to flood has caused planting to only be done in the transition period from rainy to dry season.

The forms of mechanical conservation in the upstream watershed are as follows: C (*Contour*) and RC (*Ridges and Channels*) have often been practiced so that water can flood paddy fields, without causing landslide. Tr (*Terrace*) was not conducted,

because it had once been conducted. In the middle part of the watershed, the three methods of mechanical conservation here have never been applied, because the land has already been cultivated and managed. In the downstream watershed, C and Tr have frequently been conducted, because the surface water is abundant. With the two methods, the soil can be strengthened. On the other hand, RC has never been done because the soil is only suitable for paddy planting. In the coastal areas, the three mechanical methods have never been applied because of the areas' unsuitability.

The types of chemical conservation applied in the upstream, middle-stream, and downstream watersheds are Pol (*Polymerisation*) and Hyd (*Hydrolysis*), which have often been done, because fertilisation is very important for planting. In the coastal areas, the two types of chemical conservation have never been applied, because the areas are often flooded by the ebb and flow of the tides.

The topic of environmental conservation integrated into teaching and learning materials is less appropriate, both in terms of content and time allocation. The inappropriate content and time allocation have an impact upon students' lack of understanding of the subject matter. The irrelevance of the subject of conservation to the teaching and learning materials is mainly caused by limited time allocation. Hence, in addition to formal education in schools, conservation should be understood and practiced by the community, ultimately farmers.

The knowledge and understanding on conservation should be continuously disseminated among farmers, so that sustainable employment and farm production with minimum environmental damage can be achieved. Forms of every conservation methods at basin was done by farmers, because the farmers those methods and forms of conservation as system to cultivate, in other land could product. But at the coastal area, methods and forms was not be done, because coastal area have surface near same with surface of sea level, so the

coastal area often experience flooding was resulted by wave of sea. In consequence, the methods and forms of conservation at the basin are not same with the coastal.

So, to everlasting of Sagara Anakan coastal must be suitable with land condition and forms of coastal conservastion be materials for learning. Conservation on the basin differ with coastal, so conservation on the coastal area must be done conservation for decreasing erosion on basin and sedimentation on coastal. The conservation form coastal has to be studied by student in spite of the fact farmers and fishing.

CONCLUSION ¹

Sagara Anakan is very potential for fishery, tourism, sport, and transportation. Even though the farmers cultivate the land, while practicing conservation, erosion still occurs. Conservation in the form of reforestation has not been practiced, because it is thought to reduce the productivity of the crops. On the other hand, conservation on land in some parts of the downstream watershed is not conducted, because the physical conditions are not suitable.

The subject of conservation is less relevant to the teaching and learning materials on environmental conservation taught among the eleventh grade of Senior High Schools' students. The teaching and learning materials on conservation should not only be applied in schools, but they have to be practiced by the farmers who cultivate the land. In addition, conservation should be done by all members of community who exploit the land.

Community participation in conserving the environment of Sagara Anakan encourages sustainable benefits; therefore, the government should encourage and

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guide the community to do an integrated and cross-sectional conservation, engaging the community and research institutions. The forms of conservation in the watersheds cannot be applied in some parts of the downstream watershed; thus, conservation has to be done simultaneously by the government and the community by also engaging the educational institution to provide enrichment, so that the area where students and the community live can be learning resources.

With learning resources, so students would understand the roles and function of Sagara Anakan to society life at coastal area. Although to everlasting of Sagara Anakan need to be done cohesiveness among the farmer, fisherment, and government, coastal area and basin area with that cooperation, Sagara Anakan would be roles and functions to sustainable and everlasting to society life at the coastal area.

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