ENDINAMOSIS 2017

2nd International Conference on
Rural Development and Community Empowerment
Bandung - Indonesia, November 2nd - 4th, 2017

PROCEEDINGS

CENTER FOR RURAL AREAS
EMPOWERMENT – ITB

ENDINAMOSIS 2017

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Rural Development and Community Empowerment

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THE SECOND INTERNATIONAL CONFERENCE ON
RURAL DEVELOPMENT AND COMMUNITY EMPOWERMENT

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Message From The Chairs

Speech presented at Opening Ceremony of Endinamosis 2017

Ladies and Gentlemen

It is a great pleasure for me, on behalf of the Organizing Committee, to welcome you this morning to this important International Conference. Special greetings to all our guests who come from abroad. Welcome to our beloved country - Indonesia.

Ladies and Gentlemen,

The theme of this International Seminar is "Applied Science and Engineering for Rural Development" This theme, to me is suitable now with the current conditions of Indonesia since we still have many developing rural, remote and underdeveloped areas. To empower rural areas requires optimal strategies and technologies. This challenging task is clearly our all responsibility. Therefore this Conference becomes a great opportunity for all of us to enhance our knowledge as well as to share our expertise and experiences during presentations and discussions given by the speakers. Today participant is from Indonesia, Malaysia, Australia, Japan, Sweden, Korea, Taiwan, and Thailand

Ladies and Gentlemen,

Through this Conference, I do hope that the participants can extract invaluable lessons from the speakers and fruitful interaction among us. Before ending, I would like to congratulate the committee members to make this seminar to happen. Finally, I hope you have a good and pleasant seminar.

Chairman of Endinamosis 2017
Brian Yuliarto, Ph.D

Message From Rector of ITB

Speech presented at Opening Ceremony of Endinamosis 2017

Honorary Ladies and Gentlemen,

First of all we thank God Almighty for granting us His bounties so that I can gather in this conference in CRCS Building at Campus Ganesha ITB. We welcome you all to this campus ITB and hope that you will enjoy the environment of the campus.

One of three missions of Higher education in Indonesia (Tridharma Perguruan Tinggi) as has been stated by Indonesian's government is Community services, meaning that Higher education in Indonesia, besides conducting education and research also should carry out programs to serve community both in local and national scales. This is a social responsibility of higher education such as ITB to contribute to the society and nation in forms of ideas, community empowerment programs, products of applied technology that can be useful for community.

ITB has been conducting various programs in Community services through faculties, schools, Center of researches and Centers where this "Center for Rural Areas Empowerment" (Pusat Pemberdayaan Perdesaan) of ITB is one of them. Center of researches and Centers have been created in ITB for conducting multidisciplinary programs. As we know that in ITB there are engineering's, sciences and arts study programs. A multidisciplinary approach probably more appropriate in solving problems in our community which usually have complexity in nature.

Since 2013 ITB has set up a new Center which named "Pusat Pemberdayaan Perdesan" or Center for Rural Empowerment of ITB. The mission is for ITB community to be able to gives ideas, applied technology products made by ITB community to be promoted in rural areas in various sector such as for agricultural sector and infrastructures, well as for rural area's community development. So far ITB has given its financial commitment in the form of "KKN Tematik" programs through "Lembaga Kemahasiswaan" ITB, the programs include built bridges, renovate building for school and multipurpose activities in some villages in west java.

We hope that this conference on "Applied Science and Engineering for Rural Development" conducted by P2D ITB will run smoothly and produce ideas as well as good publications.

Rector of Institut Teknologi Bandung,
Prof.Dr.Ir. Kadarsah Suryadi DEA

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Development of Rubbercrete Interlocking Bricks

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Abstract. Tires disposal contribute a several environmental issues, therefore, this paper is dedicated to exploit the scrap tires in the form of crumb rubber to develop rubbercrete interlocking brick. Rubbercrete interlocking brick is a mortarless technology using dry-stack interlocking bricks by employing waste materials such as crumb rubber and fly ash. The newly developed rubbercrete interlocking brick promotes low cost concreting materials and construction process, rapid execution by interlocking method and high impact. The aim of this paper is to develop the mix design and investigate the physical and mechanical properties of rubbercrete interlocking bricks. The mix design has been developed and confirmed using response surface methodology (RSM). Dimension test, density, water absorption, initial rate of suction, efflorescence, thermal conductivity, compressive strength and modulus of rupture were investigated. The best mix design to develop rubbercrete interlocking brick is found to be 10% crumb rubber as partially replacement of fine aggregate and 57% fly ash as partially replacement of cement. The compressive strength of rubbercrete interlocking brick is conducted and found to be 15.86 MPa, which comply the compressive strength requirement in ASTM C90 for load bearing masonry structures. The typical dimension of the developed rubbercrete interlocking brick is 250 x 125 x 105 mm with density of 1890 kg/m2. The obtained water absorption, initial rate of suction, efflorescence, thermal conductivity, and modulus of rupture values satisfy with the relevant international standards, especially ASTM standards and BS standards.

Keywords: Crumb rubber; Fly Ash; Interlocking Brick; Rubbercrete; Physical & Mechanical properties

1. Introduction

The significant increases in the automotive industry all over the world lead to increase the production of scrap tires. According to National Solid Waste Management Department [1], scrap tires were used as supplementary fuel in cement production in Malaysia as it reduces cost and produce maximum heat recovery. However, tires as supplementary fuel emits high carbon dioxide gas (CO_2) which lead to greenhouse effect. In addition, the production of one ton of cement generates nearly a ton of CO_2 [2]. Other than that, illegal burning of scrap tires generates massive amount of black, toxic and hazardous smokes, and oil deposited which endanger environmental and health [3]. Scrap tires potentially provides breeding ground for disease-carrying rat, and mosquitoes, consequently lead to health problems since it is a non-biodegradable waste [4], [5].

In fact, the most proficient tire recycling methods are tire shredding to remove the steel cords and crumbing of the scrap rubber for use in civil engineering applications [6]. Utilizing the crumb rubber in concrete – known as rubbercrete - as partially replacement of fine aggregates resulted in better performance and exhibit higher ductile properties, lower compressive strength, lower density, good sound absorption and excellent thermal resistance compared to normal concrete [7].

Based on numerous studies, utilizing crumb rubber in concrete, regardless either as replacement to fine aggregates or coarse aggregates, will lead to a reduction in the

compressive strength [8], [9], [10], [11], [12], [13], [14]. Holmes et al. have studied the effects of utilizing a smaller replacement of crumb rubber percentage of 7.5% and 15% to fine and coarse aggregates [15]. They suggested that crumb rubber replacement should not exceed 20% to avoid adverse effect on the strength of concrete. This is supported by findings reported by Thomas et al. [11] where replacing of 20% crumb rubber to fine aggregates caused reduction in the compressive strength up to 50 %. Khaloo et al. have also concluded that the rubber chips and crumb rubber replacement exceeding 25% is not recommended due to the significant reduction in ultimate strength [16]. Nevertheless, the strength of rubbercrete block can be minimized by inclusion of appropriate amount of crumb rubber and fly ash.

Despite the adverse effect on the strength, it has been found that rubbercrete can be used to produce rubbercrete load bearing and non-load bearing blocks in accordance to the requirement of the ASTM C 90 and ASTM C 129 [17], [18]. [19] have developed a low cost, lightweight and high thermal resistance of rubbercrete solid brick by utilizing up to 70% of crumb rubber replacing fine aggregates. A hollow concrete block containing crumb rubber has been developed and used as load-bearing when the crumb rubber replacement amount is up to 6.5% maximum and as non-load bearing at crumb rubber replacement of up to 40.7%. [20].

Interlocking bricks is an easy and fast construction method as it eliminates the use of mortar in the construction process. The interlocking brick features grooves and protrusions that acts like puzzle or Lego, making it easier for assembly and hence reducing the construction time. Fay et al. [21] have developed an interlocking brick using soil and cement mixture as shown in Figure 1.1**Error! Reference source not found.** by implementing innovative construction process which employ perfect fitting system to eliminate the settling mortar.

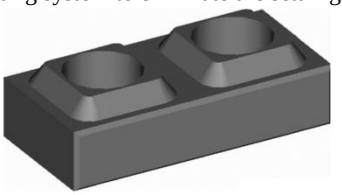

Figure 1.1: *The interlocking block developed* by Fay et.al [21]

Interlocking block that contain coconut fiber is used to advocate the earthquake prone region due to high toughness of the coconut fiber [22]. The reduction in density of the interlocking block creates less inertia forces and thus smaller dimension of the structure is required to withstand the impact, hence make it more applicable in resisting earthquake effect [22]. Other than that, Uygunolu *et al.* [23] have developed prefabricated concrete interlocking brick (PCIB) by replacing aggregates with concrete waste and marble waste. Incorporating fly ash in prefabricated concrete interlocking brick reduced the density of the block due to the low specific gravity of fly ash compared to cement [23].

Therefore, this research developed a new innovation of interlocking bricks called interlocking rubbercrete brick by utilizing crumb rubber and fly ash as parts of concreting materials.

2. Material

2.1. Cementitious Materials

Type 1 ordinary Portland cement was used in manufacturing the rubbercrete mixure. According to ASTM C 150 [24], OPC can be classified as Type 1 due to the chemical composition with specific gravity of 3.15. The chemical composition and the requirements of OPC Type 1 as per ASTM 150 [24] is given in Table 2.1.1. Fly ash is the waste material obtained from the coal fire power plant in Manjung, Perak. Fly ash, also known as cement replacement materials (CRM) was used to replace the amount of ordinary Portland cement (OPC) by volume replacement. The physical and chemical composition of fly ash is shown in Table 2.11. in accordance to ASTM C618 [25] fly ash was classified as class F fly ash contain pozzolanic properties [25] with specific gravity of 2.38.

Table 2.1.1: Properties and chemical composition of OPC and fly ash

Properties & chemical composition	**OPC (%) by mass**	**Requirement of OPC Type 1 as per ASTM C 150 [24]**	**Class F fly ash (%) by mass**	**Requirement of class F fly ash as per ASTM C 618 [25]**
Silicon dioxide (SiO_2)	20.76	20 % minimum	57.01	70 % minimum
Aluminium oxide (Al_2O_3)	5.54	6 % maximum	20.96	70 % minimum
Ferric oxide (Fe_2O_3)	3.35	6 % maximum	4.15	70 % minimum
Calcium oxide (CaO)	61.4	-	9.79	10 % maximum
Magnesium oxide (MgO)	2.48	6 % maximum	1.75	-
Manganese oxide (MnO)	-	-	0.033	-
Sodium oxide (Na_2O)	0.19	-	2.23	-
Potassium oxide (K_2O)	0.78	-	1.53	-
Titanium dioxide (TiO2)	-	-	0.68	-
Loss of iginition (%)	2.2	3 % maximum	1.25	6 % maximum
Specific gravity	3.10	-	2.38	-

2.2. Fine aggregate and crumb rubber

Washed river sand with maximum size of 1.18 mm was used as natural fine aggregates in producing RIB. The sand was obtained from the factory in Tronoh, Perak. The sieve analysis of sand was conducted according to ASTM C 136 [26] and the size distribution is shown in Figure 2.2.1. Based on the particle size distribution, the nominal size of fine aggregates was No. 8 or mesh #8. The density of the sand was recorded at 2.6335 g/cm^3. According to ASTM C 33 [27], the particles size distribution of fine aggregate is within the upper and lower limit of the grading requirement. Mesh #30 (600 micro meter) crumb rubber was used in the research which obtained from Sungai Petani, Kedah. The specific gravity of crumb rubber is 0.95, replacing the amount of fine aggregates by volume percentage. The sieve analysis and size distribution for crumb rubber was conducted as shown in Figure 2.2.1.

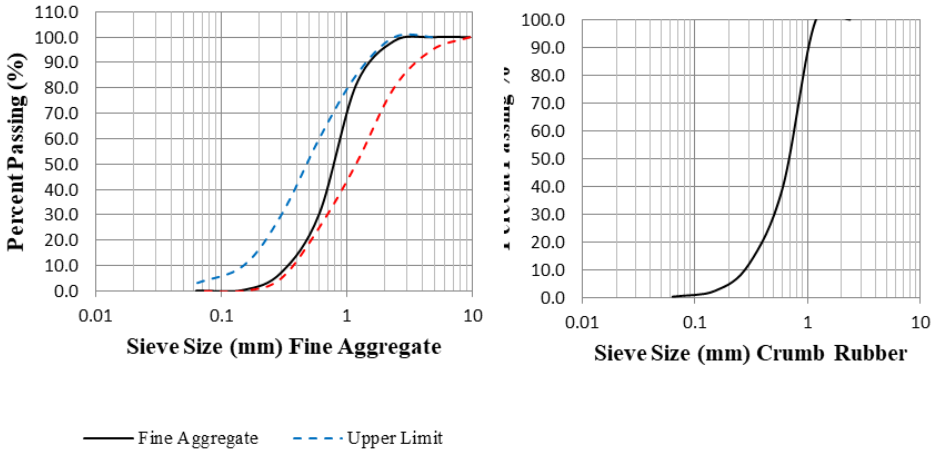

Figure 2.2.1: Particle size distribution of fine aggregate and crumb rubber

2.3. Water

A clean tap was used in preparation of rubbercrete interlocking bricks. As the dry mix is opted in the research, the amount of water is only about 10% of the total weight, which produced zero slump mixture. According to Mohammed et al., 8.5% of total batch weight is the required total water content for the production of zero slump value for the mix dry [14].

3. Trial mix design

Forty eight mix designs with variance in crumb rubber and fly ash content were proposed. The ratio of the cement to aggregate was set as 1:2 as control and it was further developed. The cement content was varied from 100% to 90%, 80%, 70%, 60%, 50%, 40% and 30%, which later was replaced with fly ash. Meanwhile for fine aggregate, the amount was reduced from 100% to 90%, 80%, 70%, 60% and 50% and replaced by crumb rubber. Crumb rubber and fly ash replacing fine aggregate and cement was done by volume percentage replacement and Table 3.1 shows the trial mixture ratio proportion of rubbercrete interlocking brick.

For each mix design, six full whole size of rubbercrete interlocking bricks were prepared, casted and tested for compressive strength test. In total, there were two hundred eighty eight rubbercrete interlocking bricks. The size of the bricks are according to the mold size (250 mm × 125 mm × 105 mm).

Table 3.1: Trial mixture ratio proportion of rubbercrete interlocking brick

Mix	Cementitious materials		Aggregates		Aggregates		Aggregates		Aggregates		Aggregates		Aggregates	
	Control		Control											
	OPC	FA	Sand	CR %	Sand	CR %	Sand	CR %	Sand	CR %	Sand	CR %	Sand	CR %
Control	1	0	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F10	0.9	0.1	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F20	0.8	0.2	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F30	0.7	0.3	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F40	0.6	0.4	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F50	0.5	0.5	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F60	0.4	0.6	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1
F70	0.3	0.7	2	0	1.8	0.2	1.6	0.4	1.4	0.6	1.2	0.8	1	1

4. Production of rubbercrete interlocking brick (RIB)

Sand and crumb rubber was mixed until uniform mixture is obtained then cement and fly ash were added to the mixture and mixed for approximately three to four minutes. At the end, the water was slowly added to the mixture and mixed thoroughly. The dry mixture then placed in the 250 mm × 125 mm × 105 mm steel mold and compacted approximately at 180 bar (18 MPa). The compaction exerted on the freshly placed rubbercrete mixture able to remove the entrapped air and also help to form the interlocking shape. The interlocking shape made of three holes with groove and protrusion which resulted in 10% of hollow cavities. The compaction was exerted for six seconds for two times before the brick was immediately removed from the steel mold (Figure 4.1). After the bricks were removed from the mold, they were left for 28 days curing process at room temperature (27℃) to attain the required strength. For the dry mix, the curing process were done by spraying water to the specimens for 28 days.

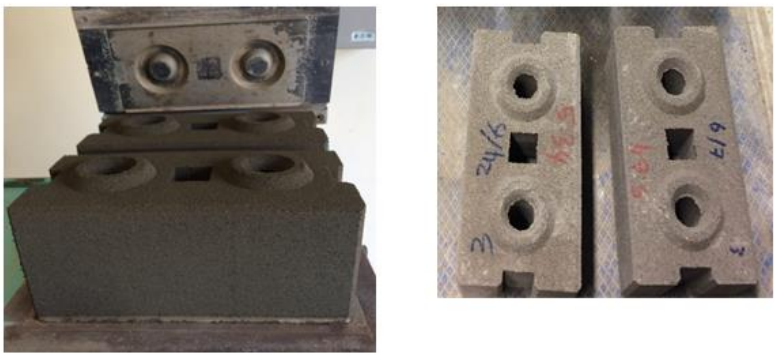

Figure 4.1: Rubbercrete interlocking brick at the end of the process

5. Mechanical and physical properties Test procedures of RIB

After the rubbercrete interlocking brick has been developed, several mechanical and physical properties were conducted as tabulated in Table 5.1.

Table 5.1: Mechanical and physical tests

Test	Dimension (mm)	No. of specimen	Standard
Compressive strength	250 × 125 × 105	6/mix	ASTM C 67
Dimension	250 × 125 × 105	24	BS 3291
Initial rate of suction	250 × 125 × 105	5	ASTM C 67
Water absorption			
i. 5 hour boiling	250 × 125 × 105	10	ASTM C 67
ii. 24 hours cold immersion	250 × 125 × 105	10	ASTM C 67
Density	250 × 125 × 105	5	BS EN 12390-7
Modulus of rupture	250 × 125 × 105	5	ASTM C 67
Thermal conductivity	10 × 10 × 10	5	ASTM D 7984
Efflorescence	250 × 125 × 105	10	ASTM C 67

5.1 Compressive strength Test

250 mm × 125 mm × 105 mm hardened rubbercrete interlocking bricks were tested for compressive strength after 28 days of curing period. The compressive strength test of the specimens were conducted according to ASTM: C67-03 [28] by using 3000 kN Digital Compressive Testing Machine Figure 5.1.

Figure 5.1: Compressive strength test for rubbercrete solid brick

5.2 Modulus of rupture

Modulus of rupture test was conducted on five full size rubbercrete solid bricks in according to ASTM C67-13 [31] by using three point load test. The brick supported flatwise and the load is exerted at mid-span in the direction of the depth of the brick unit on a span approximately 25.4 mm less than the basic unit length. In the presence of recesses, place the recesses on the compression side. The load is applied to the upper surface of the specimen through the steel bearing plate with 6.35 mm in thickness, 38. 10 mm in width and the length must be at least equal to the width of the specimen. The supports shall be free to rotate in the longitudinal and transverse direction so that they will not exert any force in these direction (Figure 5.2). Modulus of rupture was then calculated by using Equation 2.

$$S = 3W(\frac{l}{2} - x)/bd^2 \qquad \text{Equation 2}$$

Where S is the modulus of rupture at the plane of failure in Pa; L is the maximum load (N); l is the distance between the supports (mm); b & d are the net width and depth of RIB respectively (mm); and x is the average distance from midspan to plane of failure (mm).

Figure 5.2: Three point test set up for rubbercrete interlocking brick

5.3 Dimension test

The dimension of twenty four (24) bricks was tested according to BS 3921 [30]. Dimension test was conducted by arranging 24 bricks as per guideline in one straight line on a levelled surface and in contact with each other. The bricks shall be clean from any dust to acquire an accurate result. Measurement of height, width and length of 24 bricks are recorded. The individual size should not vary greatly from average of 24 bricks. The variation between the batches is one of the factors that causes the different size of the bricks. The tolerance of the individual brick should not exceed 6.4 mm on length and 4 mm on width and height [30].

5.4 Water absorption test

Water absorption was conducted according to ASTM C67 [31]. British standard (BS) also having the same procedure for the testing as in BS 3921 [30]. Water absorption test was conducted to determine the capability of the bricks to absorb water. There are two method of water absorption, 5 hours boiling and 24 hours cold immersion method. For the 5 hours boiling method, ten bricks are required and the test was conducted by using water bath tank. The specimens were first dried in the ventilated oven at 100℃ to 115℃ for less than 24 hours until 0.2% weight difference is obtained. After it was cooled, the specimens were weighted before it were immersed in the water tank. The water then was heated approximately 1 hour to reach boiling point and continuously boil for another 5 hours. Then,

the interlocking brick specimens were allowed to cool by natural heat loss for more than 16 hours. The bricks were removed and wipe off with damp cloth before weight.

While for the 24 hour cold immersion method, ten rubbercrete interlocking bricks were first dried in the ventilated oven at 100°C to 115°C for less than 24 hours until 0.2% weight difference is obtained and then the weight was recorded. The rubbercrete interlocking bricks were immersed in a tank of water at room temperature. After the bricks were removed from the immersion tank after 24 hours, the specimens were dried in the oven at 110°C to 115°C for 48 hours at least until a constant mass is obtained. Cool the specimen for 2 to 4 hours before the weight is recorded. The water absorption for 24 hours cold immersion and 5 hours boiling is calculated (Equation1).

$$\boldsymbol{Absorption}, \% = \mathbf{100}\left(\frac{\boldsymbol{Saturated\ mass - Dry\ mass}}{\boldsymbol{Dry\ mass}}\right) \qquad \text{Equation 1}$$

5.5 Density

Density test of hardened rubbercrete interlocking bricks were determined according to BS EN 12390-7 [32]. The density test was done by first, measuring the specimens' weight and recorded as as-received mass (mr). The saturated mass (ms) was determined by immersing the specimens in water at 20±2°C until the changes in mass is less than 0.2% obtained in 24 hours. For the oven dried mass (mo) the specimens was dried in the oven at 105±5°C until the changes of less than 0.2% obtained in 24 hours. The specimens were closely monitored for any presence of smoke or burnt smell resulted from the high temperature of oven. The specimens were cooled to room temperature in dry air tight vessel before weight was recorded. The volume of specimens were determined by water displacement method due to irregular shape of rubbercrete interlocking bricks.

5.6 Initial rate of suction

Five specimens of RIB were tested for the initial rate of suction in accordance to ASTM C67 [31]. Two metal plates were placed in a big and shallow container at least 75 mm to 100 mm apart before water was poured in the container to approximately 3 mm, covering the metal plate. Then, the bricks were measured to obtain the dry mass of the bricks. After that, the bricks were placed on top of the steel plates for 60 seconds. Lastly, remove the brick and wipe off the water by using damp cloth before it was measured again to obtain the wet mass. The initial rate of suction was then calculated by Equation 2.

$$\boldsymbol{I, kg/m^2 \cdot min} = \frac{\boldsymbol{1000\,(wet\ mass - dry\ mass)}}{\boldsymbol{At}} \qquad \text{Equation 2}$$

Where A is the area of the immersed surface (m2); and t is the time of submersion (min)

5.7 Thermal conductivity

According to ASTM C168, thermal conductivity is the time rate of steady state heat flow through a unit area of homogeneous materials induced by a unit temperature gradient in a direction perpendicular to that unit area [33]. The thermal conductivity test was conducted in accordance to ASTM D 7984 by using thermal conductivity analyzer C-Therm TCi [34]. This equipment follows Modified Transient Plane Source (MTPS) technique in measuring thermal conductivity of specimens in 1 to 3 seconds Figure 5.2.

Figure 5.2: Thermal conductivity test for a piece of rubbercrete interlocking brick

5.8 Efflorescence

The efflorescence test was conducted to determine the soluble salt deposited on the surface of the RIB. The most common salts that normally exist are magnesium sulphate, calcium, sulphate and carbonate. However, magnesium present in the bricks must be less than 0.05% and the soluble salt content shall not exceed 0.1% in order to allow them to be used in construction. In this study, ten (10) RIBs were tested for efflorescence in accordance to ASTM C67 [28] and BS 3921 [30]. The bricks were divided into two sets, which consisted of 5 bricks per set. The 5 bricks were partially immersed in the pan that filled with distilled water at a depth of 2.54 mm for 7 days and kept in drying room. Another 5 bricks, were placed in the drying room without any contact with water as in Figure 5.3. Each brick was separated at least 50.8 mm from one another. After 7 days, the bricks were dried in the drying oven for 24 hours. The bricks then were observed for any differences in term of salt appearance on the surface.

Figure 5.3: Efflorescence test (a) RIBs partially immersed in water; (b) RIBs in drying room

6. Results and discussion

6.1 Trial Mix

The response data from the conducted experiments of the forty eight mixes were analyzed using response surface method (RSM) to calculate the effects of all terms. The analysis of variance (ANOVA) results for the quadratic polynomial model is shown in Table 6.1. They also show low p-values, which is less than 0.0001. All p-values are less than the significance level of 0.05 except for fly ash (B), crumb rubber and fly ash (AB) and fly ash and fly ash (B2), which means that these terms have no significant effect on the compressive strength. In this response analysis, crumb rubber (A) and crumb rubber with crumb rubber (A2) are significant model terms, which satisfied both the F value and Prob > F value. p-value for

terms A and A2 are < 0.05, therefore, the compressive strength has a quadratic relationship with crumb rubber.

Table 6.1: ANOVA for Response Surface Quadratic model of the trial mixes

Source	dF	Mean Square	F value	P-value Prob > F	Significant
Model	5	614.51	44.79	< 0.0001	Yes
A - Crumb rubber	1	2464.12	179.62	< 0.0001	Yes
B - Fly ash	1	2.92	0.21	0.6470	No
AB	1	9.42	0.69	0.4120	No
A^2	1	595.69	43.42	< 0.0001	Yes
B^2	1	0.4	0.029	0.8657	No

By referring to the graph in Figure 6.1, it can be seen that an increase of crumb rubber replacement causes a decrease in compressive strength where 50% crumb rubber replacing fine aggregates shows the most significant loss in compressive strength. However, compressive strength of 15.86 MPa is acquired by using 10% of crumb rubber and 57% of fly ash replacement.

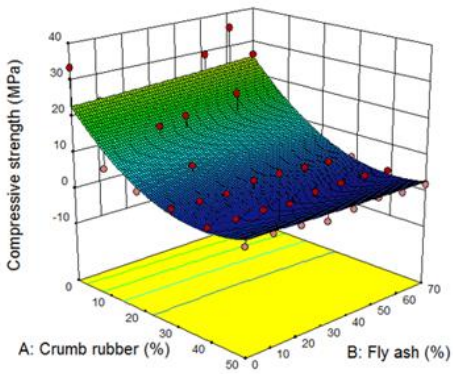

Figure 6.1: 3D response surface of compressive strength for RIB

In conclusion, the final mix design for producing RIB was obtained at 10% crumb rubber replacement of fine aggregate and 57% fly ash replacement of cement as confirmed by both experimental and optimization tool of RSM.

6.2 Compressive strength of rubbercrete solid brick

Figure 6.2 shows the compressive strength of rubbercrete interlocking brick at 50% and 60% fly ash replacement with crumb rubber replacement from 0% to 50%. It can be seen that at 10% crumb rubber replacement, the average compressive strength of 50% and 60% fly ash replacement is 10.54 MPa and 20.33 MPa, respectively. Hence, the minimum compressive strength requirement of load bearing masonry unit is 11.7 MPa in accordance to ASTM C 90, the partial replacement of fly ash must be greater than 50% and less than 60% for it to be considered as load bearing unit. Therefore, 57% fly ash replacing cement was chosen in the final mix design. The compressive strength of rubbercrete interlocking brick decreased by 12% to 94% as the crumb rubber replacing fine aggregates increases from 0% to 50%. The most significant reduction in compressive strength of the rubbercrete bricks occurred when 50% of fine aggregates was replaced by crumb rubber while, the least reduction in compressive strength was occurred at 10% of crumb rubber replaced fine aggregate.

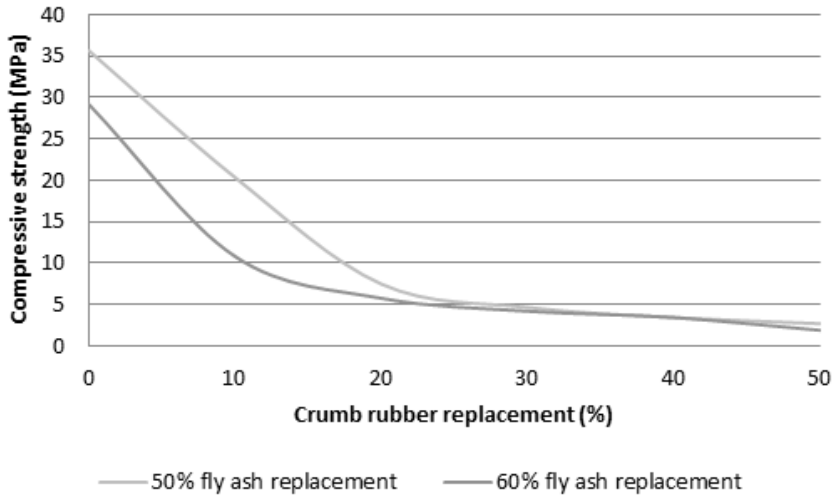

Figure 4.6: Average compressive strength at 50% and 60% fly ash replacement

Compressive strength of the rubbercrete interlocking bricks decrease as the crumb rubber percentage replacement increase. The reduction in compressive strength is contributed by the hydrophobic behavior of crumb rubber which entrapped air around its surface, hence induces stress concentration which lead to failure at lower stress. According to Lv et al. [35], the compressive strength reduction of rubbercrete was due to the decreasing amount of solid load carrying materials as the crumb rubber replacement increase. From the microstructure of rubbercrete bricks, the existence of small gap between the crumb rubber and cement paste, which is called interfacial transition zone (ITZ) reduced the adhesion of the crumb rubber-cement matrix and hence formed a weak zone which caused degradation of compressive strength [35]. Other than that, the behavior of crumb rubber that expel water and trap air around its surface during mixing, resulted in increasing the air void in the hardened brick [14]. Due to the increasing air void in the hardened rubbercrete brick, the cracks accelerated the failure of the rubbercrete bricks. Hence, the higher the crumb rubber replacement in the rubbercrete brick, the higher the reduction in compressive strength.

In conclusion, the chosen mix design is 10% crumb rubber as partially replacement of fine aggregate and 57% fly ash as partially replacement of cement. It achieved the expected strength and met the strength requirement of masonry brick which lies between 5 MPa to 150 MPa. The compressive strength of the rubbercrete interlocking brick also exceed the minimum requirement of the load bearing masonry unit accordance to ASTM C 90, which is 11.7 MPa [17]. Therefore, the developed rubbercrete brick is considered as load bearing masonry unit.

6.3 Modulus of Rupture

The flexural strength of rubbercrete interlocking brick obtained from the modulus of rupture test were ranges from 1.57 MPa to 2.50 MPa with an average of 2.23 MPa. According to Masonry Standard Joint Committee (MSJC), the modulus of rupture subjected to in-plane loading (normal to the bed joint) should be taken as 1.72 MPa [36]. However, the modulus of rupture of rubbercrete interlocking brick obtained in this study is rather low compared to normal concrete, which usually exhibited a value of 4.8 MPa [8]. This is due to the inclusion of crumb rubber which degrade the mechanical strength of rubbercrete interlocking bricks. Moreover, the crumb rubber in the rubbercrete interlocking brick reduces the adhesion

between the crumb rubber particles and cement paste, thus reduces the modulus of rupture in the rubbercrete interlocking brick.

6.4 Dimension tolerance

The average measured length, width and height for one brick are 249.79 mm, 127.00 mm and 105.33 mm, meanwhile the brick mold size is 250.00 mm length, 125.00 mm width and 105.00 mm height. The difference in length, width and height is 0.21 mm, 2.00 mm and 0.33 mm, respectively which consider a very small and within the allowable tolerance. According to BS 3921, the tolerance of the individual brick should not exceed 6.4 mm on length and 4 mm on width and height [30]. In addition, ASTM C 216 also set the dimension tolerance for solid masonry unis must not exceed 7/32 for the height and 1/8 inch for the height and width[30]. Therefore, the developed rubbercrete interlocking bricks are applicable for use in structural application in term of uniformity of the dimension.

6.5 Initial rate of suction

Initial rate of suction or also known as initial rate of absorption (IRA) test was conducted to measure the ability of the brick to absorb water. The initial water suction of rubbercrete interlocking brick ranges from 1.37 kg/m2 × min to 4.1 kg/m2 × min which are equivalent to 40 grams to 120 grams of water absorption within one minute. According to ASTM C 67, the acceptable value ranges from 10 grams to 30 grams [31]. The nature of crumb rubber to trapped air during the mixing led to high void formation in the hardened rubbercrete interlocking brick. The porous microstructure of the rubbercrete interlocking brick then contributed to the high IRA. Other than that, the dry mix method opted in casting the rubbercrete interlocking brick also contributed to the increasing of initial rate of suction of rubbercrete interlocking bricks, where only 10% of the water was used as binder during the mixing process.

According to Boral, the optimum value of initial rate of suction is considered to be between 0.5 and 1.5 kg/m2/min. Nevertheless, it can exceed these limits [37]. However, brick with initial rate of suction between 10 to 35 grams is preferable for its superior bonding property. Unacceptably high value of initial rate of absorption and water absorption can cause changes in volume and hence lead to cracks formation in concrete or bricks [38].

For normal brick, the water retentivity of mortar or grout should be matched to the brick type where good bond strength is critical. Too high or too low of IRA is detrimental to achieve a good initial and final bond between brick and grout, which not only affects the masonry flexural strength, but also its water tightness and durability [40]. IRA greater than 1.5 kg/m2/min is for highly porous and absorptive bricks exhibits rapid suction of water in grout by the bricks.

In conclusion, high initial rate of suction of rubbercrete interlocking bricks tend to absorb large quantities of water from the grout, thus resulted in poor bond connection between grout and bricks. Therefore, total water-cement ratio may be increase to reduce IRA. James suggested that the bricks should be wetted few hours before the grout is poured [39].

6.6 Water absorption

The average of 5 hours boiling water absorption is 226.45 kg/m3. Therefore, the rubbercrete interlocking brick is classified as medium weight brick. According to ASTM C 90 for load bearing masonry units, the maximum permissible water absorption limit for solid cement bricks is 208 kg/m3, 240 kg/m3and 288 kg/m3 for normal weight bricks, medium weight bricks and lightweight bricks, respectively. In general, the water absorption of rubbercrete increase as the crumb rubber replacement increase.

The hydrophobic behavior of crumb rubber which expel water and entrapped air during mixing process led to high volume of void formation upon hardening. Thus, during water absorption test, the voids were filled with water and resulted in high water absorption. In addition, the water absorption of the bricks also increases with decreasing of cement content [41]. Mohammed at el. [14] obtained a water absorption of 208 kg/m3 at 10% crumb rubber replacing fine aggregates with 85% cement content. It is in agreement with the higher water absorption of rubbercrete interlocking brick which exhibit 43% of cement content at 10% crumb rubber replacement.

On the other hand, the water absorption by 24 hours cold immersion method shows lower value which ranges between 2.93% to 3.38% and the average is 3.07%. It is in accordance with BS 3291 [30], were the 24 hours cold immersion method exhibit lower water absorption compared to 5 hours boiling test method. For the 24 hours cold immersion method, the water is not saturated entirely, hence the air in pores is not evacuated from the bricks completely. According to ASTM C 67, the 24 hours cold immersion should not exceed 8% [31]. Moreover, according to BS 3921, the 24 hour immersion test was used as work controls test only and the result generally is lower and not proportional to 5 hour boiling test method [30]. The good quality of brick absorb less than 20% water of its self-weight [42]. The lower amount of water absorbed by the rubbercrete interlocking brick produce better quality bricks.

The crumb rubber content influenced the porosity and hence affecting the water absorption capacity of rubbercrete interlocking bricks. Ahmad et al. [43] have investigated the water absorption of interlocking soil-cement by using 24 hours cold immersion method and 5 hours boiling method. 8.5% and 17% water absorption was recorded for 24 hours cold immersion and 5 hours boiling method, respectively. The result obtained in this research is in line with the result obtained by Ahmad et al. where 5 hours boiling method shows lower water absorption compared to 24 hours cold immersion. However, the rubbercrete interlocking bricks show lower absorption compared to normal concrete due to the behavior of the crumb rubber.

6.7 Density

The density of rubbercrete interlocking bricks ranged from 1799 kg/m3 to 1979 kg/m3 with average of 1894 kg/m3 which classified as medium weight brick in accordance to ASTM C 129 [18]. Ortega in his research recorded a dry density of 1930 kg/m3 at 10% crumb rubber replacement in rubbercrete brick [44]. They also concluded that density of the mixture increase as the amount of cement in the mixture increase. It is in line with this conducted study where the density obtained is lower than the density obtained by Ortega due to the lower amount of cement which was later replaced by the fly ash, hence reducing the density of the developed rubbercrete interlocking bricks. This reduction in the density of rubbercrete interlocking bricks is contributed by the low specific gravity of rubber compared to the conventional aggregates [45], [44]. Non-polar nature of crumb rubber particles and their tendency to attract air on their surfaces, hence increases the air content in the mix also lead to further reduction in density of rubbercrete interlocking bricks.

6.8 Efflorescence

Efflorescence is classified according to the severity; if the whitish layer is only about 10% of the brick surface, the efflorescence is considered as slight and thus acceptable [42], [46]. Meanwhile, if the alkalis cover up to 50% of the brick surface, it is classified as moderate exposure and if it is more than half, it indicates the brick is severely affected or a heavy case. The brick that shows moderate or heavy efflorescence may be used where efflorescence would not cause a serious problem.

It can be seen in Figure 6.3 the presence of the salt in RIB when it was partially immersed in the distilled water for seven days. After drying, a normal eye observation have been conducted on all faces of the rubbercrete interlocking brick. One out of five bricks was affected by efflorescence, which can be concluded that the brick is not effloresced in accordance to ASTM C 67. However, the presence of salt deposited might be due to the existing salt from the container, salt deposited on the sand or crumb rubber itself.

Figure 6.3: RIBs partially immersed in distilled water for efflorescence test

6.9 Thermal conductivity

The results of 6 RIBs undergone thermal conductivity test range from 0.613 to 0.863 W.m/m^2(K) with average of 0.729 W.m/m^2(K). This value is lower than the thermal conductivity of ordinary concrete (1.18 W.m/m^2(K)).

Low thermal conductivity of rubbercrete interlocking brick is due to the microstructure of the rubbercrete brick which trapped air on its surface, thus increasing the air content. According to Mohammed et al. [14], thermal conductivity of the air is 0.025 W.m/m^2(K), less than that of concrete which is 1.7 W.m/m^2(K). Therefore, the air voids inside the rubbercrete brick can deter the thermal transfer throughout the rubbercrete interlocking brick. In addition, crumb rubber particles also restrain thermal flow due to low thermal conductivity of the crumb rubber particles which is 0.16 W.m/m^2(K), less than the fine aggregate with 1.5 W.m/m^2. Other than that, the thermal conductivity of fly ash is also lower compared to cement, leads to further reduction in the thermal conductivity.

6.10 Structural behavior of rubbercrete interlocking prisms

6.10.1 Failure Mode

Six identical prisms (3 hollow and 3 grouted) consist of three units have been constructed and tested under compressive load. The experimental results show that the specimens crushed at the peak load, approximately at 4 MPa and 9.8 MPa for hollow and grouted specimens, respectively. Prisms were also split into half at the center along the longitudinal direction (web splitting) as shown in Figure 6.1. Meanwhile, the grouted prisms performed better behavior compare to the hollow prisms where there is no complete crushing which is due to the grout that hold the face of the prism together. According to Jaafar et al. [135], the grouted prism has no discontinuity planes and the closure of the contacted interfaces depends on the bond between the grout and the brick shells which prevent the complete disintegration of the grouted prisms.

(a) (b)

Figure 6.1: Hollow prism of 3 unit failure (a) Spalling of hollow prism of 3 units; (b) Failure and crack pattern.

6.10.2 Compressive strength and modulus of elasticity

The compressive strength of the grouted rubbercrete interlocking prisms is higher than hollow rubbercrete interlocking prisms. The average compressive strength for the hollow rubbercrete interlocking prisms is 4.00 MPa. Meanwhile, for the average compressive strength of the grouted rubbercrete interlocking prisms is 9.80 MPa. The modulus of elasticity of a concrete is controlled by the elastic modulus of its aggregates. The average experimental modulus of elasticity of hollow and grouted rubbercrete interlocking prisms are 24.32 GPa and 33.38 GPa, respectively. According to BS EN 1992, Poisson's ratio may be taken equal to 0.2 for uncracked concrete and 0 for cracked concrete [120]. Poisson's ratio of the hollow and grouted rubbercrete interlocking prisms is 0.061 and 0.247, respectively. Overall, rubbercrete interlocking prisms shows relatively higher Poisson's ratio compared to the normal strength concrete which usually exhibited Poisson's ratio of 0.15 to 0.22.

Table: Compressive strength and modulus of elasticity of hollow and grouted rubbercrete interlocking prisms

	Hollow prism	**Grouted Prism**
Average compressive strength, f (MPa)	4.00	9.80
Modulus of elasticity (GPa)	24.32	33.38
Poisson's ratio	0.061	0.247

6.10.3 Stress-Strain Curve Relationship

The stress-strain behavior of the rubbercrete interlocking prisms is shown in Figure 6.1 for hollow prisms and grouted prisms. The stress-strain curves for all hollow prism specimens, followed an almost parabolic relationship up to failure.

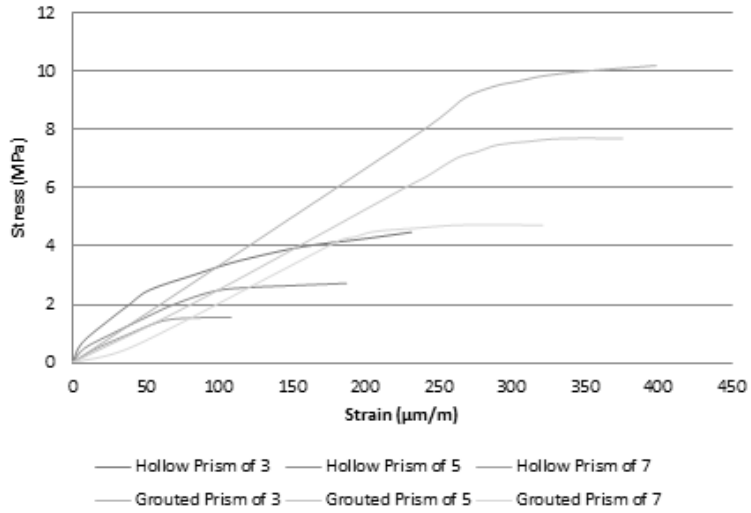

Figure 6.1 :Stress-strain curve of hollow and grouted rubbercrete interlocking prism

For hollow rubbercrete interlocking prisms of three units, the stress-strain curve shows a linear relationship between stress and strain up to 2.5 MPa. The three unit hollow prisms reached failure strength of 4.5 MPa at strain of 231 µm/m. Meanwhile, hollow rubbercrete interlocking prism of five units reached failure stress and strain at 2.7 MPa and 187 µm/m. Hollow rubbercrete interlocking prisms of seven units undergo failure at lower stress, which is at stress of 1.5 MPa and 108 µm/m strain. In general, the discontinuity planes in the rubbercrete interlocking hollow prisms have accelerated the cracks and led to failure at lower stress and lower strain. It can be concluded that the hollow rubbercrete interlocking prisms of three units exhibits less ductile behavior compared to hollow rubbercrete interlocking prism of five and seven units.

For grouted rubbercrete interlocking prisms, stress-strain curves almost followed a linear relationship up to failure. In this study, the stress-strain curve has taken straight path beyond the ultimate failure which confirms the actual behavior of masonry in case of axial loading to failure, where the stress-strain relationship beyond ultimate is taken as a straight line. Other than that, the grouted rubbercrete interlocking prisms also exhibit higher strain at the linear elastic region compared to the hollow prisms. The maximum strain of the grouted prisms of three units, five units and seven units was recorded at 398 µm/m, 375 µm/m and 321 µm/m at 10.7 MPa, 7.3 MPa and 4.7 MPa, respectively.

As the result, the increasing of compression load increases the bilateral strain. Under uniaxial compression, grouted rubbercrete interlocking masonry prisms expands more compared to hollow rubbercrete interlocking masonry prisms. The result obtained for the stress-strain curve of the hollow and grouted interlocking rubbercrete masonry prisms is in line with the result obtained by Sadek and El-Attar [46].

Figure 6.2 shows the principal stress versus principal strain curve of hollow and grouted rubbercrete interlocking prisms of three units, five units and seven units. According to Hibbeler, [136] principal stress represent the maximum and minimum normal stress at the point. It was observed that the principal stress versus principal strain for hollow and grouted three unit prism shows almost parabolic curve. However, the hollow rubbercrete interlocking prism of three unit shows higher principal strain compared to others. Furthermore, grouted rubbercrete interlocking prisms shows higher principal stress compared to hollow rubbercrete interlocking prisms.

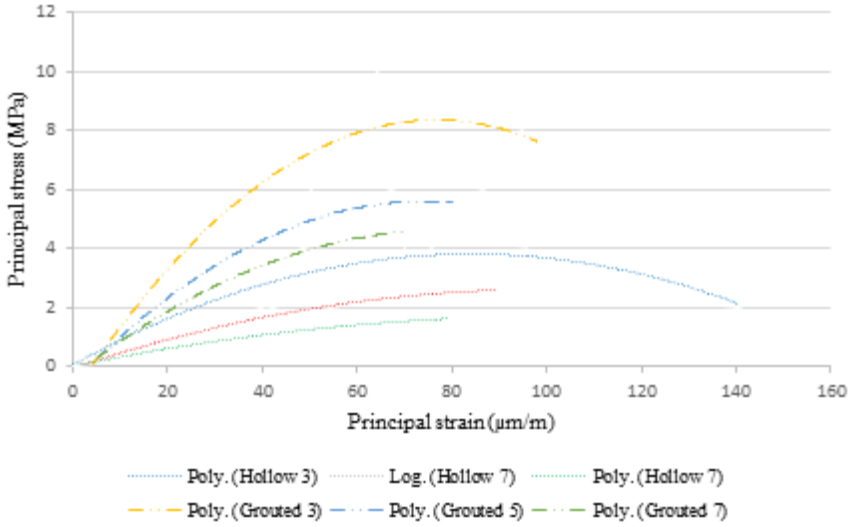

Figure 6.2: Principal stress-principal strain curve of hollow and grouted rubbercrete interlocking prism

7. Conclusion and recommendation

Rubbercrete interlocking brick with 10% crumb rubber and 57% fly ash replacement of fine aggregate and cement, respectively have been tested and proven that the compressive strength recorded a value of 15.86 MPa, exceeded the minimum compressive strength limit requirement for load bearing masonry unit application, which is 11.7 MPa in accordance to ASTM C 90.

Rubbercrete interlocking brick exhibit uniform size and shape which is within the dimension tolerance, thus make it easier to lay in masonry. Based on the density test, rubbercrete interlocking brick is also considered as medium weight concrete, as crumb rubber exhibit a low specific gravity (0.95) compared to specific gravity of fine aggregates (2.71). The lower density of the bricks contributed to the reduction in the dead load for load bearing unit. The hydrophobic behavior of crumb rubber particle that trap air around its surface and repel water lead to reduction in compressive strength, modulus of rupture, and density, as well as higher water absorption, initial rate of suction and better thermal conductivity.

Rubbercrete interlocking brick presents an opportunity to improve environmental and engineering performance compared to conventional brick in practices. Some of the potential areas for the future research.

- The interfacial transition zone (ITZ), can be further increase or densify with nano size particles such as nano-silica as it able to fill the voids and reduce the voids in the rubbercrete interlocking brick.

-Extensive research studies regarding the structural behavior of rubbercrete interlocking masonry are required to be done.

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The Impact of Environmental Pollution to Rural, Urban and Coastal Communities in Recent Years

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1. Introduction

Global pollution is one of the major concerns in our urban and rural environments. Coastal environments encompasses both urban and rural communities. Among the most common pollutants affecting coastal ecosystems is persistent organic pollutants (POPs). Among examples of POPs are polycyclic aromatic hydrocarbons (PAHs), polybrominated diphenyl ether (PBDE), polychlorinated biphenyls (PCBs), dichlorodiphenyl- trichloroethane (DDTs), among others. Major sources of POPs are industrial effluents, urban runoffs, domestic wastes, atmospheric fallouts, and landfill leachates. POPs are mostly non-polar compounds that has octanol-water partition coefficients (Kow) similar to that of lipids. Therefore, POPs are easily partitioned into lipid tissues and stored for a considerable length of time. POPs are endocrine disrupters and they are able to mimic human hormones. Thus, they are also called environmental hormones. POPs are resistant to biodegradation and deposited in the sedimentary environments and uptake by shellfish. Due to intense industrialization, POPs can also be found in mangrove sediments. Organisms living in mangrove ecosystems are highly exposed to POPs and pose toxicity problems and ecosystem health.

2. Petroleum Pollution

Petroleum pollution has been a prominent problem since commercial drilling of oil in the late 19^{th} century. Pollutants derived from petroleum and its products will be increasing in the future. In industrialized and urbanized areas where intense anthropogenic activities are occuring, petroleum pollution is very significant. Due to close proximity to ports, harbors and sea transport, coastal areas undergo immense degradation of environmental quality. With industrialization and urbanization, population has seen to increase and this has led to high consumption of petroleum and its products. Many coastal communities in Southeast Asia has experienced higher levels of development in the past decades. Moreover, Southeast Asian countries heavy industrilization activities has opened to increased oil tanker traffic. For example, the Straits of Malacca bordering Malaysia and Indonesia is the shortest shipping route for transportation of oil tankers from Middle East and North Europe to Northeast Asian countries such as Japan, Korea and China (Figure 1).

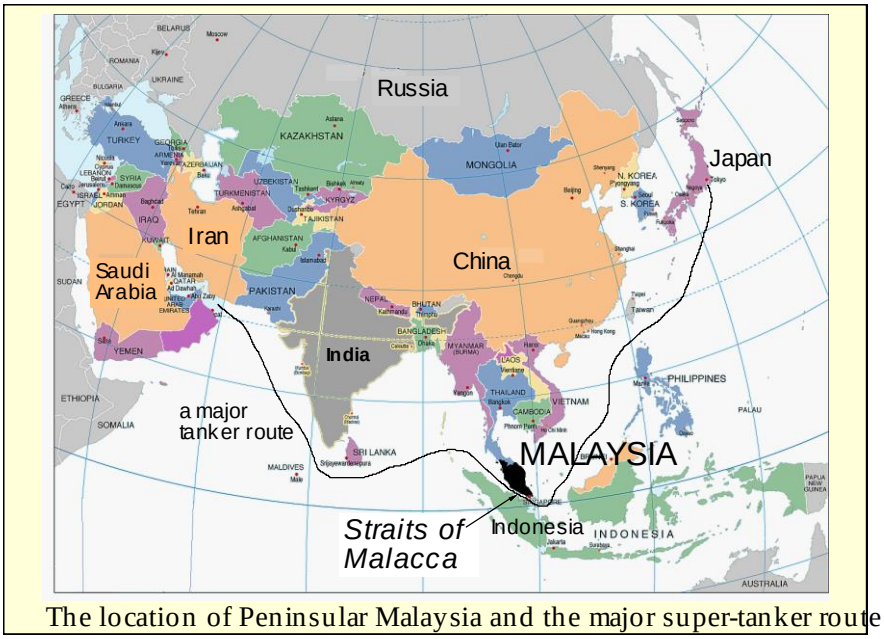

Figure 1. A major supertanker route plying the Straits of Malacca

Furthermore, a huge number of merchant ships pass through the Straits turning it into one of the busiest shipping routes in the world. As a result, large and small accidental oil spills as well as spillage from ballast water and tanker washing discharges occur frequently. Consequently, the west coast of Peninsular Malaysia receives pollutants including those from petroleum and its products from both land and sea. Among pollutants of major concern in petroleum hydrocarbons is polycyclic aromatic hydrocarbons (PAHs) (Figure 2).

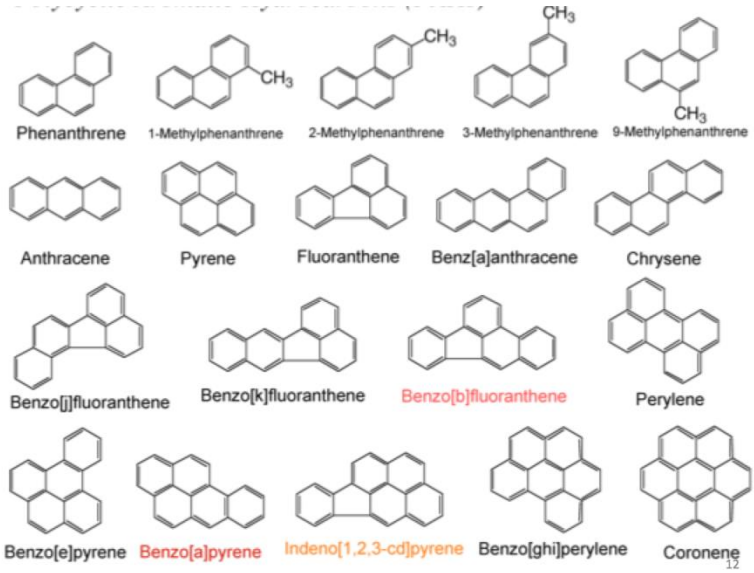

Figure 2. 16 USEPA polycyclic aromatic hydrocarbons (PAHs). The red and orange PAHs indicate the most toxics and carcinogenics.

PAHs are the widespread ubiquitous contaminants in the different compartments of the environments. These compounds are generally generated by natural and anthropogenic processes and can be introduced into the environments through various routes. Anthropogenic input from incomplete combustion, oil spills, urban runoff, domes- tic and industrial wastewater discharges, as well as atmospheric fallout of vehicle exhaust and industrial stack emission have caused significant accumulation of these compounds in the environments. Due to their toxicity, mutagenicity, and carcinogenicity characteristics, PAHs are considered to be hazardous to the biota and environments.

Because of their low water solubility and high partition coefficients, these compounds are strongly sorbed onto the surface of particles associated with the organic compounds of solid phase matrix and can be deposited to the underlying sediments. Therefore, the investigation of PAH concentrations in aquatic environments is needed to provide important information on anthropogenic impact on the environment and serve as an indicator of contaminant loading. Furthermore, studies has shown that PAHs contamination along the coastal waters of Southeast Asian countries has increased significantly in the past decades. Immeadiate control in the form of sound legistlations and standards has to be put in place in order to reduce such contamination.

3. Sewage Pollution

Discharge and emission of sewage contamination are derived from human activities such as industrial development, urbanization, tourism, etc. The control of aquatic pollution has been identified as an immediate need for sustained management and conservation of the existing fisheries and aquatic resources. By far, sewage is the greatest volume of waste discharged to the marine environment. There are many different types of sewage indicators from animal inputs. Chemical markers such as sterols are used to identify specific source of sewage from animals and humans (Figure 3).

Highly populated cities generate huge loads of such wastes daily which are finally washed out by the drainage systems that generally release into nearby rivers or aquatic systems. Sewage contamination can be assessed by microbiological and chemical markers. In the rural

areas, sewage treatment is rarely available. The cost of having sewage treatments and its maintanence is expensive. Raw sewage is released without treatment making the coastal waters suceptible to water-borne diseases. In areas where water circulation is poor, eutrophication of bays and eclosed water bodies become prominent. Eutrophication of water bodies to exccesive concenntrations of nutrients will results in algal blooms. Algal blooms has potential health problems to coastal communities in the presence of harmful algal blooms, or HABs. HABs occur when colonies of algae grow out of control while producing toxic or harmful effects on people, fish, shellfish, marine mammals, and birds. The human illnesses caused by HABs, though rare, can be debilitating or even fatal. HABs have been reported in every Sabah (Malaysia) waters, in the Philippines coastal areas, and their occurrence may be on the rise. HABs are a national concern because they affect not only the health of people and marine ecosystems, but also the 'health' of local and regional economies.

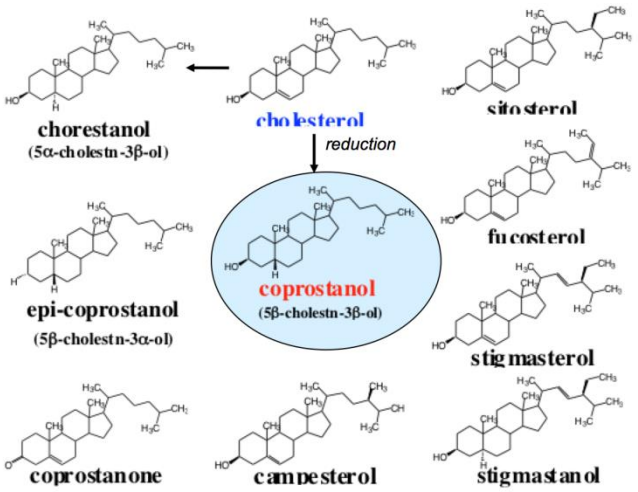

Figure 3. Different types of sterols used as indicators of sewage pollution.

4. Heavy Metal Pollution

Heavy metals are defined as metallic elements that have a relatively high density compared to water. Examples of heavy metals are Cadmium, arsenic, mercury and lead. Some heavy metals are able to induce toxicity at low level of exposure. There has been an increasing ecological and global public health concern associated with environmental contamination by the metals stated above. Human exposure has risen dramatically as a result of an exponential increase of their use in several industrial, agricultural, domestic and technological applications. Reported sources of heavy metals in the environment include geogenic, industrial, agricultural, pharmaceutical, domestic effluents, and atmospheric sources. Heavy metal pollution is very prominent in point source areas such as mining, foundries and smelters, and other metal-based industrial operations. Although heavy metals are naturally occurring elements that are found throughout the earth's crust, most environmental contamination and human exposure are derived from anthropogenic activities such as mining and smelting operations, industrial production and use, and domestic and agricultural use of metals and metal-containing compounds. Environmental contamination can also occur through metal corrosion, atmospheric deposition, soil erosion of metal ions and leaching of heavy metals, sediment re-suspension and metal evaporation from water resources to soil and ground water. Natural phenomena such as weathering and volcanic eruptions have also been reported to significantly contribute to heavy metal pollution. Industrial sources include metal processing in refineries, coal burning in power plants, petroleum combustion, nuclear power

stations and high tension lines, plastics, textiles, microelectronics, wood preservation and paper processing plants. One of the classic cases of heavy metal pollution affecting coastal communities occurred in the Minamata Bay in Japan. Mercury was in the waste product dumped into Minamata Bay on a massive scale by a chemical plant. The mercury had contaminated fish living in Minamata Bay area. People ate the fish, were themselves contaminated, and became ill. Local bird life as well as domesticate animals also perished. In all, 900 people died and more than 2000 people were certified as having directly suffered from mercury poisoning - now known as Minamata Disease.

5. Conclusions

Rapid expansion of industries, expolosion of urban and rural population has led to drastic deterioration of coastal resources. It is become a pressing need for the Southeast Asian countries to promote local participation in management of costal resources. Environmental Protection Zone has to be created and Ecologically Sensisive Areas be identified to prevent further deterioration of the coastal ecosystems especially the mangrove forests. Mangrove forests are valuable resources of tropical ecosystems and they play important roles in beach protection, groundwater recharge and enriching biological diversity. Mangroves in the Southeast Asian countries has been severely destroyed and polluted. Corrective measures on planning, management, research and conservation should be formulated. Biodiversity of coastal systems are highly threatened and immediate preservation on a regional and global scale is needed.

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Roadroid to Collect Condition Data for Rural Roads, Current Development and Progress

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Abstract. As a part of GoI transfer fund, village fund (dana desa) has been increasing quite significantly since its introduction in 2015. Starting at 20 trillion rupiahs in 2015 dana desa's allocation now stands at 60 trillion rupiahs. Despite of its increasing trend, dana desa's budget for improving and maintaining rural road condition is still very limited. Considering the budget constraint, it is very important to make rural road program prioritization based on road condition which is mainly represented by International Roughness Index (IRI). Capturing IRI is the key for optimizing road improvement and maintenance programming. Tools with high accuracy result usually cost more than local government budget for rural road condition survey. Therefore, an affordable survey tool with optimal result would be needed to create rural road program prioritization. Roadroid, a smartphone apps that can create a smart and simple road data collection, would be an ideal tool for rural road condition survey due to its advantage in simplicity, price, and optimal accuracy compared to other sophisticated and complex tools such as hawkeye, roughometer, NAASRA, etc. A survey done in Tanjung Sari Village will give an illustration on how Roadroid collect road condition.

Keywords: Dana Desa, IRI, Roadroid, Rural Road

1. Introduction

Dana desa's share in transfer fund has been steadily increasing since its introduction in 2015. It stood at 3% share of transfer fund in 2015 and now stands at 10% share of transfer fund. The highest priority of dana desa's allocation is in infrastructure sector, which is used in road, irrigation, drainage, etc. It takes more than 80% share of dana desa's budget. Even with these figures, rural road improvement and maintenance is still facing a limited funding due to inefficient method such as visual method.

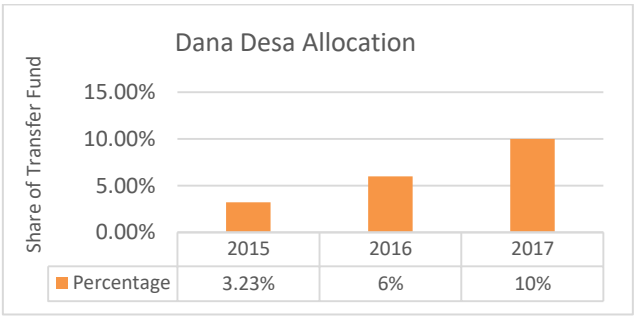

Figure 1 *Dana Desa Share (Source: www.kemenkeu.go.id/dana-desa)*

Limited funding requires optimization of budgeting based on accurate data, which is prioritization on each road segment that will be handled. However, all this time, rural road

maintenance is often performed without any solid basis for planning, without accurate data, and occasionally occur political intervention. Large size of the budget has yet to guarantee a village to have a good road network as long as the management of road maintenance is still performed sporadically and without proper planning.

Data that is very important in the planning process is the local road network data and road conditions. One of the parameters of road conditions that can be used is the International Roughness Index (IRI). IRI is the flatness of the road surface is expressed by the number of vertical changes in the road surface for each unit of road length (mm / km). Rule of thumb for IRI is: the greater the value of IRI, the worse the road conditions. In Indonesia, road with IRI less than 4 (very good condition) should be given routine maintenance, road with IRI between 4 and 8 (good condition) should be given periodic maintenance, road with IRI between 8 and 12 (poor condition) should be given rehabilitation treatment, and road with IRI more than 12 (very poor condition) should be given reconstruction treatment.

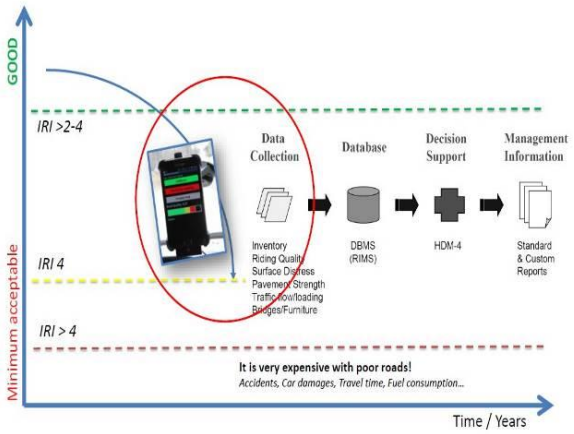

Figure 2 *IRI Utilization for Road Planning and Programming*

The IRI collecting methods vary from its accuracy, efficiency, and cost. For agency that has limitation on its budget such as village government, its survey method has to be quite precise, easy to use, not time consuming, and cost efficient in order to obtain robust road data set.

2. Road Survey Method Classification

Roughness measuring devices is classified in ASTM E 950-94, it is divided into four group based on its accuracy and the tools used in determining IRI.

A. Class I
Precision profiles with high accuracy (10 – 20 m intervals)

B. Class II
Other profilometric method that consider dynamic measurement to determine elevation profile or combining statistic calculation from elevation data.

C. Class III
This class estimates IRI from correlation equations.

D. Class IV
Subjective measurement based on ocular inspection.

Table 1 *Advantages and Disadvantages of each Road Survey Method Class*

Level	Method	Tool Example	Advantages	Disadvantages
Class 1	Lasser scanner technology	• *Hawkeye* 	• High precision • Data obtained vary (not only IRI) • Interval 10-20 m	• Expensive (up to Rp 25 Billion) • It can not work when it rains / there are puddles on the road • Unable to pass through a narrow street • Long survey time
Class 2	Complex profilometer method	• NASSRA / *Roughmeter* 	• Medium precision	• Quite expensive (Rp 100 Million-1.5 Billion) • Long survey time • Only one ruts
Class 3	Corelation method	• Road Roid 	• Low cost • Easy to use • Cover large areas in short time (>100 km/day) • Precision 80% of laser method • *Portable* • Data in cloud server and used anywhere from web browser (no client needed). • Interval >20 m	• Sensitive to the age and speed of vehicles • Sensitive to GPS signal • It should be combined with a GPS system that has stronger signal, especially in remote areas
Class 4	Visual method			• Long survey time • Subjective

Source: several sourves

3. Roadroid

Given the limited survey funds on village government, implementation of Roadroid could be preferred as an alternative that has low cost, produces accurate data, and is easy to operate. Roadroid is a mobile software developed in Sweden, the first prototype of Roadroid was published in 2002 based on PC. It has been developed on smartphones since 2011. It measures IRI using smartphone accelerometer that also can automatically capture photos and videos of road. The types of data that can be acquired using Roadroid are spatial, visual, and numeric data.

3.1 Preparation

Before using Roadroid to capture IRI, there are several preparations that have to be made.

3.1.1. Device

The main thing that need to be prepared for the operation of Roadroid is smart phones with Android operating system. Android OS 4 for the classic app (v 1.7.5) and Android OS 5 for the Version 2 PRO app. The Roadroid application can be downloaded in www.roadroid.com/home/app. Roadroid needs to register the phone's IMEI number before any data can be uploaded. Fill in the registration details on: www.roadroid.com/registration. Every device has one username and password to access the data uploaded from the device.

3.1.2. Fitting Adjustment

Mount phone in a car rack in the windshield

- horizontally/landscape mode
- standing vertically from road
- it should be easy to reach the display
- make sure camera lens capture road

Choose fitting adjustment menu on the Roadroid apps to calibrate the phone position. Set the devices until the X,Y,Z's color changes to green and their values near to 0, and choose OK.

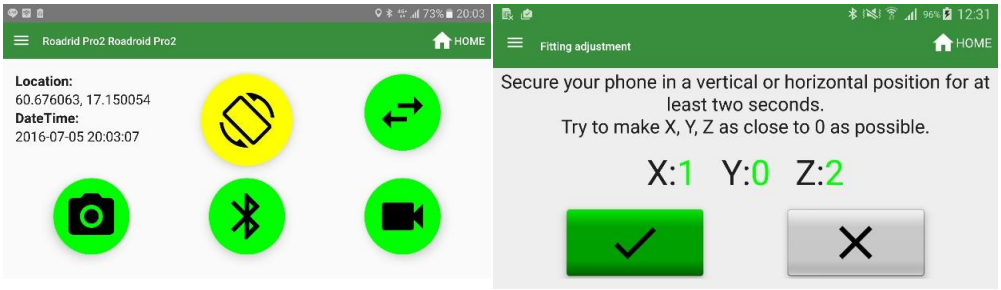

Figure 3 *Fitting Adjustment*

3.1.3. Initial Settings

There are several parameters that need to be adjusted according to the survey condition, those parameters are: vehicle type, sensitivity, segment length, and low speed latitude/longitude threshold. Those parameters should be carefully adjusted to avoid error caused by misuse. This setting is very crucial for validating IRI generated by Roadroid. Before using Roadroid for road survey, IRI generated by Roadroid must be calibrated by comparing it with known IRI defined by a reference method class 1 or 2. If the desired result hasn't been reached, double check every setting and adjust the sensitivity until the captured IRI meet the tolerance limit set.

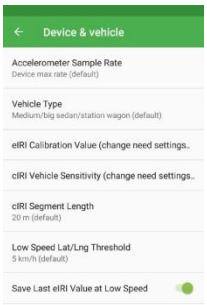

Figure 4 *Initial Settings*

3.2 Data Collection

To achieve accurate result, you should:

1) Run the system on a road with known IRI defined by a reference method class 1 or 2
2) Run Roadroid in a certain speed (car and phone)
3) View the result in app survey monitor or excel together with the reference data
4) Adjust sensitivity until desired survey result is reached for both texture and roughness
5) Adjust the presets for different cars, phones and survey speeds

After a proper calibration is made, start the survey from base point of road segment and choose start sampling button to begin collecting the data. Then give name to the road segment according to the road code. Then, Roadroid will collect the road data. When it reaches end point of road segment, choose stop sampling button to stop collecting the data. Data and documentation of the condition of these roads have been recorded in the devices, and surveyors can begin the survey to other sections and so on. The data should be immediately uploaded to the internet considering the limited phone memory.

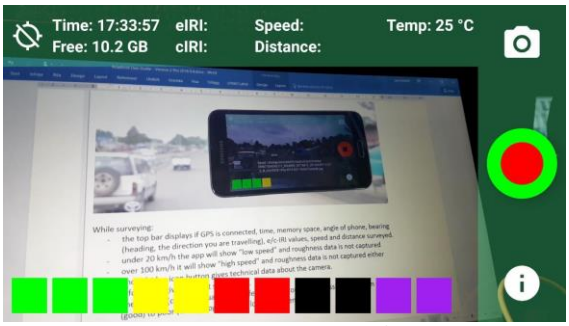

Figure 5 *Roadroid Survey Interface*

This road condition data will be recorded on roadroid server and it can be seen in Roadroid.com. Furthermore, log in with username and password to access the database. Data obtained from the survey is:

1. KML file and Shape Files that can be generated on a map applications.
2. Data in the text files (* .txt) that can be generated for each road segment with at least every 20m, 50m, and so on. The data contain: the time and date of the survey, Major segments, the position of the GPS, distance, speed, changes in the road vertical alignment, eIRI, and cIRI. Based on experience and analysis, eIRI value is more recommended to use as road condition representation.

4. Rural Road survey Implementation and Result Analysis

A survey has been done in Tanjung Sari Village, Banten Province on 22 August 2017. The survey covered 6,400 meter of road (around 80% of total rural road length) using motorcycle as the vehicle. Time needed to complete this survey is only 2 hour using one motorcycle. It costs in average around Rp.480,000 or USD 35 per day to do surveying using Roadroid with assumption that motorcycle rent cost Rp. 100,000 per day, surveyor fee cost Rp. 250,000 per day, and Roadroid license cost Rp.130,000 per day (around Rp. 4 million per month).

4.1 Road Condition

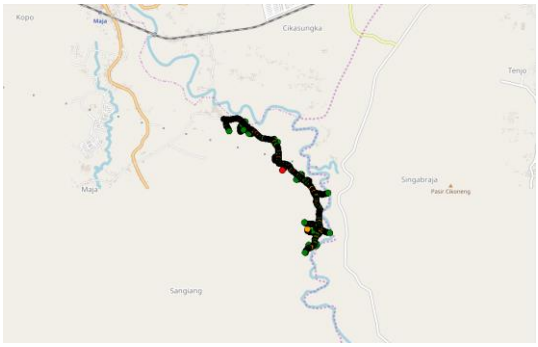

Figure 6 *Tanjung Sari Rural Road Condition*
Source: roadroid.com

Figure 6 shows the road network condition that has been surveyed in a device, the view can be adjusted based on the survey date. Each link generate its own data that can be uploaded to the server and then be downloaded to be utilized. The aggregate file uploaded to roadroid.com will give us information in .txt, beside aggregate file, shape file and KML file can also be generated for mapping purposes.

Table 2 *Roadroid Aggregate File with 10 m Interval Sample (Jalan Cibogo)*

DateTime	Latitude	Longitude	Distance (m)	Speed (km/h)	Altitude (m)	eIRI	cIRI
8/22/2017 11:38	-6.3553	106.4241	10	4.32	54.15	3.22	0
8/22/2017 11:38	-6.35533	106.4241	20	7.57	53.94	2.1	0
8/22/2017 11:38	-6.35546	106.4241	30	8.2	53.7	2.8	0.06
8/22/2017 11:38	-6.35556	106.4241	40	7.77	53.49	3.35	0.11
8/22/2017 11:39	-6.35563	106.4242	50	7.67	53.46	3.43	0.11
8/22/2017 11:39	-6.35566	106.4242	60	7.9	53.81	2.58	0.68
8/22/2017 11:39	-6.35578	106.4241	70	7.95	54.24	2.54	0.8
8/22/2017 11:39	-6.35588	106.4241	80	7.07	54.29	3.81	0.66
8/22/2017 11:39	-6.35593	106.4241	90	6.72	54	4.77	0.63
8/22/2017 11:39	-6.35603	106.4241	100	7.48	53.92	1.71	0.63
8/22/2017 11:39	-6.35609	106.424	110	8.17	53.94	2.46	0.66
8/22/2017 11:39	-6.35618	106.424	120	8.45	53.97	1.58	0.69

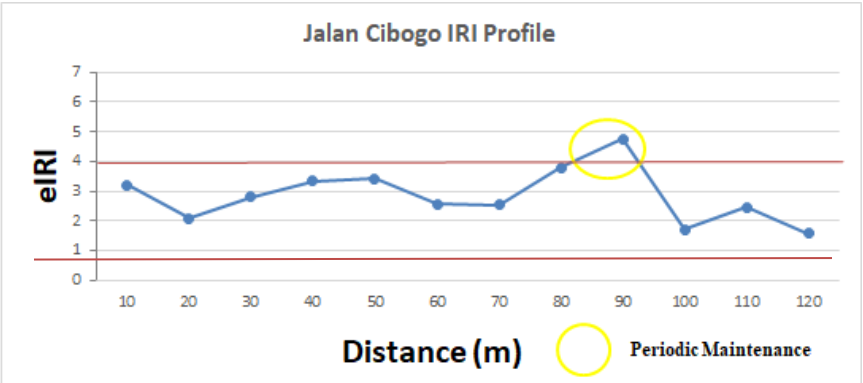

Figure 7 *Jalan Cibogo IRI Profile Sample (10 m Interval)*

The aggregate file as in

Table 2 give information about the surveyed link such as Latitude, Longitude, Distance, Vehicle Speed, Altitude, and IRI. This aggregate file can then be used to create IRI profile for a link with 5/10/20/50/100/160/200 m interval depending on each link's length, By creating IRI profile for each links, maintenance and/or improvement planning could be created by prioritizing segments that have high IRI.

Figure 7 illustrate a link IRI profile with 10 m interval**.** Based on the profile, road on the 80-100 m segment should be given periodic maintenance to lower the IRI because it exceeds the threshold at value of IRI >4, whereas other segments should just be given routine maintenance to maintain the link quality. This profile approach is very crucial in identifying which segments that need more serious treatment and which segments that only need routine maintenance.

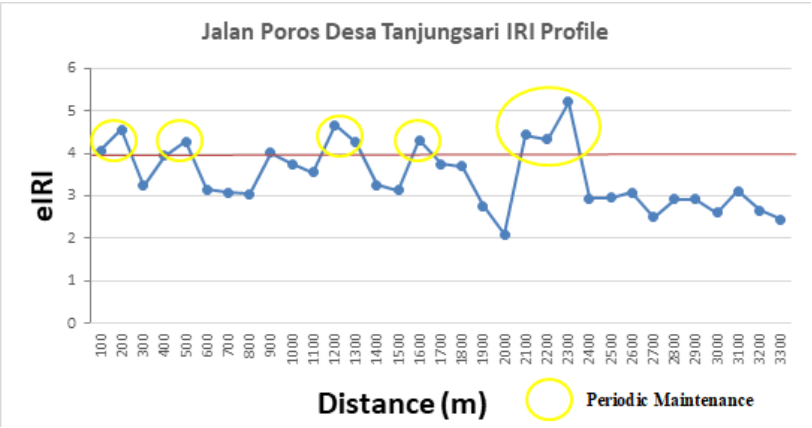

Figure 8 *Jalan Poros Desa Tanjungsari IRI Profile Sample (100 m Interval)*

Table 3 *Roadroid Aggregate File with 100 m Interval Sample (Poros Desa Tanjung Sari)*

DateTime	Latitude	Longitude	Distance (m)	Speed (km/h)	Altitude (m)	eIRI	cIRI
8/22/2017 12:07	-6.34849	106.4149	100	14.45	40.72	4.07	2.25
8/22/2017 12:08	-6.34861	106.4158	200	17.17	44	4.56	8.64
8/22/2017 12:08	-6.34844	106.4167	300	18.59	39.83	3.23	5.65
8/22/2017 12:08	-6.3487	106.4175	400	17.2	39	3.94	6.84
8/22/2017 12:09	-6.34928	106.4181	500	21.04	40.68	4.27	11.09
8/22/2017 12:09	-6.34986	106.4187	600	17.08	49.61	3.15	8.91
8/22/2017 12:09	-6.35041	106.4196	700	19.88	56.88	3.07	6.63
8/22/2017 12:10	-6.351	106.4202	800	20.68	50.87	3.05	5.67
8/22/2017 12:10	-6.35145	106.4209	900	19.05	48.27	4.01	7.07
8/22/2017 12:10	-6.3516	106.4219	1000	14.54	52.64	3.74	5.29
8/22/2017 12:10	-6.35195	106.4226	1100	21.76	54.8	3.56	7.99
8/22/2017 12:11	-6.35275	106.4232	1200	17.85	53.1	4.66	9
8/22/2017 12:11	-6.35368	106.4233	1300	19.16	52.96	4.26	12.18
8/22/2017 12:11	-6.35466	106.4233	1400	20.16	52.75	3.25	6.65
8/22/2017 12:12	-6.3552	106.4237	1500	18.54	55.42	3.13	8.8
8/22/2017 12:12	-6.35541	106.4246	1600	16.98	50.75	4.31	5.99
8/22/2017 12:12	-6.35608	106.4252	1700	19.78	44.89	3.74	7.08
8/22/2017 12:13	-6.35678	106.4259	1800	18.29	40.65	3.69	7.41
8/22/2017 12:13	-6.35727	106.4265	1900	20.22	44.2	2.77	4.21
8/22/2017 12:13	-6.35782	106.4272	2000	21.89	46.91	2.09	2.36
8/22/2017 12:13	-6.35846	106.4279	2100	15.31	45.37	4.44	3.87
8/22/2017 12:14	-6.35924	106.4285	2200	15.6	51.78	4.33	5.65
8/22/2017 12:14	-6.35997	106.4288	2300	19.21	48.58	5.21	8.8
8/22/2017 12:14	-6.36082	106.4291	2400	15.76	43.03	2.94	3.53
8/22/2017 12:15	-6.36168	106.4293	2500	25.1	46.02	2.95	8.18
8/22/2017 12:15	-6.36244	106.4296	2600	22.14	43.62	3.07	7.59
8/22/2017 12:15	-6.36334	106.4295	2700	17.62	45.79	2.49	5.51
8/22/2017 12:16	-6.3642	106.4295	2800	19.25	48.46	2.92	6.71
8/22/2017 12:16	-6.36516	106.4297	2900	20.86	46.06	2.92	9.14
8/22/2017 12:16	-6.36598	106.4295	3000	21.76	50	2.6	9
8/22/2017 12:17	-6.36659	106.4289	3100	21.48	49.92	3.11	6.54
8/22/2017 12:17	-6.36748	106.4288	3200	17.77	43.7	2.65	5.1
8/22/2017 12:17	-6.36801	106.4282	3300	16.06	51.86	2.44	7.86

Figure 8 illustrate a link IRI profile with 100 m interval**.** On a longer link such as Poros Desa Tanjungsari, multi treatment contract is plausible to be done. By differentiating treatments based on the condition of each segments, a more efficient contract could be made. This approach implies a better value for money infrastructure and a solid basis for road planning and programming.

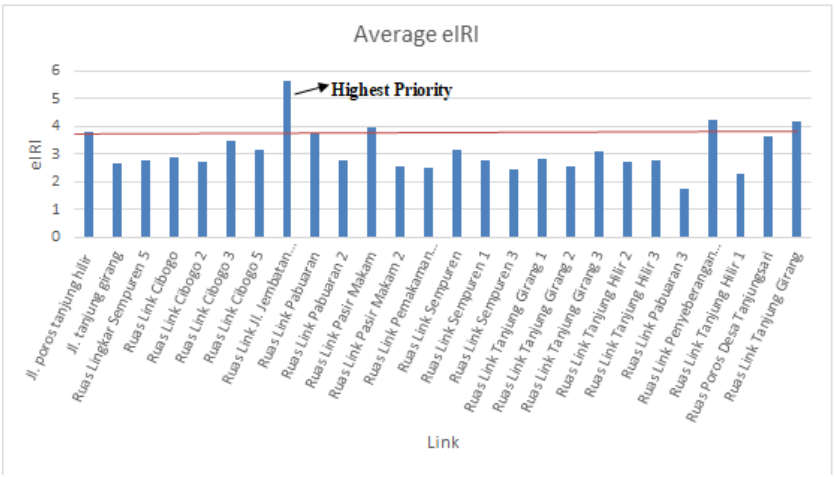

Figure 9 *Average eIRI per link*

Figure 9 provides average eIRI for every link that has been surveyed. Prioritization per link can also be made by giving higher priority to links that have higher average IRI value. Overall IRI in a village can be monitored and evaluated to maintain and improve rural road performance.

4.2 Road Network Mapping

Shape File and KML file can be utilized to create road network maps automatically using map application such as google maps or google earth or by processing numeric data using software such as ArcGIS or QGIS. After converting the coordinate from Roadroid data, the surveyed road network can be imposed to another existing maps to create road network maps for any mapping purposes.

Figure 10 *Mapping Result*

4.3 Road Documentation

For every road links that has been surveyed, automatically captured photo per 100 m interval (default) can be collected through roadroid.com. This will be very beneficial for validating eIRI data by comparing it to the visual documentation and collecting road inventories such as pavement type, cracking, road equipment, marking, shoulder, drainage, etc.

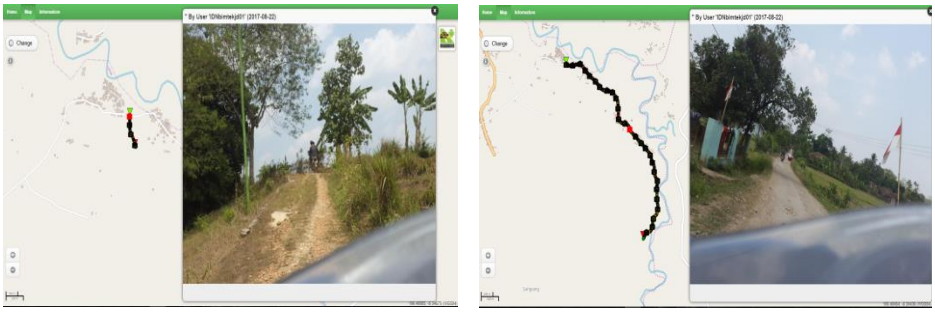

Figure 11 *Road Documentation*

5. Conclusion

In conclusion, Roadroid could be an alternative for Village Government to manage their rural road conditions. Its advantages are that it has low cost, produces accurate data, and is easy to operate as shown in this paper and the survey result of Tanjung Sari Village. The data acquired by Roadroid are IRI, road network maps, and road documentation. These data can be used for road asset management and road planning and programming. Roadroid would be an optimal tools to do road condition survey in villages with limited budget, allowing it to focus on another aspect of village development without ignoring its road infrastructure quality.

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Projection of Food Agricultural Land Sustainability (LPPB) Using GIS in Majalengka Regency, Indonesia

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Abstract. The growth of urban population and the development of infrastructure have led to a decrease in agricultural land. This reduction gradually impacts on the amount of food production and food security. In order to protect agricultural land, Indonesian Government enacted Law No. 41 year 2009 on Protection of Food Agricultural Land Sustainability (PLPPB); however, it needs to be enhanced. The objectives of this study are to analyse agricultural land suitability, to estimate the number of paddy field area required, and to project LPPB area. Geospatial datasets from Regional Development and Planning Board of Majalengka Regency provide the context to apply a Geographic Information System (GIS) method for suitability analysis. Socioeconomic data are used to calculate the number of paddy field area required. Finally, descriptive analysis is used to project LPPB area based on agricultural land suitability, type of irrigation system, the potency of underground water, number of cropping intensity, and the rate of agricultural land conversion. Several suitability indicators including land use, slope, elevation, soil type, soil depth, and road access are evaluated based on expert knowledge. The result shows the majority of agricultural land classes in Majalengka Regency is moderately suitable, which accounts for 56,944 Ha. Furthermore, to fulfil 1,280,359 people as the estimation population in 2035, the number of paddy field area required is 19,187 Ha for a scenario I; 17,251 Ha for a scenario II; and 14,070 Ha for a scenario III. The descriptive analysis displays 46,100 Ha of agricultural land is projected for LPPB area. While paddy production in Majalengka Regency will meet the food demand in the next 2035, agricultural land should be protected. Policy implication which is proposed to protect LPPB area includes reinforce the law and punishment on spatial planning, improve the agricultural infrastructure, utilize technology in advanced, and strengthen financial sector.

Keywords: **Food Agricultural Land Sustainability (LPPB); Agricultural Land Suitability Analysis; Policy Implication**.

1. Introduction

A land where human doing all activities, is a finite natural resource. It should be managed to attain sustainable development. However, the growth of urban population and the development of infrastructure have led to a decrease in agricultural land. Some problems might arise as a result of development, for example, a proliferation of settlement area due to urban sprawl that disrupts protected area's function, and an endangerment productive agricultural land that causes shifting of central food production (Fact and analysis of Majalengka spatial planning year 2011-2031). This reduction gradually impacts on the amount of food production and food security. Therefore, dealing with that problem, Indonesian Government enacted Law No. 41 year 2009 on the protection of food agricultural land sustainability (PLPPB). Also, the Local Government of Majalengka Regency set-up Local Regulation No. 11 year 2011 that one of the points is determined LPPB area. Although these programs have run several years ago, it needs to be enhanced.

The aims of Protection of Food Agricultural Land Sustainability or *Perlindungan Lahan Pertanian Pangan Berkelanjutan* (PLPPB) are to protect agricultural land, to achieve food

self-sufficiency, and to increase farmer welfare (Republic of Indonesia Law Number 41, 2009). Protection of agricultural land is very important because Indonesia is an agrarian country with the 31.90% of population work at agricultural sector (Central Statistical Bureau of Republic of Indonesia, 2016).

Land suitability analysis is a prerequisite in order to project LPPB area. It used to identify and determine the most suitable area for specific uses (Collins, M. G., Steiner, F.R., Rushman, M. J., 2001). The researchers argue, land use suitability purposes to identify the most appropriate spatial pattern for the future land uses (Hopkins 1977; Collins et al., 2001 in Liu et al., 2014) according to the specific requirements and preferences because different types of land use will have different purposes. Land suitability analysis has been broadly applied to assess agricultural land use (Akinci, H., Ozalp, A. Y., Turgut, B., 2013), development of residential land use (Mu, Y., 2006), and determine land use suitability for urban development (Liu et al., 2014).

In order to analyze agricultural land, several indicators should be applied. According to Bandyopadhyay et al., (2009) indicators include soil texture, organic matter content, soil depth, slope, and land use/land cover, while Akinci, et al., (2013) considered to apply great soil group, land-use capability class, land-use capability sub-class, soil depth, slope, aspect, elevation, erosion degree, and soil properties. Other researchers applied soil, topographic, climatic, economic, land use, and accessibility (Montgomery et al., 2016) and elevation, slope, aspect, soil fertility, soil PH, temperature, precipitation and groundwater were selected by Feizizadeh, Blaschke (2012) as indicators for agricultural suitability.

In addition, Projection of LPPB area is an important step for future planning by considering to population growth, rice consumption demand, productivity, food national demand, and farmer perception regarding the PLPPB program (Republic of Indonesia Law Number 41, 2009). For instance, a research that conducted by Zulfikar et al. (2013), aimed to analyze public perception regarding factors affecting the sustainability of paddy field, to analyze the projection needs of paddy fields at the district levels, and to select areas for sustainable paddy land area on the sub-district administrative boundary. In another study in which socio-economic data used, Sakti et al. (2013) assessed LPPB area considering to the number of population, the number of paddy production, productivity, and cropping intensity. Similarly, in the study by Sumarlin et al. (2009), who investigated the number of agricultural land area to fulfil food demand in Lampung Barat regency, the authors carried out descriptive analysis to calculate the number of agricultural land area.

The aim of this research is to project food agricultural land sustainability (LPPB) in Majalengka regency, by considering to paddy field area required and agricultural land suitability. Also, residential suitability needs to be assessed as one of the reasons conversion occurred.

2. Materials and methods

2.1 Study area

The study area is Majalengka regency – West Java Province, Indonesia, which is located between latitudes $6^{\circ}36'$ and $7^{\circ}03'$ S and longitudes $108^{\circ}03'$ to $108^{\circ}25'$ E. This regency has twenty six sub-districts with total area is 1204.24 km^2 (see figure 1). Based on topography, the elevation range of Majalengka regency is from 19 to 857 meters above sea level. In addition, the temperatures range is between 26.2 and 29°C. Rainfall influenced by climatic conditions, geographical and turnover air current.

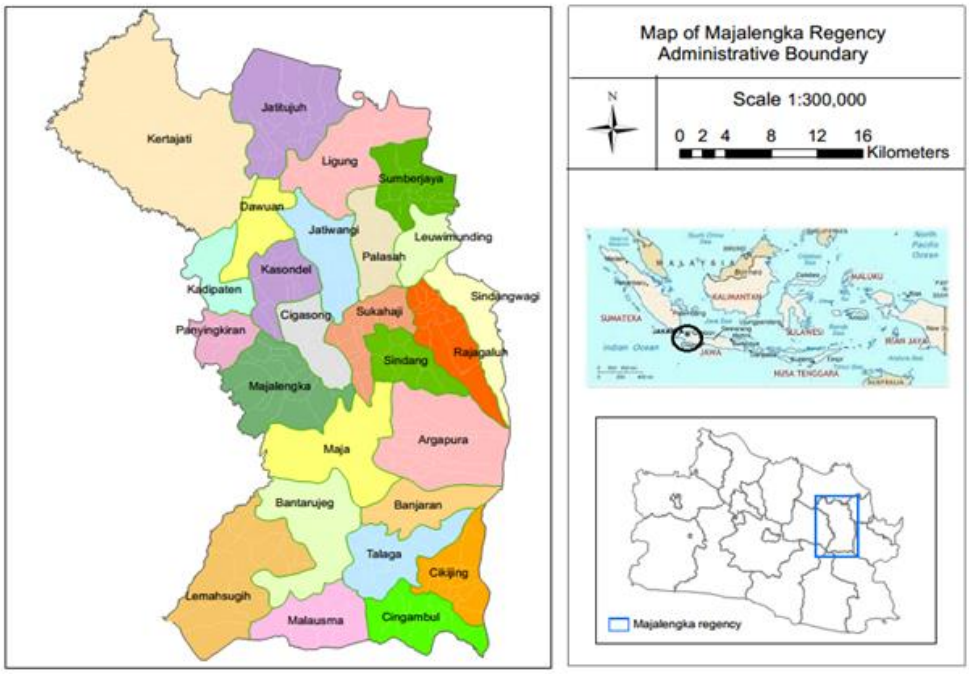

Figure 1. Map of Majalengka Regency, Indonesia.
Source: Regional Development and Planning Board of Majalengka regency (2006).

Population of Majalengka regency attained 1,166,473 in 2010, and it projected rise to 1,188,004, consist of 593,721 male and 594,283 female, in 2016 (Regional Development Planning Board of Majalengka Regency, 2016). Agriculture is the most dominant sector in the economic structure of Majalengka regency which is around 30% of people work in agriculture, forestry and fisheries (Central Statistical Bureau of Majalengka Regency, 2016).

Project the agricultural land is important because Majalengka is one of West Java granary which generates 664,220 tons paddy in 2014 (Department of Agriculture and Fisheries 2015 in Central Statistical Bureau of Majalengka Regency, 2016). In addition, Majalengka regency has a strategic location that can contributes to rising economic activities in the eastern part of West Java province. Five mega projects have been constructed, namely: *Kertajati* International Airport, *Jati Gede* reservoir, *Cikopo – Palimanan* railroad, *Cisumdawu* railroad, and *Rancaekek – Tanjungsari – Cirebon* railway. Consequently, these development will create positive and negative impacts for surrounding.

2.2 Indicators used in agricultural land suitability analysis

Indicators applied in this research are land use, slope, elevation, soil type, soil depth, and road accessibility (see figure 2). There are two main reasons for using these indicators. The first is the fact that indicators requirement regarding slope and soil depth are written in Ministerial Regulation of Agriculture No.79/Permentan/OT.140/8/2013 to determine land suitability criteria for irrigated paddy field. The second reason is those indicators are chosen not only based on several previous studies, but it also spatial data availability from regional development and planning board (BAPPEDA) of Majalengka regency. The indicators used in this study are explained in Table 1.

Table 1. Scoring assigned to indicators and classes for agricultural land suitability analysis land.

Indicators	Justification	Classes	Score	Description
Land use/cover [a] (Weight = 35%)	Land use zoning involves guidelines that was set up by local government to manage the development of land within their jurisdictions. In this research land use will be scored based on each specific purposes and how each land use will influence both agriculture and residence development.	Settlement	1	Not suitable
		Water body	1	Not suitable
		Water fill	1	Not suitable
		Pond	1	Not suitable
		Forest	2	Poor
		Plantation	2	Poor
		Rock	2	Poor
		Thicket	5	Average
		Grassland	5	Average
		Field	6	Moderate
		Rainfed	7	Moderate
		Irrigated paddy field	9	Good
Slope [b] (Weight = 30%)	Slope degree or slope percentage can be used as erosion control. The increase in slope degree will impact on soil development that occurs slowly. Slope also indirectly limit agricultural production because restricting the possibility of using machines and management applications	<3%	9	Good
		3.01 – 8%	7	Moderate
		8.01 – 15%	5	Average
		15.01 – 30%	2	Poor
		>30%	1	Not Suitable
Elevation [c] (Weight = 10%)	Elevation plays a part in variation of vegetation cover due to temperature changes. Generally, each 100 meters of increase in elevation of mountains area corresponds to 100m of divergence from lower to higher latitudes	< 25 m	9	Good
		25 – 50 m	9	Good
		50 – 100 m	9	Good
		100 – 500 m	9	Good
		500 – 1000 m	8	Fair
		> 1000 m	2	Poor
Soil type [d] (Weight = 5%)	Soil behavior help in estimating the soil performance for agricultural production. Good soil consist of essential nutrients in amount and proportion balanced for paddy growth. It also related to the ability of soil hold onto moisture, and it contains organic matter and other chemical compound	Alluvial	9	Good
		Andosol	9	Good
		Gleysol	8	Fair
		Latosol	6	Moderate
		Litosol	1	Not Suitable
		Grumusol	6	Moderate
		Regosol	2	Poor
		Podzol	1	Not Suitable
Soil depth [e] (Weight = 5%)	The effectiveness of soil depth directly effect on plant root growth. It indicates the depth to which the roots of cultivated plants can reach and use the available water and nutrient. Topography, parent material, living organism and climate has connect to soil depth.	<30m	3	Poor
		30 – 60 m	5	Average
		60 – 90 m	7	Moderate
		>90 m	9	Good
Road access (Weight = 15%)	Road has significant impact for city development. Road as link to connect certain area with other areas. In agriculture, road facilitates farmers to transport the equipment, technology, produce, resources to other paddy field area and to urban market.	0 – 100 m	8	Fair
		100 – 200 m	7	Moderate
		200 – 300 m	6	Moderate
		300 – 400 m	5	Average
		400 – 500 m	4	Average
		500 – 670 m	3	Poor

[a] Score assignment refers to assessment of land suitability potential for agriculture using remote sensing and GIS based approach, according to Bandyophyay et al. (2009)
[b] Score assignment refers to Ministerial Regulation of Agriculture No.79/Permentan/OT.140/8/2013
[c] Score assignment refers to Ministerial Regulation of Agriculture No.79/Permentan/OT.140/8/2013
[d] Score assignment is based on World Reference Based for Soil Resources (2014)
[e] Score assignment refers to Agricultural land use suitability analysis using GIS and AHP technique, according to Alkinci (2013)

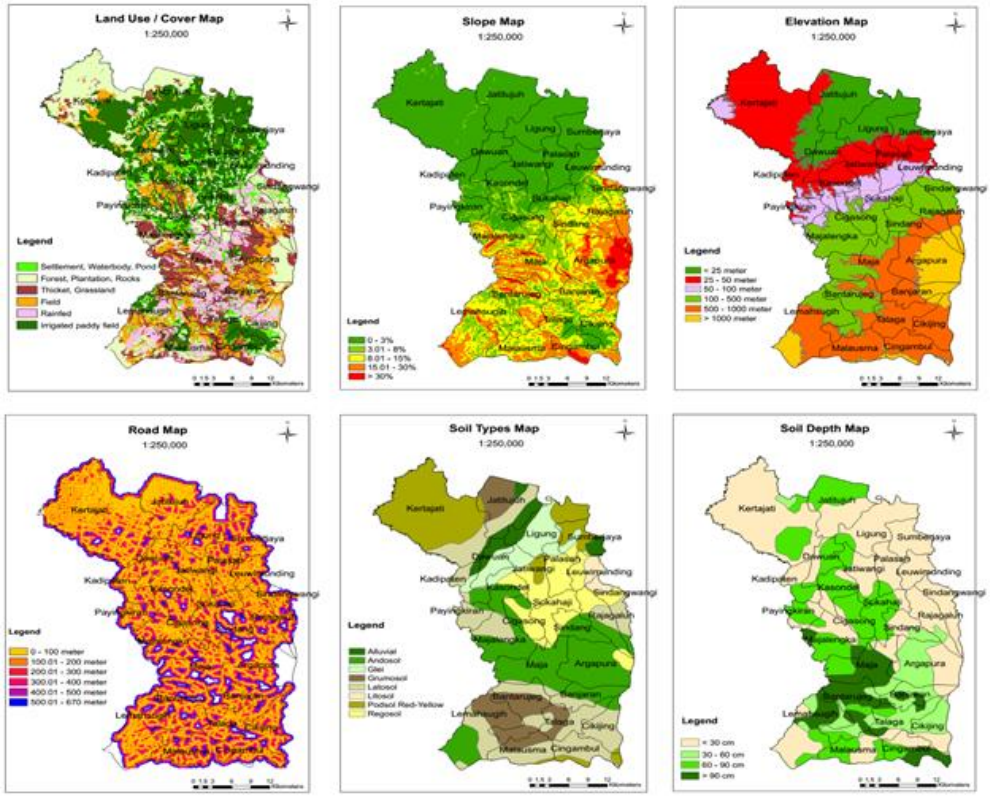

Figure 2. Indicators for agricultural land suitability analysis

2.3 The number of paddy field area required

Three scenarios are set up in order to calculate the number of paddy field area required in Majalengka regency in 2035. It consider to projection number of population and rice consumption per capita while productivity and cropping intensity will be constant for scenario I and vary both for scenario II and III. Table 2 below describes several socioeconomic indicators to estimate the number of paddy field area required.

Table 2. Socioeconomic indicators to calculate the number of paddy field area

Socioeconomic indicators	Description	Formula
Population	Population projection on city and regency level are based on growth rate of each city or regency. The number also refers to calculation on province level. Geometric methods is appropriate approach to do, because it assumes the number of people will increase geometrically. In this calculation, rate of growth are same in every year (Central Statistical Bureau; United Nations Population Funds 2015).	$P_t = P_o (1 + r)^t$
Rice consumption required (RC)	Rice consumption will be calculated based on population number (Y) multiplied by rice consumption per capita per year (FC). In this research, rice consumption is geometrically predicted.	RC = Y * FC
GKP production	The quantity of rice consumption (in ton), will be converted to GKP (*Gabah Kering Panen* / dry paddy harvested) (in ton)	GKP production = RC * 100/40
Harvested area requirements (HAR)	Harvested area will be calculated based on food consumption divided by productivity. Actually, many factors influence paddy productivity, such as quality of seeds, fertilizer, climate, and soil nutrition. However, in this research productivity (P) will be calculated as the trend of productivity projection by using data from 2012 to 2016.	HAR = GKP / P
Cultivated area requirements (CA)	Cultivated area as the result of the sum of harvested area and the risk of failure (RoF). Crop failure can caused by pest attack, climate change, natural disaster, etc	CA = HAR + RoF RoF = 1% * HAR 1% is the estimation percentage of paddy failure
Paddy field area required (PAR)	Paddy field area required will be analyzed from dividing cultivated area by cropping intensity (CI). Cropping intensity is a number of times a crop is planted per year in a given agricultural area or in another word, the ratio of effective crop area harvested to the physical area.	PAR = CA / CI

2.4 Identification of potential LPPB area

Identification of potential LPPB area is performed by overlaying agricultural land suitability maps with land use planning maps 2011 – 2031. The evaluation result of overlaying agricultural land suitability and agricultural land use planning are potential LPPB area with is classified as highly suitable (S1), moderately suitable (S2), marginally suitable (S3), and currently not suitable (N1) and permanently not suitable (N2).

2.5. Geographical Information System (GIS) methods

GIS-based multi-criteria evaluation (MCE) is used to analysis both agricultural and residential suitability. It generates land suitability classes based on ranking on each indicator. The results from GIS-based multi-criteria evaluation is a spatial feature with a final score. The higher the score, the more suitable the area is. The weighted overlay tool in ArcGIS 10.1 software applies one of the most approaches for overlay analysis to solve a multi-criteria problem. In this analysis, the steps for running the weighted overlay tool are as follows: (1) Select several indicators used to determine land suitability. (2) Convert input to raster format. (3) Set scale values by using reclassify tool. The default values can be obtained by using the range value. Input cell according to importance of suitability. (4) Assign weights based on its importance. Each input raster can be weighted, or assigned a percentage influence. The total influence for all raster must is 100 per cent. (5) Run the weighted

overlay tool. The cell values of each input raster are multiplied by the raster's weight (or percent influence). The resulting cell values are added to produce the final output raster.

2.6. Data sets and methodology

The data concerning thematic maps for agricultural land suitability indicators were obtained from 1:25000 scale. Those maps acquired from the Regional Development and Planning Board of Majalengka regency year 2000.

The data regarding agricultural and socio economic condition are based on secondary data from Central Statistical Bureau of Republic Indonesia, Central Statistical Bureau of Majalengka regency, and Department of Agriculture and Fisheries of Majalengka regency.

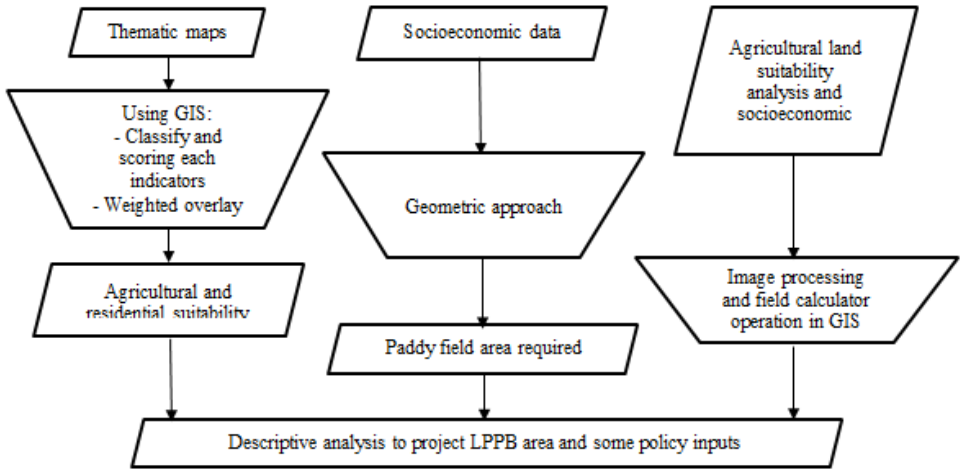

Figure 3. Methodological framework

3. Result and Discussion

3.1. Agricultural land suitability analysis

According to the result of agricultural land suitability analysis, the majority land in Majalengka is classified as moderately suitable (S2), which attain 40.5% of the total area. Moderately suitable means the land has limitation to generate paddy, however, some inputs can be applied to increase productivity and yield. Highly suitable (S1) area, that reach 36000 Ha, are located in the northern part of Majalengka regency. The figure 4 illustrate suitability analysis both for agricultural and residential.

Furthermore, the result of residential suitability shows that the majority of highly and moderately suitable area are concentrated near the main regional road access.

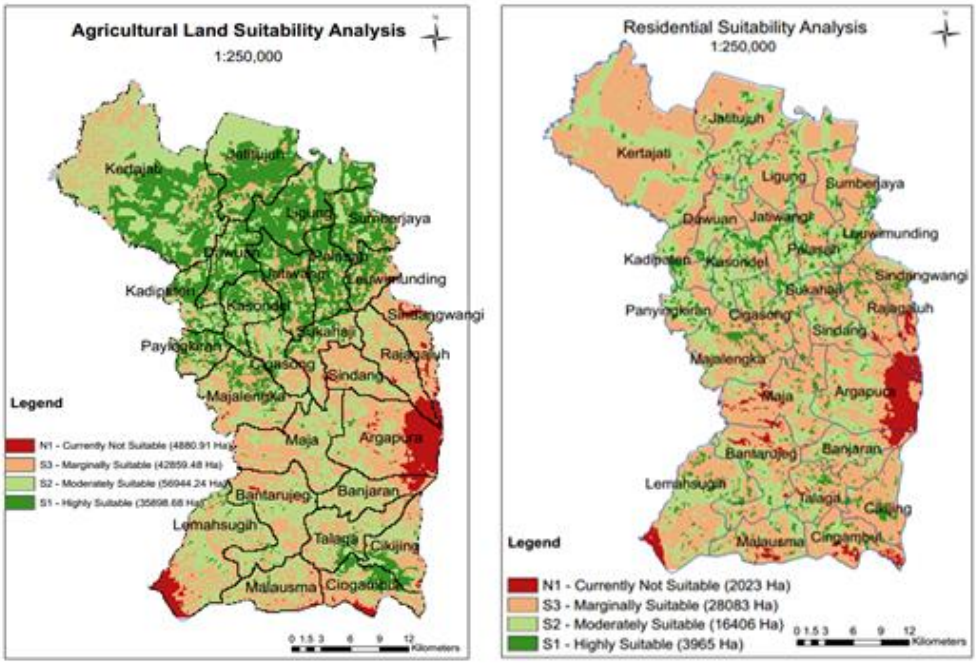

Figure 4. Maps of agricultural and residential suitability

3.2. The number of paddy field area required

The table 3 below shows the calculation result of paddy field area required based-on scenarios. Geometric methods are applied appropriately to estimate the paddy field area required for 2035. The result show as much as 19187.107 Ha of paddy field area should be fulfilled for scenario I, 17251.300 Ha for scenario II, and 14070.545 Ha for scenario III.

Table 3. Prediction number of paddy field area to fulfil local food demand in 2035

Description	Scenario I	Scenario II	Scenario III
Population (people)	1280359	1280359	1280359
Rice/cap (kg)	85.64	85.64	85.64
Rice consumption (ton)	109650	109650	109650
GKP (ton)	274125	274125	274125
Productivity (ton/Ha)	6.559	7.295	6.559
Harvested area (Ha)	41793.7	37577.1	41793.7
Risk of failure (ton)	417.937	375.771	417.937
Cultivated area (ton/Ha)	42211.63	37952.86	42211.63
Cropping intensity	2.2	2.2	3
Paddy field area required (Ha)	19187.1	17251.3	14070.5

The paddy field area in Majalengka regency decline 0.32% per a year, so the number of paddy field predict will attain 44627.1 Ha for the next 2035. Then, according to the analysis of paddy field area required above, the first scenario results the highest number which is less than 20000 Ha, while the third one is the lowest. It can be concluded that Majalengka regency still has a large number of agricultural area to meet the needs.

3.3. Identification of potential LPPB area

In order to identify potential LPPB area, agricultural land suitability and other socio economic condition including: productivity, cropping intensity, irrigation system and agricultural land conversion should be measured. The table 4 below displays potential agricultural land in each sub-district in Majelengka regency.

Table 4. Potential agricultural land in each sub-district

No	Sub - district	Area (Ha)				Productivity (ton/Ha)	Cropping intensity	Irrigation			Agricul Tural Conversion (%)
		S1	S2	S3	N1			Technical	Semi technical	Rainfed	
1	Kertajati	1047.15	806.83	109.86		6.51	1.5	Yes	Yes	Yes	-3.18
2	Jatitujuh	2380.22	807.99	301.48		6.62	1.3	Yes	Yes	Yes	-0.70
3	Ligung	2210.96	682.58	249.81		6.62	1.8	Yes	Yes	Yes	4.76
4	Sumberjaya	1138.67	271.14	89.31		6.64	1.9	Yes	Yes	Yes	2.82
5	Leuwimunding	1171.78	158.17	303.41		6.62	2.7	Yes	Yes	Yes	-4.87
6	Sindangwangi		78.68	463.85		6.46	2.3	Yes	Yes	Yes	1.47
7	Rajagaluh	2.18	329.81	1494.09	3.21	6.50	2.4	Yes	Yes	No	0.23
8	Sindang	2.31	415.64	1043.60	38.47	6.53	2.2	Yes	No	No	0.37
9	Sukahaji	1164.50	1096.39	1075.63	38.99	6.56	2.4	Yes	Yes	No	-4.62
10	Argapura	9.99	1258.86	1094.78		6.53	2.0	No	Yes	Yes	-0.12
11	Maja	13.22	2419.85	1476.65	4.76	6.51	2.5	Yes	Yes	No	2.38
12	Bantarujeg	21.95	1082.52	610.94	4.30	6.50	1.9	No	Yes	Yes	0.28
13	Lemahsugih	14.11	1254.65	508.40	4.30	6.55	2.6	No	Yes	Yes	0.64
14	Malausma	5.04	1080.21	409.58	9.22	6.54	1.4	No	Yes	Yes	1.64
15	Cingambul	149.72	247.91	332.09	8.85	6.57	2.3	No	No	Yes	0.19
16	Cikijing	133.20	807.06	424.52	26.30	6.57	2.1	No	Yes	Yes	0.07
17	Talaga	14.03	1312.37	396.26	1.96	6.54	2.3	No	Yes	Yes	-3.22
18	Banjaran	0.53	1274.25	332.73		6.49	2.3	No	Yes	No	-2.04
19	Majalengka	81.74	1331.99	627.01	4.76	6.64	2.3	Yes	Yes	Yes	-0.59
20	Panyingkiran	110.08	195.64	58.04		6.58	2.4	Yes	Yes	Yes	-2.76
21	Kadipaten	437.03	381.24	81.54		6.62	1.9	Yes	Yes	Yes	-0.63
22	Dawuan	1157.30	432.64	66.82		6.61	2.2	Yes	Yes	No	0.33
23	Jatiwangi	2264.04	559.58	124.30		6.67	2.2	Yes	Yes	Yes	-1.32
24	Palasah	1295.76	195.75	205.48		6.65	2.4	Yes	Yes	No	-0.30
25	Kasondel	595.32	685.70	80.78		6.46	2.2	Yes	Yes	Yes	0.26
26	Cigasong	241.90	1220.34	295.00	2.65	6.55	2.5	Yes	Yes	Yes	0.65

Agricultural sector in Majalengka regency shows a positive trend. Productivity's range is from 6.46 to 6.67, and cropping intensity is around 1.3 – 2.7. Irrigation status displays more

than two-third sub-district in Majalengka have technical irrigation system, two of twenty six sub-districts does not have semi irrigation system.
Three categories to project LPPB area based on sub-district similarities. The first category is sub-districts with the enormous number of highly suitable agricultural land area (S1). The location of agricultural land area is mostly close to the residential area and other public facilities (it can be seen from the percentage of conversion rate). Consequently, those areas have a potential to be converted in the future. To overcome with that problem, several policies can be realized as follow: 1) Preserve the quantity of agricultural land from conversion. Regulation concerning spatial planning must to be implemented, and punishment can be executed to private sectors who break the laws. 2) Repair damaged irrigation system. According to the data from Central Water Resources of Majalengka regency, more than fifty per cent of irrigation are broken. Technical irrigation is the main water sources to support paddy production should be concerned by the Government (Ministry of Public Work and Ministry of Agriculture) as a provider. 3) Financial support to farmers. This policy was established on Agriculture Ministerial Regulation No. 12/Permentan/OT.140/2/2008, about the guidelines for the distribution of social assistance to farmers. The aim of this policy is to improve the capacity and independence of agricultural business and empower agricultural communities. In addition, by giving financial support, farmers tend to keep and protect their land from conversion. 4) Agricultural land banking by the Government. Farmers might have a tendency to sell their paddy field due to economic reason. To overcome with this problem, the Government could buy the land parcel, then determine it as LPPB area. 5) Apply new technology innovation, for example: rice trans-planter, tractor, and hand-sprayer.
The second categories are sub-districts that located in the middle part of Majalengka regency with varying number of suitability classification. Irrigation is provided for watering the paddy field area. So that, the strategy to protect agricultural are based on farmer empowerment and technology application to improve the yield. Detail strategies as follows: 1) Repair damaged irrigation system. 2) Socialization of in handling post-harvest. The purpose is to reduce the amount of food loss that caused by improper post-harvest techniques. Through good handling practices, farmers will more capable in paddy harvesting. 3) Fertilizer and pesticide subsidies. This strategy aims to ease the farmers' load due to a high price of fertilizer and pesticide. 4) Socialization about pest control.

The third category is sub-districts that located in the south of Majalengka regency. Those areas have different characteristics than others, so that different strategy should be applied in order to protect LPPB area. Several strategies can be implemented, such as 1) Build water catchment. 2) Apply technology innovation, such as water pump and rice trans-planter. 3) Socialization of in handling post-harvest. 4) Socialization about pest control. 5) Fertilizer and pesticide subsidies. Although there is no technical irrigation system, the amount of underground water in almost those sub-districts are good.

From 26 sub-districts in Majalengka regency, one sub-district, namely Cingambul does not grouped as potential area for LPPB, because Cingambul does not have both technical and semi-technical irrigation system.

Protection of agricultural land is important to attain food consumption to achieve food self-sufficiency and national food security. Indonesian Government as a policy decision maker have to create laws and develop a system to implement the LPPB program in every cities and regencies, since agricultural land shrinks due to rapid conversion. This program should be supported by several Ministries, the National Development and Planning Board, and the Regional Development and Planning Board, because LPPB program is fairly complex to be implemented.

In general, there are three policies that can be proposed to Local Government of Majalengka regency, based on the result of identifying potential agricultural land in each sub-district. The policies as follows:
1. Reinforcing on the spatial planning.

- Local Government of Majalengka regency established local regulation No. 11 year 2011 about regional spatial of Majalengka regency year 2011-2031. In that regulation, the article 87 paragraph 3 emphasizes regional zoning of the paddy field area, include the prohibition to convert LPPB area, and conversion allowed in accordance with the legislation (Government Regulation No 1 year 2011 about the determination and conversion of agricultural land). Therefore, punishment can be applied if the conversion occurs in the LPPB area in the absence of legislation.
- Determination number and location of LPPB area does not mention in the Local Regulation for each sub-district specifically. Therefore, to adjust LPPB area, both land suitability in a parcel of land and basic infrastructure should be considered.
- Socialization of spatial use control, especially to private sectors and societies.

2. Improving on the agricultural sectors.
   - Developing the agricultural infrastructure, such as repair and maintenance of technical and semi-technical irrigation network as the main water supply for irrigated paddy field. Additionally, build up ponds as water catchment during raining season is really essential for rainfed area.
   - Applying agricultural technology innovations, for example: rice trans-planter, tractor, and hand-sprayer. Using those innovation can increase cropping intensity, speed up cultivation method, and reduce food loss during the post-harvest process.
   - Conducting socialization about pest control to avoid the risk of failure during the cultivation process; socialization to use natural or vegetable pesticide to promote sustainable agriculture; and socialization in handling post-harvest, including yield storage.
3. Strengthening on the financial sectors.
   - Giving fertilizer subsidies. It helps farmers to access fertilizer easily with lower price.
   - Redeveloping the cooperative's role.
   - Networking with bank as a partner for financial support.
   - Agricultural land banking by country. A highly suitable agricultural land can be purchased by Central Government to protect the land from conversion. The Government can buy the parcel of land from farmers who have a tendency to sell their land due to economic reason.
   - Providing grants to issued land certificates. Many farmers get difficulty to issue the certificates because of costly. By financial support mechanism, hopefully it can help farmers to keep their own paddy field area.

4. Conclusion and Recommendation

The research outcomes demonstrate the application of GIS-based MCE to project food agricultural land sustainability (LPPB) in Majalengka regency. Six indicators are conducted to analyse agricultural land suitability, include land use, slope, elevation, soil type, soil depth, and road access. The result shows the majority land use in Majalengka regency is classified as moderately suitable for agriculture (S2), which attain 56944.24 Ha.

By using geometric method, the population is estimated to reach 1,280,359 people in the 2035, with an annual population growth rate is 0.396%. To fulfil food demand in 2035, the Local Government of Majalengka Regency have to provide 19000 Ha of paddy field area.

Observing the trend of agricultural land changes, it can be acquired that 0.32% of paddy field lose annually. To project potential LPPB area, physical (involve: agricultural land suitability), environmental (involve: irrigation system and underground water condition), and socioeconomic aspect (involve: productivity, cropping intensity, and conversion rate) are obtained. The result shows the total potential agricultural land for LPPB is 46100.11 Ha, consists of 15513.01 Ha as highly suitable area, 20139.88 Ha as moderately suitable area, and 10447.22 Ha as marginally suitable area.

Policy implication regarding LPPB area is proposed to attain sustainable agriculture in Majalengka regency, such as: reinforce the law and punishment on spatial planning, improve the agricultural infrastructure, utilize technology in advanced, and strengthen financial sector.

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Mapping Waste Facilities of Formal Sector Depok Using Geographic Information System (GIS)

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Abstract. Until now, waste has become a very important issue. The increase in population causes the increase of waste generation. Therefore, the need for a solution for adequate waste management so that it can reduce the amount of waste generation. This study aims to identify the distribution of Waste Container and Waste Processing Unit of Depok by using Geographic Information System (GIS) software, analyzing the relationship between Waste Container and Waste Processing Unit with the number of population and waste generation and determining the place Which is best for the manufacture of new Waste Container and Waste Processing Units by using analysis of GIS software. The method used in this research is descriptive analysis, spatial analysis, and projection method. The results of the research indicate that the formal sector waste disposal facility (managed by the government), The Waste Container with the number of 63 out of 183 units and The Waste Processing Unit with 30 of 45 units operating at the moment. The number of residents will affect the generation of waste per day if there is an increase in the number of the population it will be higher the amount of waste generated per day. The percentage of composition of inorganic waste in Depok is 35% from the amount of waste generated per day. The sub-district meet the Indonesian National Standard (INS): Pancoran Mas (18 units), Cilodong (3 units), Beji (10 units) Sukmajaya (13 units), and Sawangan (11 units). Based on the identification, the Waste Processing Unit in Depok has not fulfilled the Minister of Public Works Regulation and the Waste Container in Bojongsari and Cinere sub-district has not fulfilled the INS 03-1733-2004 .

Keywords: **GIS; Waste Shelter; Waste Processing Unit.**

1. Introduction

Solid waste has become a very important issue. The increase in population causes the increase in waste generation. Therefore, the need for a solution to adequate waste management so as to reduce the amount of waste generation. According to Indonesia Regulation of Waste Management No. 18 in 2008 explained that waste is the residual activity of human daily and/or natural process in the form of solid.

Depok is one of the most populous cities in Indonesia with a population of 2016 about 2,106,100 inhabitants. (DDA, 2015) According to Indonesian National Standard 19-3964-1994 with the number of residents, Depok is included in the metropolitan city, that is by generating waste about 2 – 2.5 L/person/day. Waste management facilities in Depok have not been map. The facilities are Waste Bank, Waste Processing Unit (WPU), and Waste Container (WC). Therefore, innovation is needed regarding the decision making process of the placement of waste sorting and collection facilities, one of them by using Geographic Information System (GIS) tool to optimize waste reduction in Depok. Spatial analysis using GIS can be a good alternative to mapping the facilities.

The purpose of this study was to identify the distribution of WasteContainer and Waste Processing Unit by using GIS software.

2. Research Study

Depok is a in West Java Province, Indonesia. The is between Jakarta and Bogor. The research was conducted in eleven sub-districts of Depok: Beji; Pancoran Mas; Cipayung; Sukmajaya; Cilodong; Limo; Cinere; Cimanggis; Tapos; Sawangan; and Bojongsari.

3. Data Collection and Analytical Methods

3.1 Data Collection

Sources of data obtained are primary and secondary data. The following are the primary and secondary data:

- The primary data of the coordinate data Waste Container and Waste Processing Unit in Depok along with observation data.
- Secondary data are population data, data of generation and composition of waste, data of waste facilities and infrastructure, administration map and land use of Depok.

3.2 Analytical Methods

The primary and secondary data that have been taken are made into a spatial data using the ArcMap feature in the GIS. Spatial data for each data is made by adding column based on data type in attribute of base map in Depok. Attribute data to be used in the manufacture of spatial data are as follows:

Table 4. Waste Container Criteria

Criteria	Dataset	Attribute	Layer	Source
Land areas	Area	Area in m^2	Area	Department of Environment and Hygiene or The manager of Waste Container
The distance to residential areas	Parcels	Land use	Parcels	Department of Environment and Hygiene
The distance with road	Road	-	Road	Department of Environment and Hygiene
Coverage of Waste Container service	Service range	Area of service in m^2 or km^2 or based on number of households	Service range	The manager of Waste Container
Land owned by the government	Parcels	Land use	Government land	Public Works Department and Department of Environment and Hygiene
Land use	Parcels	Land use	Land use	Department of Environment and Hygiene, Public Works Department, and The manager of Waste Container

Table 5. Waste Processing Unit Criteria

Criteria	Dataset	Attribute	Layer	Source
Land areas	Area	Area in m^2	Area	Department of Environment and Hygiene or The manager of Waste Processing Unit
The distance to residential areas	Parcels	Land use	Parcels	Public Works Department and Department of Environment and Hygiene
The amount of waste	The amount of waste	The amount of waste in kg/day or l/day	The amount of waste	The manager of Waste processing Unit
Composition of organic waste	Composition of waste	Composition of waste in %	Composition of waste	The manager of Waste processing Unit
The distance with road	Road	-	Road	Department of Environment and Hygiene
Coverage of Waste Processing Unit	Service range	Area of service in m^2 or km^2 or based on number of households	Service range	The manager of Waste processing Unit
Land owned by the government	Parcels	Land use	Government land	Public Works Department and Department of Environment and Hygiene
Land use	Parcels	Land use	Land use	Department of Environment and Hygiene, Public Works Department, and The manager of Waste processing Unit

After that, the data can be saved into new file with the format of shapefile. Spatial data that has been tidied up its database can be directly analyzed using ArcMap. The main analysis features in ArcMap are planned to use select by attribute, select by location, and overlay feature. Symbology feature in ArcMap can also be used to show quantitative gradient of spatial data.

4. Results and Dicussion

4.1 Distribution of Formal Sector Waste Facilities

Based on the observation, it has been identified that the formal sector waste facility in Depok is 93 from 228 units of waste facility, the following is data of number of Waste Cntainer and Waste Processing Unit in Depok according to Department of Environment and Hygiene and the existing of Waste Container and Waste Processing Unit can be seen in Table 4.

Table 6. Number of Existing Waste Container and Waste Processing Unit

No.	Sub-district	Number of Waste Containers According to the Department of Environment and Hygiene	Number of Existing Waste Containers	Number of Waste Processing Unit According to the Department of Environment and Hygiene	Number of Existing Waste Processing Unit
1	Sawangan	13	11	5	2
2	Bojongsari	5	0	7	6
3	Pancoran Mas	31	18	2	1
4	Cipayung	0	0	12	10
5	Sukmajaya	35	13	3	2
6	Cilodong	27	3	1	0
7	Cimanggis	34	4	5	3
8	Tapos	11	3	4	3
9	Beji	13	10	1	1
10	Limo	1	1	4	1
11	Cinere	13	0	2	1
Total		183	63	46	30

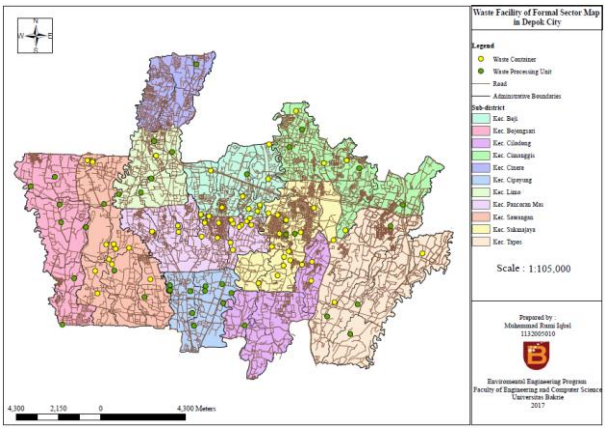

Figure 1. Waste Facility of Formal Sector Map in Depok

Based on the observation result, it is found that only 30 units of Waste Processing Unit are still operational, while 15 units are not operated with the condition: 5 units are temporarily closed, 2 units are destroyed and not operated, 1 unit of is used as warehouse, 3 units in operational plan, 2 units have no access roads, 1 unit has not been operated yet, and 2 units have no agreement with the Department of Environment and Hygiene.

Waste Container in Depok, which operates as a Waste Container are 63 units, while the other 57 units operate, but not as a Waste Container but as a waste collecting point. There are about 50% of the 120 units of them using a door-to-door collection system. This system is usually used in residential areas and is more commonly used in Cinere and Bojongsari sub-district.

4.2 Distribution of Waste Container In Depok

Waste Container in Depok is used as a place to accommodate waste before disposal to landfill. The following is the distribution of Waste Container (WC) in Depok in the form of graphs and maps:

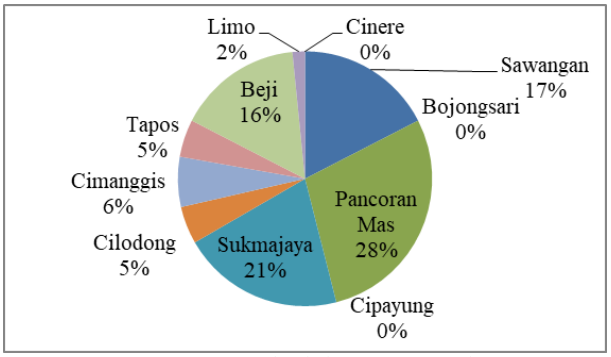

Figure 2. Percentage of Existing Waste Container

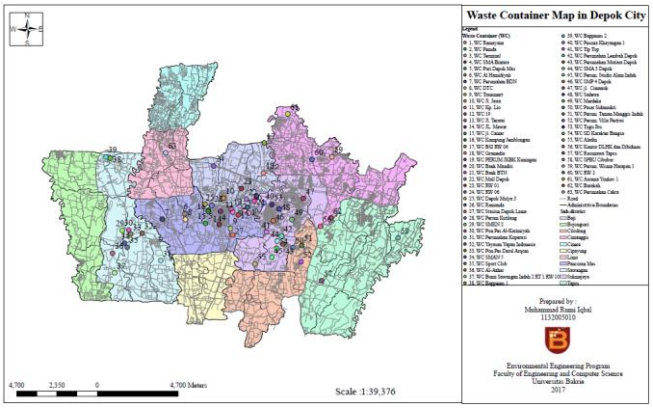

Figure 3. Waste Container Map in Depok

Can be seen in figures 2 and 3, the Sub-district Cinere, Bojongsari, and Cipayung do not have Waste Container. Kecamatan Cipayung is a sub-district that does not have a waste facility in the form of Waste Container, this is because in Cipayung there is a Final Disposal Place. While in Sub-district Cinere and Bojongsari do not have Waste Container, because the collection system in the sub-district using a door-to-door system or a gathering point.

The door-to-door collection system is usually done in residential areas that have only one entrance and exit access. The door-to-door collection system does not require wake-up containers but only with waste trucks or junk motorcycles alone. The door-to-door system usually takes the waste directly from house to house and the waste that has been taken will be immediately discharged to the Final Disposal Place. Waste Container in Depok has an average of supporting buildings, but the waste Container building is not equipped with a roof so that rainwater can just enter into the Container. However, not a few buildings that Waste Container that have a roof that can be protected from rain water.

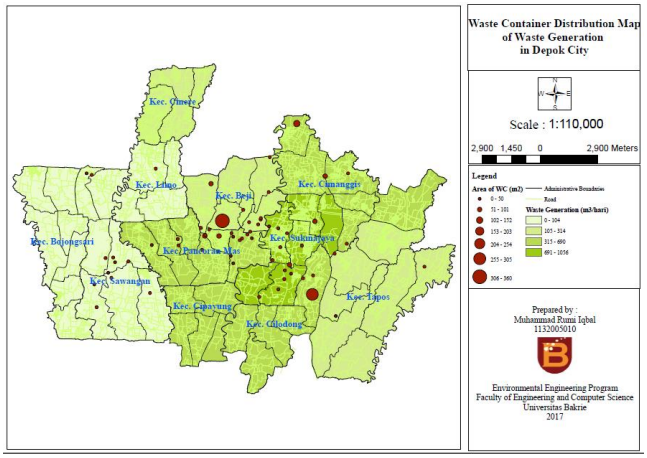

Figure 4. Waste Container Distribution Map of Waste Generation in Depok

Can be seen in Figure 4, the Sub-district Beji and Cilodong have the largest Waste Container (306-360 m^3/day). Sub-district Beji and Cilodong are sub-districts with high waste generation (315-690 m^3/day). Compare with the Sub-district Sawangan and Pancoran Mas, low-waste waste (0-104 m^3/day) and high enough (315-690 m^3/day). Waste Container in the sub-district is sufficient to accommodate waste generation although the Waste Container area is not large with the sub-districts in Beji and Cilodong.

Can be seen in the Figure 4, the amount of waste generation in the Sub-district Cipayung (416 m^3/day) and Cinere (298 m^3/day) is a considerable amount of generation compared to the Sub-district Bojongsari, Limo, and Sawangan, but in that sub-districts do not have Waste Containers. The Sub-district Sukmajaya and Pancoran Mas have adequate waste dumps in accordance with the generated waste generation, whereas compared to the Sub-district Cinere, Bojongsari, Cipayung, and Cilodong, there is no waste collection facility managed by the local government.

4.3 Distribution of Waste Processing Unit In Depok

The following is the distribution of Waste Processing Unit (WPS) in Depok in the form of graphs and maps:

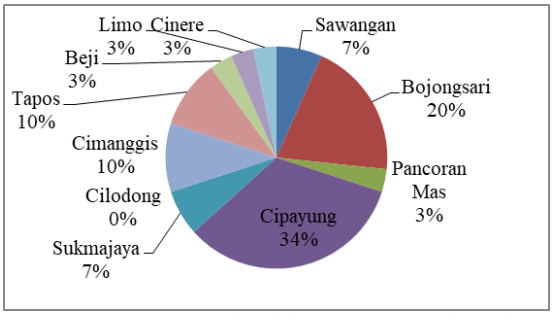

Figure 5. Persentage of Existing Waste Processing Unit

The number of Waste Processing Unit in the Sub-district Cipayung are 12 units, but there are 2 units that have not yet agreed with the Department of Environment and Hygiene, therefore 2 units are not yet operating optimally by the relevant agencies. Waste Processing Unit in the Sub-district Bojongsari can be said a lot because of the number of 6 out of 7 units. A Waste Processing Unit in Bojongsari Sub-district is not yet operational because it is still under construction. Waste Processing Unit service scale in Depok is 2,000 persons/unit up to 12,000 persons/unit (400 households/unit up to 2,400 households/unit). The following is a map of the location point of the Waste Processing Unit (WPS) which can be seen in Figure 9.

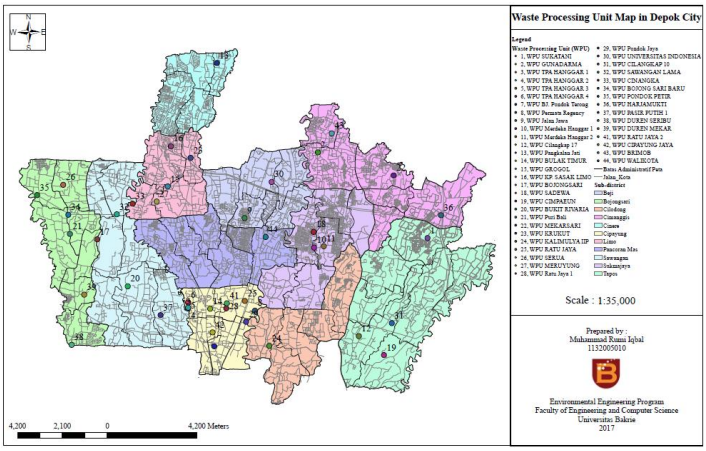

Figure 6. Waste Processing Unit Map in Depok

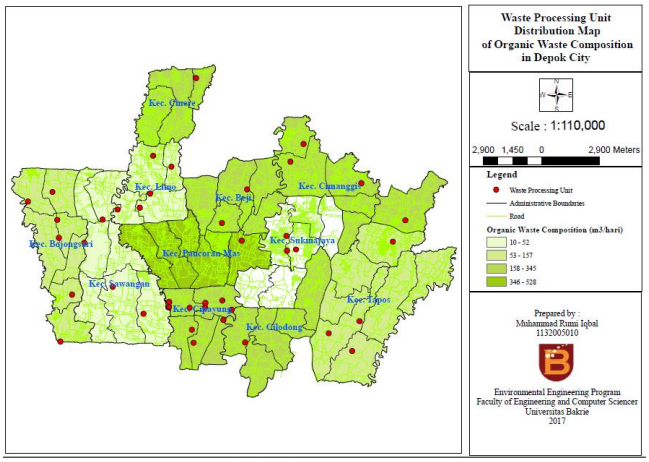

Figure 7. Waste Processing Unit Distribution Map of Organic Waste Composition in Depok

From the Figure 7, the amount of composition of organic waste in the Sub-district Cilodong (208 m^3/day), Pancoran Mas (345 m^3/day) and Cinere (149 m^3/day) is the amount of generation that is sufficiently large compared to the Sub-district Bojongsari, Limo, and Sawangan, but in the Sub-district Cilodong, Pancoran Mas, and Cinere only have 1 unit only.

4,4 Distribution of Inorganic Waste Composition In Depok

Can be seen in Figure 8, the composition of inorganic waste in Depok is very high (243-370 m^3/day) for Sukmajaya Sub-district. Compared to other sub-districts, such as Pancoran Mas, Cipayung , Cimanggis, and Cilodong Sub-districts are categorized as high levels of inorganic composition (111-242 m^3/day) . The lowest inorganic waste composition (7-36 m^3/day) is located in Bojongsari , Sawangan and Limo Sub-districts. From the results of the map it can be concluded that Sukmajaya Sub-district is a sub-district that has the highest inorganic waste composition of Depok , because the population of Sukmajaya Sub-district is also quite high, which is 281,418 inhabitants. The percentage of inorganic composition of Depok currently covers with settlement and non-settlement area, which is 35% . Depok the rate of population growth also affects the high composition of inorganic waste and organic waste in Depok.

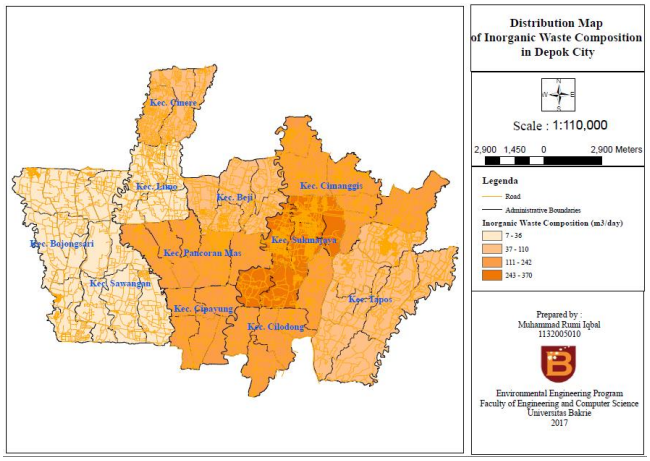

Figure 8. Distribution Map of Inorganic Waste Composition in Depok

5. Conclusion

The conclusion of this study are the Waste Container with the number 63 of the 183 units and Waste Processing Unit with the number 30 of the 45 units. The distribution of Waste Container in three sub-districts, Sukmajaya sub-district (13 units), Pancoran Mas (18 units), and Beji (10 units) are well distributed and the highest Waste Processing Unit spread in Cipayung Sub-district (10 units); based on INS 03-1733-2004, Pancoran Mas Sub-district (18 units), Cilodong (3 units), Beji (10 units), Sukmajaya (13 units), and Sawangan (11 units) have met the standards on environmental planning procedures in terms of this is Waste Container, but in other sub-districts it can be said that it has not met the standard; based on Regulation of the Minister of Public Works No. 3 of 2013, the number of Waste Processing Unit Regulation of the Minister of Public Works and the existing concluded that the Waste Processing Unit in Depok has not complied with the applicable regulations because the number of existing Waste Processing Unit (Existing) is not comparable with the number of Waste Processing Unit that is regulated in Regulation of Minister of Public Works No. 3 of 2013.

6. Acknowledgements

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End-to-End Wireless Medical Video Telemedicine Electrocardiogram Systems Using 3G and WLAN

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Abstract. The telemedicine system is tightly coupled with the continued growth of computing technologies and systems in general. Such applications range from remote diagnosis, aided application of telemedicine electrocardiogram systems. The telemedicine system depends on data compression technology for transmission over the wireless network infrastructure. Advances in video compression, network technology, and computer technology have contributed to the rapid growth of M-health. This research focuses on describing the basic components of the wireless medical video telemedicine system, and presents demanding medical data and video streaming traffic across heterogeneous network topologies that incorporate 3G and WLAN environments. Medical video compression techniques for telemedicine applications have high fidelity requirements, in order to avoid the loss of information that can aid diagnosis, and provide an overview of the future progress trends in telemedicine systems

Keywords: **Medical video streaming, wireless telemedicine, m-health, cross-layer design, 3G and WLAN.**

1. Introduction

Currently the development of information technology in Indonesia has influenced various aspects of life. Health field is one of them, where the utilization of information technology aims to improve medical services in patients. Health is one of the basic human needs. Primary and secondary health facilities are required to provide fast and optimal health services because nowadays the variety of diseases suffered by humans has the potential to cause death. One of the most common diseases that cause death in humans is a heart attack disease. At a health facility that has an ECG machine can check the patient's heart condition. Furthermore, the ECG results are examined by a physician to ascertain whether the patient's heart is in normal or abnormal condition. However, in primary health facilities (health centers) are still short of cardiologist, so for diagnosis of ECG scan results must wait for further examination by cardiologist in secondary health facilities (Hospital). This condition can be overcome by the use of information technology for the health field known as Telemedicine System. The term Telemedicine can be defined as one of the areas within the scope of biomedical engineering, telemedicine can be interpreted as the use of information and communication technology (including electronics, tele-communications, computers, informatics) to transfer (send and / or receive) medical information, to improve clinical services (diagnosis and therapy) and education [1]. Transmitted medical data may be text, audio, images and video. Data transmission is done through the internet network by using web-based applications that can be accessed by primary health facilities (Puskesmas) or secondary health facilities (Hospital). With the application, the Primary Health Care Center (Puskesmas) can immediately send the patient's ECG scan to a cardiologist in the secondary health facility (Hospital) so that it can be diagnosed immediately and the results are sent back to the primary health facility (Puskesmas). This Telemedicine application can be developed further along with the utilization of mobile and wireless technologies. With the

increasing number of Smartphone users it is possible desktop Telemedicine application platform can be developed into mobile-based applications.

2. Telemedicine

Information technology in the health sector can be utilized as a means of sending and receiving medical information from one place to another that aims to improve health services. The term telemedicine refers to the utilization of telecommunication technology for medical diagnosis, treatment, and patient care[2]. Telemedicine in its modern form began in the 1960s in a large part fueled by technological advances in the military and aerospace sectors, as well as the existence of several individuals who used various commercial technology equipment available[3].

1.1. Telemedicine Classification

Nakajima, et. al has defined the classification method for the telemedicine world. The classification is appropriate from the starting point of the relation between a medical operation and the applicable law. The classification is divided into [4] :

- Doctor with doctor (second opinion) Nurse with doctor (Telekonsultasi)
- Patient with doctor (Direct patient care or remote medical observation)
- Patients with nurses (Telehomecare)
- Patients with pharmacists (Telefarmation)

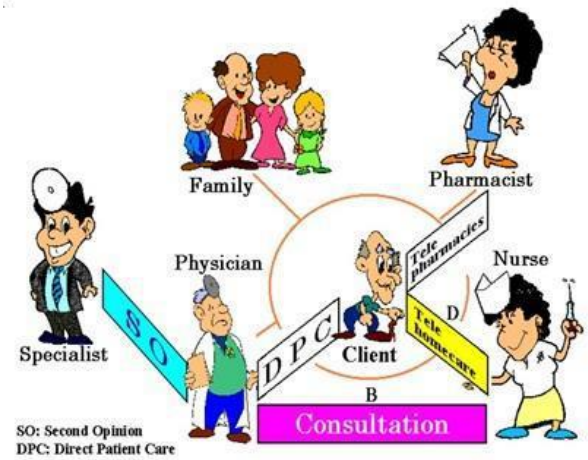

Figure 1. Telemedicine Classification

Telemedicine also can be classified also on [5] :

- Interaction between client and expert, and
- Type of information transmitted

This type of interaction is usually classified as a real-time or synchronized recording process. In the past, information was obtained and stored in several formats, before being sent, by appropriate means, for an expert's interpretation at some later time. Email is a method for storage and integration. By contrast, in realtime interaction, there is not enough delay between the information collected, transmitted and displayed. Interactive communication between each individual in a place is possible. Video Conference is the most common method of a realtime interaction.

		Information transmitted	
		Still images	Moving images (video)
Interaction	Real-time		e.g. telepsychiatry
	Pre-recorded	e.g. teleradiology	

Figure 2. Classification system for telemedicine section

1.2. Advantages of Telemedicine System/e-health

This expanding telemedicine / e-health system uses digitally transmitted digital data from health care providers to those providing health services that can support both local and long-distance services. Advantages in the presence of telemedicine are [6]:

- Improved access to patients
- Reduce patient costs
- Reduce remoteness of doctor needs
- Improve the quality of health services.

3. Web-Based Telemedicine

An implementation of the telemedicine system is the use of web-based applications to connect computers to health facilities with home patients' computers. This system is called the Home Telecare System (HTS), a system designed to support an emerging model of care in which chronic disease is managed by monitoring patient health status at home[7]. According to Farah Magrabi, et all, Home Telecare System (HTS) architecture can be described as follows:

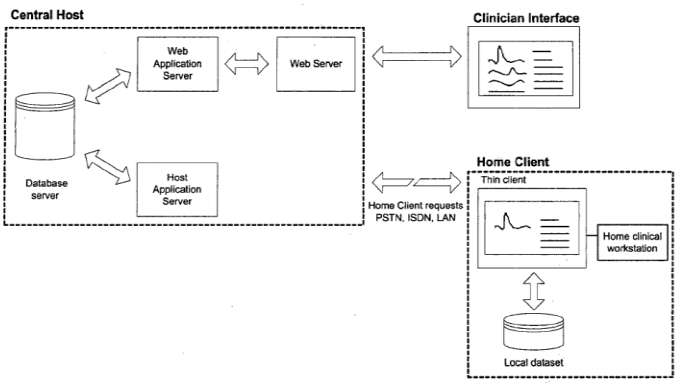

Figure 3. Architecture of the Home Telecare System [8]

Based on the above picture, it can be briefly explained that The HTS is a PC-based client-server system that uses Internet communications. An overall architecture of the system is shown in figure 3. It has been implemented as two main sub-systems; the Home Client and the Clinician Interface; which integrate to collate and provide access to patient health status information. Data collection is managed by the Home Client, a Windows application that is

the patient interface to the HTS. Data from home client is transferred to the remote server; which acts as a centralised repository for patient information; via the Internet using TCP/IP. A server-side application manages the collection and storage of the patient data. The database for the HTS has been implemented in MSSQL server and contains patient details, clinical measurements, and also all the supporting data including questionnaires and scheduling information, that is required to manage a patient's program. Then, Doctors access the system from the Clinicians Interface which is a standard Web application.

4. System m-Health

M-Health has been defined as "mobile computing, medical sensor, and communications technologies for healthcare" [9]. This emerging concept represents the evolution of e-health systems from traditional desktop "telemedicine" platforms to wireless and mobile configurations. m-Health systems are created as a synergy of emerging mobile medical computing, medical sensor technologies, and communication technologies. The trend within patient monitoring has been to allow the patient more mobility[10]. Technologies that has an impact on the development of m-Health are [11] :

1.3. 3G and Beyond Networking

The evolution of current 3G wireless communication and mobile network technologies will be the major driving force for future developments in m-Health systems. 3G wireless technology represents the convergence of various second-generation wireless systems. One of the most important aspects of 3G technology is its ability to unify existing cellular standards, such as code-division multiple-access, global system for mobile communications (GSM), and time-division multiple-access, under one umbrella.

1.4. Wireless LAN

WLAN allows users to access a data network at high speeds of up to 54 Mb/s as long as users are located within a relatively short range (typically 30–50 m indoors and 100–500 m (outdoors) of a WLAN base station (or antenna). WLAN allows clients to access realtime information as long as it is within WLAN coverage, thus improving service quality and productivity. Users can work wherever they are as long as they are located in the WLAN coverage area.

5. System Models

Development of Telemedicine Electrocardiogram system which originally based on desktop can be developed into a mobile-based called m-Health using 3G technology and WLAN. The rise of Smartphone users makes it possible to build an m-Health system that can integrate health services from existing Health Facilities with health professionals such as cardiologists at hospitals, general practitioners in Primary Health Facilities (Puskemas) and home patients. M-Health allows patients to get health services remotely such as: drug information to be consumed, date notices for medical check-up and other medical information. From the patient side, the m-Health system allows patients to conduct long-distance healthcare with a cardiologist via audio call or video call. The existence of this m-Health system can support better and more flexible health services because the condition of the patient being treated for outpatient treatment can be monitored wherever the patient's location is located. Generally, the m-Health architecture model for Medical Video Telemedicine Electrocardiogram Systems can be described as follows:

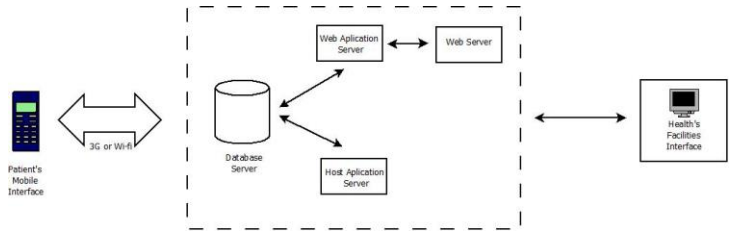

Figure 4. Architecture of Medical Video Telemedicine Electrocardiogram

6. Conclusions

Telemedicine system has undergone many changes along with the development of information technology and telecommunication, both using wire or wireless. In the early stages the ECG telemedicine system only connects health facilities that are lack of cardiologist with a health facility that has cardiologists so that patients located near health facilities away from the city still receive immediate health care. Especially with the use of mobile devices with the support of 3D communication networks and WLAN can be built an m-Health system that can support better health services to the community because the use of flexible mobile devices allow people to get health care although those people away from the location of health facilities.

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Characteristics of Kombucha Salak Suwaru (Salacca zalacca) with Variations of Sugar and Kombucha Culture

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Abstract. Kombucha is a Chinese traditional beverage that utilizes bacteria and yeast as a starter in the tea. The aim of this study was to determine the characteristics of Kombucha based on Salak Swaru added with different concentrations of sugar and culture. The research method used was Randomized Block Design with two factors which were the concentration of sugar (7.5% and 10%), and the concentration of culture (5%, 7.5%, and 10%). As the result, 6 combinations were obtained and three replications were done for each combination (18 units of research). Data obtained was analyzed using ANOVA with 5% confidence level. Determination of best treatment was done using Zeleny Test. The result shows that Kombucha Salak Swaru with addition of sugar 10% and culture of 10% is the best treatment which has 5.5×10^6 CFU/mL total bacteria, 6.1×10^8 CFU/mL of total yeast, 1.41% total acid, pH of 2.75, 7.45% total sugars, 553.43 mg/L total phenols, 1,72 mg QE/mL flavonoids, 137,45 mg/m LC50 value, 4.74 (neutral) score of taste, and 4.37 (neutral) score of aroma.

1. Introduction

Salak is one of palm tree species originated from Indonesia, and cultivated in several regions such as Java, Bali, Lombok, Maluku, and Sulawesi. Salak has become one of Indonesia's trademark in fruit commodity. Salak usually possesses a unique taste as the result of sweet, astringent, and sour combination. Salak contains high vitamins, and considered as a good source of fiber. Moerover, it is known for having high antioxidant exist in phenolic forms, such as flavonoid, vitamin A, and vitamin [5].

In East Java, Salak's productivity reached 81.322 tons in 2014 [6]. There are several areas specialized in Salak cultivation where one of them is in the city named Malang, specifically at Suwaru village. Salak Suwaru has a major taste of astringent and sour compared to other varieties of Salak, due to its high tannin content. Tannin is a chemical compound that possesses antioxidant acitivity. Tannin's antioxidant activity had been proofed for being able to inhibit tumor [7]. Salak juice contained a total phenol of 302 mg/L [8]. It is known that some process can reduce the astringent taste which one of it is utilizing Suwaru Salak in the making of kombucha.

Kombucha is a Chinese traditional beverage that utilizes bacteria and yeast as a starter in the tea. Nowadays, kombucha has become popular among the society because of its benefits towards health such as increasing immune system, and maintaining the microflora in intestine [9]. Instead of being ordinary beverage, kombucha also can be classified as functional beverage due to its antioxidant and antibacterial activity which is capable to prevent degenerative disease such as cancer, and high blood pressure [10]. Antioxidant activity of kombucha is affected by existence of organic acids such as lactic acid, acetic

acid, ascorbic acid, and gallic acid. Moreover, kombucha also contain polyphenol compounds that also acts as antioxidant such as flavonoid and tannin.

Kombucha is produced by utilizing starter that commonly known as SCOBY (Symbiotic Culture of Bacteria and Yeast) which consisted of bacteria – specifically *Acetobacterxylinum*, and yeast – specifically Saccharomyces sp. [11]. Since sugar is used as the source for starter to do metabolism process, the concentration of sugar added in the making of kombucha become one of important factors. At the other hand, the concentration of culture also become another important factor which will determine the succession of fermentation process, and the amount of metabolites produced. The aim of this study was to determine the characteristics of Kombucha Salak Swaru with different concentrations of sugar and culture.

2. Materials and Method

2.1 Materials

The materials which were used in the research were divided into two: materials for making kombucha, and materials for analysis. The materials for making kombucha were Suwaru salak that was obtained from Suwaru village, Gondanglegi, Malang District, sugar, distilled water, and kombucha starter obtained from Indokombucha, Bandung, West Java.

2.2 Experimental design

The methodology used was a randomized block design (RBD) using two factors, which were the addition of sugar and addition of culture. Two variations of sugar concentration were used which were 7.5% and 10%. Meanwhile three concentrations of culture were used which were 5%, 7.5%, and 10%. There were 6 combinations of treatment with 3 replications, and as result 18 experimental units was obtained. Data was analyzed using analysis of variance (ANOVA) with a confidence level of 5%. The best treatment was determined using Zeleny Test.

2.3 Suwaru salak juice preparation and kombucha fermentation *[12]*

Suwaru salak was peeled, the seeds were removed and weighed to 400 grams, washed, cut, and added with water with ratio of 1:1. The mixture was blended for 25 seconds. The pulp and the clear juice were separated with filtration using filter cloth. The clear juice was used for further stage, while the pulp was discharged.

The clear salak juice was pasteurized with temperature of 65°C for 30 minutes. It was added with sugar according to the treatment (7.5% and 10%) and stirred until it was well mixed. The mixture was cooled down to 25 ± 2°C. The cooled down mixture was poured into glass jar and added with liquid starter kombucha according to the treatment (5%, 7.5%, and 10%). The glass jar was covered using cloth. Fermentation process was done in 14 days. After fermentation process was done, kombucha was filtered to separate the solution and nata, and it was ready to be analyzed.

2.4 Data analysis

Analysis were performed against Kombucha Salak Swaru, which includes analysis of total bacteria and yeasts (TPC) [13], analysis of pH [14], analysis of total acid [15], analysis of total sugars [15], analysis of total phenols [16], analysis of antioxidant activity the IC50 [17], color analysis [18] and organoleptic assessment [19].

3. Results and discussion

3.1 Total bacteria and yeast

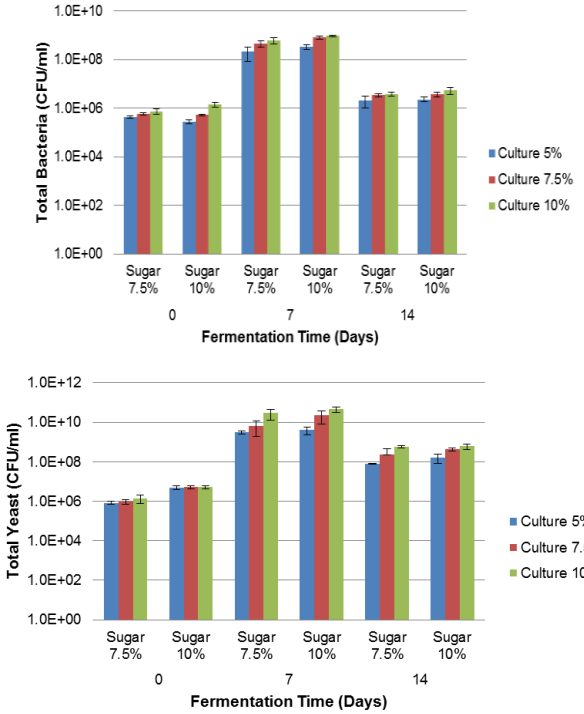

Figure 1. The growth of bacteria and yeast during kombucha fermentation.

Bacterial and yeast growth during fermentation have a pattern of increases before it declines after 7 days. The increment in total bacteria at the 7th day occurred as the result of bacteria's metabolic activity which utilize the sugar added to the medium as the source of nutrient. Also, bacteria may also utilizes another nutrient from indigenous substance in fruit such as glucose, amino acids, and vitamins. Along the fermentation process, glucose was metabolized into organic acids and energy. The energy produced was furtherly used to support the synthesis of bacterial cell, thus cause increment in the bacteria counts. The fact is supported by previous study [20] which also mentioned that during fermentation, bacteria will utilize substances in the medium as a source of nutrients to produce energy or ATP that will be used for its growth and reproduction. The addition of culture resulted in an increase in both bacteria and yeast. The most dominant bacteria contained in kombucha culture is *Acetobacterxylinum*, followed by *Lactobacillus*, *Pediococcus*, and *Gluconobacter* which also take part in kombucha fermentation process. Yeast that exist in kombucha are *Saccharomyces ludwigii*, *apiculatus Saccharomyces*, *Saccharomyces cereviceae*, *Saccharomyces pombe*, and *Zygoaccharomyces kombuhae* [21]. The addition of sugar resulted in an increase in both bacteria and yeast. The growth of bacteria and yeast depends on the sugar content, either the sugar is added or indigenously exist in Suwaru salak. This fact is supported by the literature [22] which stated that sugar is a source of glucose which serves as a substrate during cell growth and fermentation. The trend of yeast cells growth is proofed to be similar with bacteria [23]. The increment of total yeast presumably caused by yeast metabolism which utilized the nutrients in kombucha to produce energy which was furtherly used to perform cell multiplication.

The decreased total bacteria and yeast at the 14th day likely caused by nutrients shortage which also lowered the bacterial and yeast growth rate – thus increased the bacterial death

rate. The presence of inhibitor substances also become one factor that cause the total bacteria decreased, as stated by Volk and Wheeler that the longer the fermentation, bacterial growth rate will be declining as the sugar content was reduced, and the existence of organic acids and alcohols as fermentation metabolites that inhibit the bacterial growth [24].

The carbon shortage in kombucha also caused the growth rate lowered. Moreover, during fermentation, yeast produced metabolites such as organic acids, alcohol, and other antimicrobial substances which limit the growth of yeast, whereas phenol substances and organic acids formed during fermentation have antimicrobial properties that will inhibit microbial growth [21].

3.2 pH

Figure 2 shows that pH kombucha decreases during fementation and decreases with the addition of culture and sugar. The lowest pH was recorded at the 14th of fermentation with 10% addition of sugar and culture respectively. Presumably during fermentation, the bacteria and yeast produced organic acid which released H+ ion as it was partially dissociated. The H+ released may reduce pH value that caused the fermentation media became more acid [25]. Organic acid dissociates to release free protons which lower the pH value [26]. Microbes in kombucha used sugar in the medium as nutrients to produce energy and acid - organic acids. According to Nainggolan, during fermentation, sugar will be overhauled by yeast into glucose and fructose then converted into CO2 gas and various organic acids, and also other compounds. Glucose will be utilized by the bacteria *Acetobacter xylinum* – along with the yeast – *Saccharomyces cereviceae* – as an energy source, and metabolized into organic acids. Dissolved organic acids will release free protons thus lowers the pH value [27].

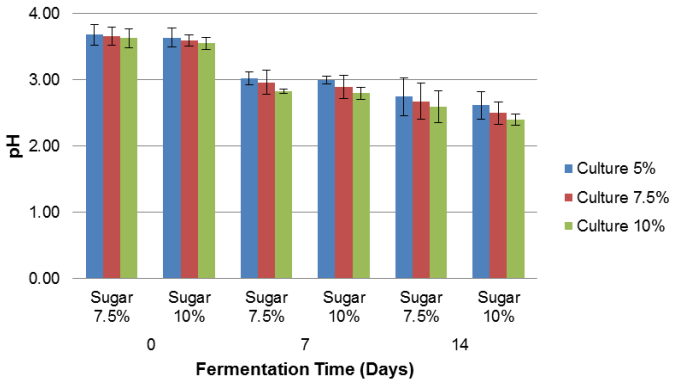

Figure 2. Kombucha pH alteration during fermentation.

3.3 Total phenols and total flavonoids

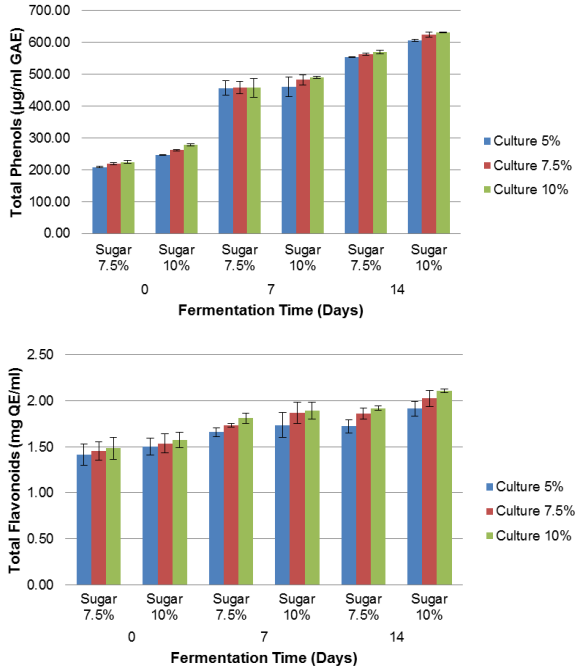

Figure 3. Total phenols and flavonoids during kombucha fermentation.

Figure 3 shows that during fermentation, the value of total phenols and flavonoids in Suwaru salak tend to increase. the addition of culture and sugar showed an increase in phenol and flavonoid components. Highest level of total phenols in Kombucha Salak Swaru observed on the 14th day with 10% addition of sugar and culture respectively.The increment in total phenols presumably caused by microbe activity which convert the complex phenolic compounds into simple forms. During fermentation, yeast and bacteria release enzymes that converting polyphenol compounds into simpler compounds [28]. Tannin which categorized as complex polyphenolic compounds in salak was able to be degraded by yeast through enzymatic degradation by releasing tannase enzyme. The enzyme acts as catalyst in hydrolysis reaction of tannin, and hydrolysis of condensed tannin which produce flavonoids as the by-product [29]. *Saccharomyces cereviceae* also produce β-glucosidase enzyme that degraded glycosidic bond to liberate phenolic compounds which increase the total flavonoids thus also increase the total phenolic compound. Furthermore, as the fermentation takes place, the activity of kombucha culture will produce enzymes to synthesize sugars and release phenolic compunds in salak, which then also increase the total phenolic compound. According to Gunther, fermentation may increase the levels of phenol, total flavonoids and antioxidant activity in the medium [30]. the fermentation process can cause the release of microbial enzymes that generate free forms of the chemical components contained in plants such as flavonoids, tannins, and alkaloids [31]. Fermentation will increase the amount of flavonoid from the plant-based food by inducting the cell wall degradation, or even inducting several bioactive compounds synthesis such as flavonoids [32].

Microorganism in kombucha will utilize sugar present in the media to perform metabolism in which hydrolyze sugar that cause phenolic and flavonoid compounds in the fermentation medium released [33]. Thus, higher sugar content in kombucha also resulted in higher amount of total flavonoids. High content sugar may initiate the growth of bacteria and yeast

which able to overhaul sugar into acetic acid as the primary metabolites, and polyphenols (flavanols, flavandiol, and flavonoids) as the secondary metabolites [34].

3.4 Antioxidant activity

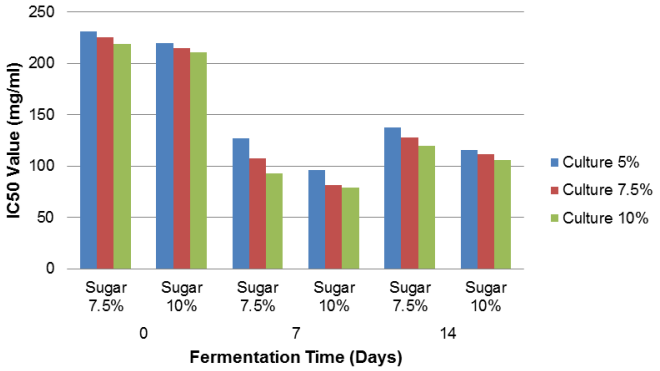

Figure 4. Antioxidant activity during kombucha fermentation

Based on the theory, as the IC_{50} value gets lower, thus indicates higher antioxidant activity. Figure 4 shows that the longer the fermentation, the IC_{50} value of Kombucha Salak Swaru tend to decreased until the 7^{th} day of fermentation. However, on the 14^{th} day the IC_{50} value increased. Higher concentration of sugar and culture added to the media, cause lower IC_{50} value. The IC_{50} value scored the lowest in the 7^{th} day of fermentation with 10% of sugar and culture added respectively.

The antioxidant activity of kombuca is affected by existing of the total acid, total phenols, and total flavonoids. The presence of sugar – carbon source for kombucha culture to perform metabolism – may cause the degradation of catechin contain in salak which may increase the value of total phenolic compounds, thus increase the antioxidant activity as phenolic compound is primary antioxidant [35]. Among 19 types of phenolic compound where its anti-complement activity was being studied, known that flavonoids able to inhibit the anti-complement activity with IC_{50} of 4.2 mg/mL [36]. Antioxidant activity represented by phenolic compounds especially flavonoids is associated with the number of aromatic hydroxyl groups which become the indicator of hydrogen transfer and its capability to bind free radical [23].

3.5 Organoleptic analysis

Taste is an important parameter in order to determine the product acceptance by consumers. The average panelist's degree of likeness toward the taste of Kombucha Salak Swaru varies between 3.81 (slightly dislike) to 4.74 (neutral). The average value of panelists preference toward the taste and aroma of kombucha can be seen in Figure 5.

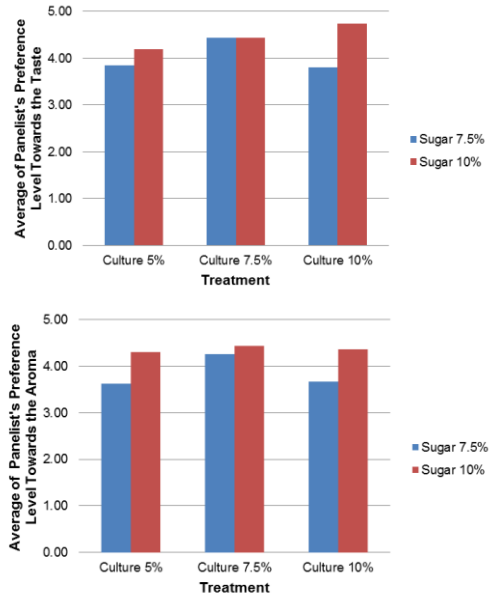

Figure 5. Panelist's Preference towards the taste and aroma of Suwaru Salak Kombucha

According to Figure 5, it can be known that Kombucha Salak Swaru with 10% of sugar and culture addition respectively resulted highest panelists preference score toward the taste, with the score of 4.74 (neutral) and 4,37 (neutral). At the other hand, lowest preference score toward Kombucha Salak Swaru was at 7.5% of sugar and 10% culture addition. Advanced Multiple Comparison Test shows that the response to the taste and aroma of Kombucha Salak Swaru was significantly different between the addition of sugar by 7.5% and culture by 5%, and addition of sugar by 10% and addition of culture by 10%. Panelist's preference toward 10% addition of sugar and culture respectively might caused by the sweetness resulted from sugar addition, while the addition of 7.5% sugar may cause less sweet in kombucha. The microbial activity during kombucha fermentation produce distinguishable amount of acid which contribute to relatively acidic taste in kombucha. High concentration of sugar more likely balanced the acidic taste of the kombucha and more preferable by the panelists.

4. Conclusion

Kombucha Salak Swaru treated with addition of sugar 10% and culture by 10% respectively is the best treatment, as it qualified in terms of physical characteristics, chemical, and microbiological. Kombucha Salak Swaru with addition of sugar and culture of 10% respectively had5.5 x 10^6 CFU/mL total bacteria, 6.1 x 10^8 CFU/mL of total yeast, 1.41%total acid, pH of 2.75, 7.45% total sugars, 553.43 mg/L total phenols, 1,72 mg QE/mL flavonoids, 137,45 mg/mLIC50 value, 4.74 (neutral) score of taste, and 4.37 (neutral) score of aroma.

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Best Practice of Local Tourism Management: Case Study of Suter Cluster of Geo-park Batur, Bangli Regency, Bali Province of Indonesia

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Abstract. Tourism management is an important thing to continue to be developed, that can enhance socio-economic and physical development within one region. Various regions in Indonesia have their own attractiveness in tourism sector, such as mountains, lakes, forests, and other attractions that must be maintained continuously. One of famous attractions that scattered around Indonesia are Geo-parks, involving area that is consist of social, cultural, physical and economic within the framework of geological heritage.The development goals of Geo-park is based on sustainable regional development, which one of the main supporting tools to reach the sustainable aspect is the implementation of geo-tourism. The management of geo-tourism itself is based on grassroots movement, and inspired by local wisdoms. One of the best-known example of implementation of grassroots movement within geo-tourism is in Geo-park Batur, Bangli Regency, Bali Province of Indonesia. Within Geo-park Batur, there were five clusters of Local Working Group which have initiatives in exploring tourism potential in their surrounding area, and also improving geo-tourism management within the Batur Geo-park region. One of the clusters that has a good performance in running various initiations is Suter Cluster within Geo-Park Batur area.This study aims to explore the key factors that lead to the success within the implementation of grassroots movement in the Suter cluster of Local Working Group.

Keywords: Geo-park, Batur, Bali, Local Working Group, Tourism

1. Introduction

Tourism has been an important sector, as it produced benefits and impacts for the socio-economic, environmental, and political condition for the host community (Hall and Page, 2014). Most of influential academia and international organizations accept that tourism has an important role to promoting cultural education between different nations. Therefore tourism could enchance cultural understanding to strengthen peace among nations worldwide. Also economically, tourism has a role to increase local revenue and enchance the development of small and medium enterprises (SMEs).

Although tourism has various positive impacts especially on socio-economic within the host community, there were also concern about its negative impacts especially on locals' well being within the massive development of tourism attractions. The heightened awareness of the negative impacts of mass tourism to popular tourist destinations (mostly sea-sand-sun) in the international tourism arena lead to a search for alternative approaches to tourism resource management, resulting in sustainable tourism with attention to

biodiversity conservation and community development (de Kadt, 1979; Smith, 1977; Turner and Ash, 1975).

Sustainable tourism became an alternative way to promote community participation, environmental and well being's protection, and improvement of the quality of life for host community. The top down approach within sustainable tourism to distributing empowerment to stakeholders is considered as an obstacle to collaborative community participation (Goodwin and Santilli, 2009; Sebele, 2010). Meanwhile the community participation would be affected by unbalanced power distribution among the community members. Therefore sustainable tourism was not the right approach to include voices from the local community. Sharing the same goals of sustainability, a new model entitled "the Community Based Tourism (CBT)" became popular in the mid-1990s, reversing the development approach to bottom-up, in an effort to provide real and all-inclusive community participation at all levels of the development (Asker et al, 2010).

CBT has been regarded as one of the best approach by different influential international organizations regarding its ability to integrate community empowerment, socio-economic development, natural and cultural conservation, and participation of all stakeholders in planning and development processes. CBT also contributes to local's well being within the development of infrastructure such as; transportation, water, electricity, and telecommunication networks; and superstructure such as institutional and legal structure of health, safety, security, and civil rights (Asker et al, 2010; Goodwin & Santilli, 2009; Thailand CBT Institute, 2013). It provides, expands and improves sources of livelihood and opportunities to earn income, which is often times used for basic living material, education, healthcare and clothes, and building houses (Caalders et al, 2001).

Regarding to various literature on CBT, the term of success is a controversial based on different criteria, perspective, and expectations. If the criteria of success depends on financial return, improvement of livelihoods, and escape from various uncertain work that relies on extractive and agriculture sectors, then one could argue that few communities in Batur Geo-park participating in CBT have proved successful. However, we cpuld get different conclusion if the criteria directed to different point of view, such as community benefits and participation determine the achievement of success. These approach could be develop by allowing member of local communities to give their judgements about their own achievement, and to define success on their own terms, it casts efforts to facilitate CBT in Batur Geo-park in a positive point of view. (Kontogeorgopoulos, N., Churyen, A., & Duangsaeng, V., 2014).

The purpose of this paper is to examine the specific factors that have led to successful CBT in the community of Batur Geo-park. This study is driven by some research questions as follows: (1). What are the driving force of the Suter Cluster LWG achievement? (2). Who are the key actors that determine the success of Suter Cluster LWG? (3). What are the institutional settings that support the success of Suter Cluster LWG? Ultimately, this paper argues that Batur Geo-park's success is based on three factors: the ability of local tourism to improving local communities' livelihoods, support to local economic development, and social empowerment through the establishment of various local working groups (LWGs). Further, this combination also supported by the willingness of Bangli Regency and Bali Province Authorities to improving the level of service within the tourism sector, one of the real example is the ongoing effort to establish Batur Geo-park Authority Agency. These effort could be replicate by other regions that have similarities, especially on administrative and socio-cultural aspects. The importance and success of CBT in Batur Geo-park are evident when examining the ways in which tourism activities have boosted both local economic development and social empowerment in Indonesia.

The rest of the paper discusses the literature review of geo-park and ecotourism as a tool to increase quality of local communities. Further, the literature is further used to propose the concept for analysis and research method. This is followed up by the discussion on how the

local working group has become successful is presented in the paper. Finally, the conclusion and recommendation are presented.

2. Literature Review: Geo-park, Ecotourism and Local communities

Sustainable development attempts to address the long-term prosperity of human societies and the ecosystems that support them by obtaining the necessary ecological information for responsible development, management, and conservation of Earth's resources (Campbell & Reece 2011). Meanwhile, sustainable tourism values ecological, social and economic systems. Swarbrooke (2002) supports the view that tourism development in developing countries should be viewed within the general sphere of development. Therefore, in order to understand sustainable tourism as a contemporary concept particularly in developing countries; approaches to, actors within, and goals of development should be considered along with the principles of sustainable development with importance given to local actors and their initiatives. Sustainability maybe defined as the enhancement of communities into the indefinite future without impinging on the value of natural systems. It is obtained through equity within and between generations, conservation of biodiversity and natural systems, and wise use of resources (Dovers 2005).

The United Nations World Tourism Organization (UNWTO) also emphasizes that ending poverty and hunger are integrally interlinked with sustainable tourism. With tourism representing more than 10% of the world's GDP (UNWTO 2016), it has a direct impact on global poverty levels. The creation of decent employment in the tourism sector directly affects local people's livelihoods and wellbeing which helps them obtain fair wages and positive social flow on effects. The potential for women, youth and disadvantaged groups to be raised out of poverty while simultaneously safeguarding the environment is enhanced through sustainable tourism development. Ending hunger, achieving food security, improving nutrition and promoting sustainable agriculture is inextricably tied with the potential for sustainable and community based tourism (CBT) in developing and developed countries. Most global poverty is in rural communities, where there are the highest levels of malnutrition. Agricultural productivity through the production, use and sale of local products can be enhanced through grass roots sustainable tourism activity while providing additional income for local people living in tourism destinations. Businesses can promote sustainable tourism, stimulate agricultural production through local consumption and support alternative business models such as agro-tourism while respecting the environment and local customs (UNWTO 2013).

In Addition, Geo-park as ecotourism and geo-tourism has an essential role in implementation of sustainable tourism development. Geo-park success is reliant upon local communities benefitting from their establishment and participation in building harmony between people and nature. Thus, geo-parks' management emphasizes inclusiveness, especially by local community involvement in conservation efforts engaging ownership of resources and locations which contribute positively to livelihoods and quality of life. UGG should holistically integrate conservation initiatives that consider sustainable resource utilization, provision of infrastructure and local socio-economic development, along with well-being (Halim, 2011). Furthermore, the direct involvement of local communities leads to local empowerment allowing for free expression of traditional local wisdom that reinforces local identity and cultural protection.

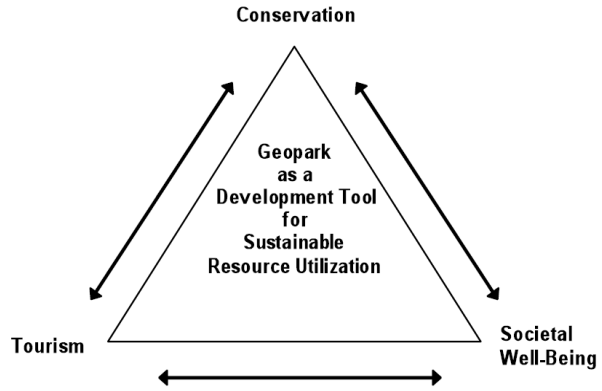

Figure 1. The Geo-park and its main components (Halim, 2011)

The United Nations Educational, Scientific and Cultural Organization (UNESCO), considers geo-parks not only as a defined geographical area, but also sites of ecological, archaeological, historical or cultural value. It is mean that Geo-parks are of value for education, science, culture and socio-economic development (mainly through tourism sector) for local community. To be specific according to the EGN and UNESCO's recommendations, the criteria for a geo-park include (UNESCO, 2006a) consist of three essential targets, there are conservation, education and promotion of local economy through geo-tourism. The geo-park play an important role in the development local economic, for instance geo-parks can provide second jobs or seasonal job opportunities for local communities. Geo-parks also can increase environment education local community through involve locals in conservation activities, workshops and geo-park work teams (Farsani at all,2010).

According to Neda Torabi Farsani et al, geo-park and geotourim provides economic and other benefts to local community, such as creating job opportunities and generating income, as well as some other services, products and supplies, geotourism has, nowadays, been introduced as the best form of sustainable rural tourism marketing. The partnership between the government, local people, academics, local businesses, private sectors, outdoor companies, tour agencies, restaurants, accommodations among others also being represented by geotourim development. This partnership is welcomed because it makes good economic sense and can beneft all partners (Dowling, 2009).

This new paradigm of geotourism and geo-parks have to create new products (geoproducts, geomenus in restaurants, etc), new jobs (geotours, georestaurants, geobakeries and rural hotels) and new recreational activities (geosports, geomonuments, geo-park museums, etc.) for local communities. It is worth mentioning that these recreational activities that are related to topography and geology, in some ways, are educational tools to increase implementation of sustainable development. (Farsani at all,2010).

3. Research Methods & Analysis

Our purpose of this research was to identify factors that influence the grassroot movement in the Suter Cluster, Bangli Regency, which are regarded as one of the most successful by most of local Local Working Groups in Batur Geo-park Area.

The research was conducted with surveys and in-depth study in Suter Cluster of Geo-park Batur Area, Bangli Regency. Surveys were consist of interviews to the leaders of Local Working Group, local communities, businessmen, local government agencies, scholars in tourism development, and other tourism actors. The collected data then analyzed to know following aspects that contributes within the development of Local Tourism Management; (i) the regional overview of Batur Geo-park Area, (ii) the historical aspects of Batur Geo-

park Area, (iii) improved livelihoods/standart of living, (iv) local economic development, and (v) the impact of social capital and local empowerment of Suter Cluster.

The indicator of improved livelihoods/standard of living, local economic development, and impact of social capital and local empowerment were derived from Goodwin et al (2009) that explained success factor from various clusters of Community-Based Tourism (CBT) which consist of;

- Improved Livelihoods/Standard of Living, which includes; Employment, increased livelihood options, establisment of micro-enterprises, poverty alleviation, improved standard of living, and income/revenue generation.
- Local Economic Development, which includes; Economic development/benefits, use of local products / reduce leakage, rural development, and stakeholder partnerships/linkages.
- Commercial Viability, which includes; Profitable, commercially functional, longevity of project, sound business/project plan, innovative/good product, growth/opportunity for growth, sustainable, increased/high visitation, achieved with minimal donor intervention/funding
- Collective Benefits, which includes; Ability to fund social/other projects/product, and regeneration/infrastructure development
- Social Capital and Empowerment, which includes; Equal opportunities, empowerment/decision making/capacity building, local community management/ownership/leadership/governance, participation, local community working together, and minimal impact on community
- Sense of Place, which includes; Cultural revitalisation/conservation, raised community/tourist awareness of cultural/natural heritage & environmental issues, and instilled sense of place/pride
- Education, especially on education and training of local skills
- Conservation and Management, which includes; Conservation of environment/heritage, sustainabe technologies, environmental policies, and environmental monitoring
- Tourism, which includes; Tourist experience, raised awareness of destination, and award winner
- Other, such as triggered replication of other projects, allowed sufficient time for project, and funding/investment

In this research we will scope the analysis of success factor to 3 (three) points which is fundamental as the baseline of a successful grassroot movement; (1) Improved livelihoods/standard of living, (2) Local Economic Development, and (3) Social capital and empowerment. With the improved livelihoods and/or standard of living, that would define how impactful a tourism activities in certain places to contribute within local communities' well being. Local economic development also enchance the local revenue from tourism activities, and in the future also encourage the economic improvement of local communities. Meanwhile social capital and empowerment affected the effectiveness and eficiency within decision making process in local communities.

4. Findings

The findings are discussed in terms of regional overview, historical aspects, improved livelihoods and local economic developments.

A. Regional Overview

Batur Aspiring Geo-park was accepted as a member of Global Geo-park Network (GGN) supported by UNESCO on September 20, 2012 at Portugal (Auroca Global Geo-park), with the name Batur Global Geo-park. On November 18, 2015, then officially renamed to be "Batur UNESCO Global Geo-park Batur". Administratively, the Geo-park included in the district of Kintamani, Bangli Regency, Bali Province. The regency itself comprises four districts (Susut, Bangli, Tembuku, and Kintamani). Of 72 villages subdivided into 322 banjars. Beside the government banjars, there are 159 pekraman which are traditional autonomous units. Among the villages are four having urban status. Landscape of double-calderas, active volcanic cones, lake, lava flows, cinder cones and maar is a unified volcanic morphology that became a history of the dynamics of volcanism phenomenon over tens of thousands years ago to present time. Batur active volcano has a unique phenomenon, viz. "caldera in caldera" that is rarely found elsewhere. As a tool to develop area in a sustainable manner, the UNESCO Global Geo-park Batur mix and match among components of geology, biology and culture for the purpose of conservation, education, growth of local economic value and sustainable development. An area of 366.5-kilometer square is inhabited by about 16.625 people, spread over 15 traditional villages.

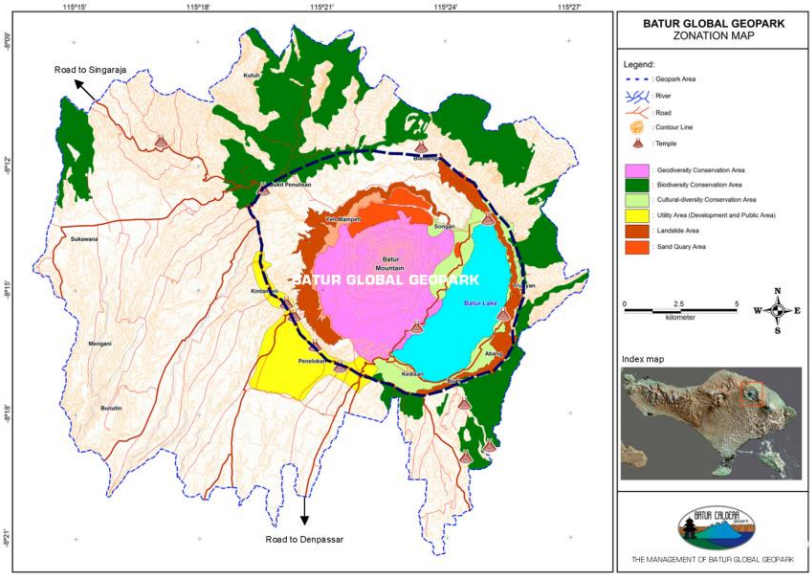

Figure 2. Map of Batur UNESCO Global Geo-park
Source: Progress Report of Batur UNESCO Global Geopark for the year 2012-2016

One of the strengths and weaknesses-the Geo-park Batur region is its population. It is not easy to develop thorough this area, because Kintamani with 48 villages has a high social diversity. Therefore, the Ministry of Culture and Tourism of Indonesia together with Bangli regency government tried to re-arrange the area by involving the community in 15 villages in one cluster Destination Management Organization (DMO). The 15 villages include: Batur Selatan Village, Central and North, Kintamani Village, Suter, Blandingan, Sukawana, Songan A Village and Songan B, Trunyan Village, Buahan, Kedisan, Abang Songan Village, Suter and Abang Batu Dinding Village.

Capturing community aspirations and commitment from 15 villages is not an easy and fast work. Some villages that include into geo-park area, there are 15 villages. Of the 15 villages located in Bangli Regency, there is a group of tourism destination zones grouped into five clusters based on location, geographical condition, and socio-cultural conditions of the community. The group is divided into 5 clusters with each cluster consisting of 3 villages. From a number of villages, not all of them have been optimized. The Suter Village which is

included in the destination cluster Abang Airawang become one of the tourist villages to be developed by the government. These villages include Kintamani Village, Terunyan, Buahan, Kedisan, Sukawana, Senggang Abang, Pinggan, Blandingan, South Batur, Batur Tenggah, North Batur, Suter, Abang Batu Dingding, Songan A and Songan B whose overall geo-park area reaches a 25- kilometers and into the caldera of Batur Global Geo-park. In this study will focus on Cluster Destination Abang Airawang is one of the village Cluster consisting of Abang Songan Village, Abang Batudinding Village and Suter Village.

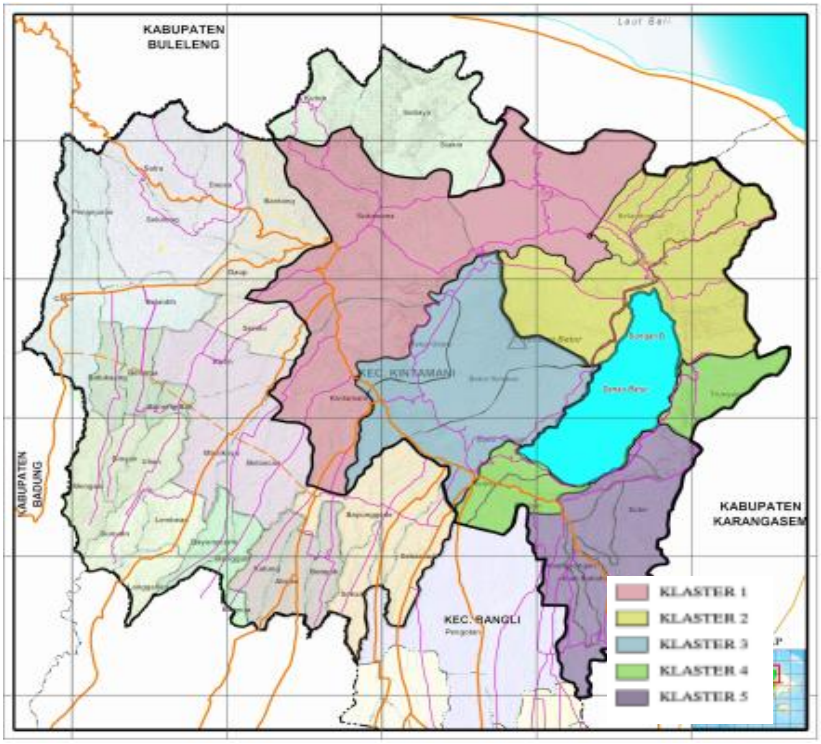

Figure 3. Map of Five Cluster of Destination Management Organization (DMO) in Batur Global Geo-park (BGG)
Source: Masterplan of Strategic Area of National Tourism (KSPN) Kintamani-Danau Batur And Surroundings

Destination Cluster Abang Airawang is one of the village clusters consisting of Abang Songan Village, Abang Batudinding Village and Suter Village. To be able to help the government program as a facilitator of village development, the three villages can not be separated because it has the same natural potential and historical background. From several clusters that exist, clusters Abang Airawang is one cluster that has tried to maximize the utilization of their natural potential. The number of tourists visiting and visiting the destination cluster is about 40% of the total number of tourist visits to the Bangli Regency tourist destinations (Source: Suter Village Participatory Rural Appraisal (PRA) Report).

In addition, Cluster Destination Abang Airawang located in District Kintamani as a tourist area that is natural tourism should be able to help the community in his village to become more economically advanced. However, this does not occur evenly in most of the three villages. Major livelihoods as a farmer is still much occupied even until children are not rarely drop out of school to help their parents to work in the fields. The type of employment that is less makes people choose to pursue the work diladang for generations. The classic reason for the difficulty of finding a job also makes many children who drop out of school after graduating from junior high school to pursue work in the field. Though much potential that can be developed in Cluster Abang Airawang if it can be managed properly. Cluster Abang Airawang is an example of a group of tourist destination villages with abundant natural resources with main agricultural produce in the form of albesia, mahogany, heinous,

corn, orange, and others are chocolate, coffee, banana, cassava but can not optimize the welfare of the village community. The condition of the villages in the hills where there is no water source makes water the main problem in the village. In addition, plant pests and diseases that attack the commodity also has an impact on the productivity of agricultural produce is less than the maximum. This makes farmers begin to switch to the craft and carpentry sectors. Utilization of land and natural resources that become less than optimal in Cluster Abang Airawang, require a solution to empower the village community as a manager and further promote the village economy. The location of the village located in the tourist area with the main locus of the forest tourism, and additional object view of the mountain and Lake Batur has not been utilized by the surrounding people as one of the potential of the village that can be developed to help increase the income of villages and residents.

B. Historical Aspects of Batur Geo-park Area

The early initiative to enchance the development of Geo-parks by UNESCO were supported by many countries, as they agreed to conserve various geological heritage and increase the value of past civilization relics. Geo-parks was one of programs that support the target of Agenda 21, which was sounded at United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, June 1992. The establishment of Geo-park emphasizes the interaction between socio-economic and the conservation of the natural environment.

An important step of improving geo-park management began when the Global Geo-park Network (GGN) was established in 2004. GGN had early membership of 25 geo-parks scattered in China and several European Countries. The membership lists then continuous to grow to more than 100 geo-park in 37 countries all over the world in 2017. GGN is currently managed by a non-profit entity under UNESCO, with an annual membership fee. GGN has a purpose to be a dynamic network with strong commitment from its members to work together, exchange ideas regarding best practice, and conduct common project to improve the standard of products and practices from UNESCO Global Geo-park.

Indonesia was well know for its biodiversity, such as various mountains and geo-parks. Amongst geo-parks in Indonesia, Batur Geo-park Area was the first that selected to be a member of GGN. Batur Geo-park Area was proposed by Indonesian government through the Ministry of Culture and Tourism (Kementerian Pariwisata) in 2009. After going through several feasibility studies and assesment from the UNESCO, the Batur UNESCO Global Geo-park Network then was established in 2011. The inauguration was conducted by Minister of Culture and Tourism (Kementerian Pariwisata) on November 17, 2012.

As a geo-park that had become a member of GGN, the management of Batur Geo-park Area is required to involve local communities to participate within the decision making process. The involvement of local communities is expected to improve the economy of the community with concern on conservation and avoid damaging the environment. Those conditions could happen if the geo-park program gets a positive response from all involved stakeholders.

C. Improved Livelihoods / Standard of Living

The implementation of Global Geo-park Network (GGN) also contributed in the improvement of livelihoods among local communities within Batur Geo-park Area. There are several scopes that measured, among others; employment, increased livelihood options, establisment of micro-enterprises, poverty alleviation, improved standard of living, and income/revenue generation.

The main challenge within the development of Batur Geo-park area is the effort to align the local livelihoods with the conservation of protected areas. There were diminishing rate of various economic sectors such as excavation, especially in Songan A and B Villages. The major shifting from previous sector (excavation and farming) to tourism considered unprofitable for them.

"About relation with geo-park, if seen from territorial base activity more to activity home industry, like craft. So geo-park is just like the real tourism area. But also with the protected area, it becomes less profitable for the local people as well, especially the farming and mining." - Cok Gede Agung Panji S.H (Head of Industrial Relations in Bangli Manpower Agency)

There were several initiatives from Bangli Local Government to improve the skills of workforce in Bangli Regency, especially around Batur Geo-park Area. One of the initiatives was the establishment of various training institutions to provide skills improvements, entrepreneurship class, and chance to do internship abroad. Those training institutions were established by local foundations and engaged in various sectors, such as tourism and plantation. This initiative showed that the Bangli Local Government already established mutual relationships with local foundations.

"When viewed from their competence, we prepare several LPK (Training Institution), which provides training on entrepreneurship or internships abroad. We currently have 12 LPKs. We recruit the participants, and later the LPK who provide coaching. In the implementation we are working with Bangli Local Government. That program began in 2012. We monitor on a quarterly basis, if there is less healthy LPK then we give coaching." - Cok Gede Agung Panji S.H (Head of Industrial Relations in Bangli Manpower Agency)

Most of the employees within public and private sectors in Bangli Regency were came from local work force. Several local businessmen already realized the importance of employing local labour to strenghen the local economy resilience. Employing local labour offers both financial and cultural benefit, and increasing interactions with tourist (Slocum et al., 2017).

"Workers here 99% are local resources that we absorb from several tourism education institutions in Bangli District. The remaining 1 from Bogor and 1 from Manado and some from Denpasar. These workers occupy all levels." – Ketut Marjana (Head of Hotel and Restaurant Association in Bangli Regency)

"The majority are still Bangli. If Bangli is like a place where people pass by. Immigrants who settled from other areas, mostly settled in Denpasar or other cities." - Cok Gede Agung Panji S.H (Head of Industrial Relations in Bangli Manpower Agency)

Also from the measurement of statistical counting from work force in Bangli Regency, there was an increase on regional minimum wage. That statistical fact shows trend of increase from local aggregate income, in which then affected the raise of salary of workers in Bangli Regency.

"Based on 2016 data, the regional minimum wage (UMK) is approximately 1,957,734. Increased in the last 5 years" - Cok Gede Agung Panji S.H (Head of Industrial Relations in Bangli Manpower Agency)

Figure 4. Local community stalls in Tourism area of Suter Village

Still there were several problems faced during the statistical counting of work force in Bangli Regency. One of the problems was not all of entities were aware of the importance of reporting on their current activities and economic level.

> *"We have given coaching and socialization that every month they have to report the current amount of manpower, but in the field not at entities were reporting the number. Those who do not report this make the amount of precision invisible to compare the development of the number of workers or SMEs."* - Cok Gede Agung Panji S.H (Head of Industrial Relations in Bangli Manpower Agency)

D. Local Economic Development

The implementation of Global Geo-park Network (GGN) enchance local economic development within Batur Geo-park Area, which includes; Economic benefits, use of local products, rural development, and stakeholder partnerships/linkages.

Most of stakeholders agreed on the positive impact of the implementation of Batur Global Geo-park regarding the increasing rate of involvement of local organizations and communities that were involved in tourism sector. The rate of involvement reflected on the rising number of organizations and communities participants in various initiatives and events related to tourism industry. Also in physical context, there are growing number of new facilities that support diverse tourism activities in Batur Geo-park area.

> *"In my opinion, Geo-park is now beginning to show its benefits to the community, as we can see today the growing number of organizations or communities that are involved in the tourism industry besides growing tourism facilities such as the example of new climbing routes, restaurants and new food stalls , newly built hot springs and new campsites indicate that people are beginning to look their way to benefit from tourism activities."* – Jero Mulyawan (Headmaster of SMKN 2 Kintamani)

In Suter Cluster of Batur Geo-park, there were a village-owned enterprise that could generate 30 – 50 million IDR of monthly revenue for the village treasury. The revenue derived from the operation of hot water bath, local restaurants, and sales of local handicraft products.

> *"The economic benefits of each month in the Suter cluster reaches 30 to 50 million. What does it mean? The existence of this geo-park can actually encourage the development of village, local community, and its products."* – Dr. I Wayan Mertha (Scholar in Nusa Dua Higher School of Tourism, Denpasar)

However the benefits from tourism activities not perceived equally by several villages outside Suter Cluster, in Batur Geo-park area. Local economic development based on tourism activities did not appear in several villages that still depend on extractive sectors, such as excavation type-C in Songan A and B Villages.

Figure 5. Local business in tourism activities (tracking, cycling and motocross) in Suter Village

"Communities involved in excavation type-C are aware of the negative impacts of these activities, but there has been no substitute for their main livelihoods, the benefits of tourism are also not evenly distributed so that they can not replace the activities of excavation type-C. In areas where economic benefits such as Batur Village, Kedisan, and others, the community strongly opposes the activity of excavation. Because they do get more benefit from tourism." – Dr. I Wayan Mertha (Scholar in Nusa Dua Higher School of Tourism, Denpasar)

To diminishing clash between the development of tourism sectors and regulation of other business sectors, the implementation of special economic zone plan could be an option to differentiate zones based on their specialties. Each of zones will develop by itself, regarding the current applied regulations.

"I think the problem is like that the government has not created a special economic zone that minimizes the clash of interests from every sector in this Geo-park Batur region. The second is that the government is still weak in limiting or even prohibiting mining activities such as excavation type-C" – Ketut Marjana (Head of Hotel and Restaurant Association in Bangli Regency)

E. The Impact of Social Capital and Local Empowerment of Suter Cluster

There are various reasons to identify particular CBT initiatives as successful. According Neda Torabi Farsani at all, 2010, The five main reasons given for initiatives being regarded as successful are Social Capital and Empowerment, Local Economic Development, Livelihoods, Conservation/Environment and Commercial Viability. Social Capital and Local Empowerment play important roles for a CBT initiative being identified as a success. The impact of social capital and local empowerment consist of four criteria, there are Empowerment, Capacity Building, Local community management/leadership and Participation Local community working together (Farsani at all,2010).

Today, opportunities present themselves to communities to gain control over their natural resources and venture into viable tourist businesses. The gradual development of community organizations which are responsible for natural-resources management and the offspring tourism projects, reflects itself in stronger communities that are increasingly able to fend for themselves. Community empowerment is perhaps the most important benefit of the community-based tourism projects (Rozemeijer, N., 2001).

"Once LWG is established, training, workshops, comparative studies, and DMO conferences throughout Indonesia are often conducted." – I Nengah Suratnata (LWG Abang Erawang Cluster)

CBT endeavors can be waste of scarce resources if not supported by a government with a solid policy promoting CBT. The government has to have a responsible leadership role and provide continuous psychological, financial, technical and educational support in all steps of CBT development. The government is the key in local governance, which needs organizing and building partnerships within the community and between the community and external agencies with continuous communication.

"Cooperation conducted with the government of Bangli, STP Nusa Dua there is a MoU with Bangli local government related to the development. The current training is the introduction of tourism potential and how to receive tourists." - Dr. I Wayan Mertha (Scholar in Nusa Dua Higher School of Tourism, Denpasar)

It can ensure collaboration and coordination of all stakeholders to create a shared, long term vision of tourism and economic development by avoiding the exclusion of marginal groups and eliminating traditional divisions and tensions in communities. The government is instrumental in building and strengthening appropriate community institutions and making them more accountable and transparent to ensure the wider community benefits.

Figure 6. Social capital and local empowerment activities in Suter Village

Additionally, the government has the means to provide initial and ongoing technical assistance for individual and institutional capacity building, feasibility studies, dissemination of information generated by research accumulated knowledge, experience and know how to benefit the locals. Furthermore, the government can develop the necessary infrastructure (roads, sewage, electricity, and telecommunication) to form an attractive tourism product as well as avoid the vulnerability and risk from natural disasters such as storms, hurricanes, droughts etc. The government's will for empowerment of locals after capacity building defines the level of actual empowerment felt by locals.

> *"From the village funds there are already own parts for the allocation. Approximately 70% is allocated for physical and 30% for community empowerment. Empowerment here is usually for traditional dance studio exercises, education, gamelan, and other exercises. For the environment including the empowerment yes, about 2% of 30%. The activities are devotional work and the provision of waste bins."* – I Wayan Marsidi (LWG Batur Karanganyar Cluster)

The success of a CBT project depends upon the equitable distribution of surplus revenue that requires internal collaboration, effective leadership, and safe access to locations.

Conclusion

Geopark and geo-tourism has been a important sector in Kintamani District, especially in Suter Village (Abang Airawang Cluster of Batur Geopark), as it produced benefits and impacts for the socio-economic and environmental conservation. Current models of CBEs in Batur Geopark are several scopes that measured, among others; employment, increased livelihood options, establishment of micro-enterprises, poverty alleviation, improved standard of living, and income/revenue generation. Furthermore, the main challenge within the development of Batur Geo-park area is the effort to align the local livelihoods with the conservation of protected areas.

The Suter Village which is included in the destination cluster Abang Airawang have been optimized and become one of the tourist villages to be developed by the government. Based on Goodwin et al (2009) that explained success factor from various clusters of Community-Based Tourism (CBT), Suter Village has three key factors to be a success CBT in Geopark Batur, there are improved livelihoods/standard of living, local economic development, and impact of social capital and local empowerment.

In Suter Cluster of Batur Geo-park, most of the employees within public and private sectors were came from local work force. Employing local labor offers both financial and cultural benefit, and increasing interactions with tourist. there was a village-owned enterprise that could generate 30 – 50 million IDR of monthly revenue for the village treasury. The existence of this geo-park can actually encourage the development of village, local

community, and its products. Meanwhile in term of social capital and local empowerment, Suter village has training and workshops for local community.

CBT initiatives in Suter Village were able to emphasize improve livelihoods, address local community priorities, enhance local economic development, enhance community empowerment and transparency, promote effective community leadership and develop community and simultaneously to enhance environmental and cultural conservation in local community.

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Cultural Preservation, Eco-Tourism

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Abstract. This paper will explore the preservation of culture in the context of tourism and globalisation. Herein the (1) diversity of Indonesian language and the decline in Javanese will be used to introduce the apparent need for cultural preservation. This will lead to (2) a discussion of tourism as a form of neo-colonialism and how in the context of globalisation its (3) impact on local communities can be both a threat and (4) a force of preservation. This discussion will be further contextualised by (5) using the area of Yogyakarta as a case study, this research conducted from interviews and formal lectures over a six-week period grants insight into the reliant nature of Indonesian culture and its international perception.

Keywords: Eco-Tourism, Empowerment, Cultural Preservation

Introduction

The nation of Indonesia has a diverse and culturally rich history, present and undoubtedly future. With this comes an inbuilt resilience to outside influences and the complex forces inherent in globalisation. With an increase in foreign tourists in Central Java that bring both positive and negative influences, this paper will explore the decline in traditional language and culture and argue that it has been substituted with a newfound optimism through a burgeoning tourism industry, fresh arts, and a renewed enthusiasm from the youth that is made possible by education, tourism and the opportunities that come from unique spiritual sites, mountains, beaches that have embraced sustainable tourism.

Section 1 : Diversity

Indonesia's islands are separated by seas so traditionally the people would not engage in day to day contact with one another. This therefore caused the individual development of cultures and language and thus led into unprecedented diversity. (Lange 2010:22). As such Indonesia has a rich language tapestry where there are 719 individual languages listed 707 of these are living and 12 are extinct 701 of the living languages, are indigenous and 6 are non-indigenous. Furthermore, 18 are institutional, 81 are developing, 260 are vigorous, 272 are in trouble, and 76 are dying." (https://www.ethnologue.com/country/ID)

1.2 "A case study: Javanese

Javanese is by far the most widely spoken local language in Indonesia. It is estimated to have over 80 million speakers thus making it the 10th most widely spoken language in the world. Yet, it is the only language in this group that is not a national or official language of a country. While this could cause concern for the language's continued use, if any language of Indonesia is "safe", Javanese should be.

Region	The Number of Languages	Remarks
Java and Bali	20	living languages
Kalimantan	83	living languages
Sumatra	49	living languages
Maluku	132	129 - living languages 3 – extinct
Nusa Tenggara	73	living languages
Papua	271	269 - living languages 2 - second languages without mother-tounge speakers
Sulawesi	114	living languages

Figure 1: Definition of languages

"A language is endangered when its speakers cease to use it, use it in fewer and fewer domains, use fewer of its registers and speaking styles, and/or stop passing it on to the next generation."

Degree of endangerment is classified in different categories ranging:

- **Vulnerable** - most children speak the language, but it may be restricted to certain domains (e.g., home)
- **Definitely endangered** - children no longer learn the language as a 'mother tongue' in the home
- **Severely endangered** - language is spoken by grandparents and older generations; while the parent generation may understand it, they do not speak it to children or among themselves
- **Critically endangered** - the youngest speakers are grandparents and older, and they speak the language partially and infrequently
- **Extinct** - there are no speakers left

There are a number of factors that seem to favour the maintenance of Javanese, including: the size of the speaker population, the existence of dense speaking communities, and the cultural and political dominance of the Javanese community in Indonesia. Indeed, in the early days of Independence and the accompanying promotion and diffusion of Indonesian as the national language, there was concern both about whether Javanese people would learn Indonesian and whether Javanese would overly influence spoken Indonesian.

Yet, despite all of these factors that seemingly support strong language loyalty, there are still changes in use of Javanese symptomatic of language shift, especially regarding a shift away from the use of Javanese by younger speakers. One aspect of this shift is a dramatic decrease in the use of Krama (High-Javanese) as reported by Errington (1998b), Poedjosoedarmo (2006), Smith-Hefner (2009), and Setiawan (2012). Young people commonly cite a fear of making mistakes and laziness (Smith-Hefner, Setiawan 2012) as reasons for abandoning Krama and favouring either low Javanese (Ngoko) or Indonesian; both of which are seen as being "more communicative" and more egalitarian. Taken together these studies suggest a categorical loss of Krama in younger generations, and a more gradient loss of Ngoko . While a perceptible shift away the formal register is quite common, it is exacerbated in the Javanese context as there is a highly codified distinction between formal and informal, which precipitates a more rapid loss of the formal register. " (http://pacling.anu.edu.au/series/SEALS-PDFs/Ravindranath&Cohn2014language.pdf)

Section 2: Tourism as Neo-Colonialism

Importantly, in the age of globalisation tourism is a form of neo-colonialism creating power structures of dependence and influence that pose a threat to the preservation of indigenous culture.

To consider the meaning of neo-colonialism, we should first reflect on the nature of colonialism. To clarify the nature of the relationship we are interested in, this research essay will try to present the outline of the division that occurs at the essence of colonialism highlighting tourism as a kind of neo colonialism.. "In the global context, meetings between the tourist and the native host do not usually have a 'partner' character – these are not meetings of people treating each other equally, in a subjective way…" (Cywinsky 2015:22) While the aim of sustainable tourism is to lead to symmetry between tourists and hosts, creating opportunities for both, the majority of interactions serve to subject the hosts, creating a dependent relationship reminiscent of colonialism

Tourist neo-colonialism occurs when the relationship between a person from outside the local social system (a tourist) and the local host meet in a way that is significantly unbalanced or even objectifying. he primary goal of this relationship is generally to satisfy the needs of tourists, rather than those of the host. As such when the tourist practice does not include relations based on equal conditions, it should be seen as a practice for the privileged – the practice of the powerful, wealthy outsiders, using the other, weaker, poorer or disadvantaged hosts In this way tourism can become a practice of producing winning actors and servile victims." (Cywinsky 2015:22). The Central Javanese tourist industry is a good example of such a relationships.

In many ways, tourism practices in central java can be seen as a form of neo-colonialism, where wealthy tourist subjects the poorer local to their benefit**.** Many who profit from the tourism industry in Central Java are " local investors and private tourism companies, which often served the interests of foreign capital, [while] the local community [is] often marginalized." (Cywinsky 2015:23) As such it cannot be sustainable, rather it continues a relationship of marginalisation started by colonialism and continued to this day. Yet, as will be seen in the next section tourism can be seen to have bought both economic benefit and cultural marginalisation to indigenous cultures.

Section 3 Impact on Indigenous Cultures

As technology improves, the world becomes smaller and travellers increasingly seek out previously inaccessible regions with greater ease. These travellers often originate from the dominant, western culture (Dransart, 2000). Their quest to accumulate novel experiences often includes aboriginal sightseeing and culture sampling (Dyson & Underwood, 2006). As a result if this form of globalization, many indigenous groups are being exploited by the tourism industry. The increasing ease of access to these cultures by Western tourists allows for a greater interaction between the two which is not necessarily equal. Western tourists often view indigenous groups as quaint relics of the past that they can observe and report back on to their friends at home. Inevitably there is the acquisition of souvenirs which Western tourists put on display as examples of the primitive encounter they have returned from. Even though there is interest in the culture of these indigenous groups, there is rarely a sense of equality. The tourist often sees themselves as superior, able to take what they please and worthy of being served.

The countries in which this type of tourism occurs, such as many African nations, often alter their policies to encourage the influx of tourist dollars. For example, the increased interest in the 'safari experience has resulted in indigenous groups being moved from their traditional territories in order to allow the Western tourist the greatest possible Safari experience.While the efforts of Western conservation organizations have convinced many African nations to alter their conservation policies to the point where there is a direct impact on the abilities of indigenous groups who remain on their land to continue providing for their people in their

traditional ways. Globalization in the form of tourism has lead to an increase in the cultural interaction between indigenous and western cultures causing alterations, both positive and negative, to the indigenous cultures. A good example of this is the concept of land and conservation in the context of tourism.

Multinational corporations view indigenous land as a valuable commodity to be bought, sold, and exploited. This has had a great impact on local environments as traditional land use is being pushed aside in favour of specific uses such as rice farming around Jogja, designed to maximize the profits for larger entities. This conflicts with the view held by many that the land is the anchor that connects them to their culture. This exploitation has pushed many indigenous groups even further to the margins of society.

The Massai of Africa give a good example both of the complex relationship between tourism and conservation, and of culture as a tourist attraction in and of itself.The growth of tourism in their area has brought in much needed tourist dollars, but there has been a price paid for this increased economic activity. The Maasai live in an area rich in African wildlife. As a result, there are limitations placed on them by the government as to what they can hunt so that they can appear to be conservationist in their policies and appease the western ideals of conservation of wildlife (Azarya, 2004). The desire by the government to appeal to Western sensibilities severely impacts the traditional lifestyle of the Maasai people. For example, the creation of national parks in traditional Maasai territory limited their traditional activities as they could no longer hunt as they always had and, in some cases, the indigenous populations were forced out (Azarya, 2004). It should be noted that this form of tourism can also be seen to positively impact local populations to some extent, however, the majority of interactions remain fundamentally unequal. (http://etec.ctlt.ubc.ca/510wiki/Indigenous_Cultures_and_Globalization)

For example a positive spin off from tourism is the greater opportunity for employment in the service industry for locals, gain, though, this tends to perpetuates the inequality of status between the tourist and the local employee. Indeed, economic opportunities have increased for the Central Javanese; with tourism comes the need for guides and labourers. Yet, the culture of Central Java itself has become a tourist attraction that can be exploited for the benefit of the tourists and a fee extracted. Local cultural items can be produced for the tourists to buy and take home as a record of their Indonesian expedition (Azarya, 2004). Yet the main economic beneficiaries of such tourist industries are not necessarily the local indigenous workers but the wealthy elite.

Moreover, cultural performances for the benefit of tourists raise questions of authenticity. The argument can be made that there is a loss of cultural significance when rituals are performed for entertainment purposes only, and not imbedded in the deeper cultural significance of their historical context. It can be argued that cultures such as Central Javanese are being further marginalised through the tourist industry, despite simultaneously benefiting from it in some ways. This is further seen in the increased ‘westernisation’ of the young.

The fear for many indigenous groups is that this global pressure on their culture will lead to the erosion of their traditional values to the point that the diversity of culture in the world will be slowly whittled away to the point that there will be only one large homogeneous culture world-wide. The consumeristic nature of globalization is often contrary to traditional indigenous values. Globalization does not take into consideration cultural and socioeconomic circumstances. Instead, it looks to further the interests of the larger, more influential countries and corporations which are the impetus behind its spread. (Gibson et al. 2007)

One of the main segments of indigenous society that is specifically targeted by multinational corporations are the young. Adolescents are far more susceptible to targeted consumerism and, as a result, may find that western consumer ideals more appealing to them than their own cultural traditions. They are easier to convert because their personal identity is not as set as that of an adult in their community. With this comes an erosion of cultural hierarchy as the sense of identity becomes more of a personal, individual choice, rather than a societal one.

As a result, many Indonesians' experience globalization as a threat to the traditional family structure, creating a disconnect from cultural traditions.

This has been visited by the Jogja based tourism and culture company 'Werkudara' who created a hybrid of new street style hip hop dance and beat driven music, to accompany a performance of the Prambanan ballet. At first criticised by elders who questioned its authenticity, however also heralded as the missing link between the inevitable 'westernisation' of the young with nostalgic reminiscence. As the company's owner Fadli states, "just one solution to move forward with is to take a risk with 'Gamlis Gambler', a rock band with gamelan instruments. Mixing the old tradition with the new style is inevitable as Indonesia and Central Java in particular, changes and grows. To engage the younger generation and introduce a new style of appreciation for Indonesian culture and diversity is a valuable tool to embrace the future of Indonesian culture." The relationship between tourism, westernisation and indigenous communities is complex, however when viewed through the lense of neocolonialism it can be seen to both positively and negatively impact them.

3.1 Positive impacts

Examples of the benefits of tourism and globalisation for Central Javanese communities can be found, when tourism is approached sustainably, and communities are actively involved in its evolution. Here we find the example of Imam Rozali who is the last remaining musician to perform a uniquely Sumatran form of music; sung in mix of Bahasa Indonesian and Bahasa Lampung, the dialect of his region. His music has been popularised by mass media and tourism thus in a way, conserving it for future generations. His music grants insight into the history of his region and the importance of the preservation of his culture. His instrument was originally introduced by by the Portuguese who would trade spices in the 14th century, and seeing a couple of months layover before a return journey, would often marry local women and hold parties with guitar like instruments with long necks (Ricklets, 2008). This was combined with the Arab traders teaching scales and modes during their trade routes before being adopted by the Indonesian culture and finally resulting in Rozali's unique blend of influences. Yet despite harnessing the forces of globalisation to popularize and preserve his music, he also recognises the threat it poses to his culture. Imam Rozali asserts that his children don't listen to other music, or have a TV/radio as he is trying to preserve the datuk's (ancestor) music. He claims that once something loses its authenticity, it loses its identity as well (Imam Rozali 2017).

Yet, at the same time, Rozali's music had been preserved through the very forces he derides. As he says, within his own culture, his music "may not attract a lot of people, but it's part of Indonesia's Identity" for a long time his music was pushed to the side, something old people listened to, and it is only with the forces of globalisation, tourism and mass media that he has to public attention . However despite national, and international attention by his own omission Rozali is treated "like an outsider in [his] own country". His experiences talks to the complexities of culture and influence. Despite being the "cultural successors [to their] ancestors" in a way he has become exotic in his own country.

Through the example of Imam Rozali the complexity of tourism, globalisation and indigenous culture comes to light. He has become successful playing tradiional music but festishised by his own country. Here we see the idea that ancestry must be preserved in its original form, without interpretation or influence if it is to remain authentic. Thus it can be argued that 'authenticity' in this context suffers suffers from the unrealistic or idealistic idea that culture is to preserved in isolation. In reality, preservation includes elements of both traditional culture, and the powers of globalisation, or, Rozali's music and mass media. (https://youtu.be/AD15tjgA5ek)

Section 4 : Tourism and Capacity Building

Capacity building programs are widely used for acquaintance of skills required to improve efficiency and performance. Side by side, tourism development and capacity building bring progress to communities, although, capability and knowledge are required to balance the environmental-social-economic axes for sustainability. Batik projects on the island of Sumatra grants good examples to explain the need for sustainable tourism development.

Batik projects in Sumatra raise the identity of several communities and focus on women's empowerment. Here the community looks to capitalise on skills, developing an activity traditionally passed through generations. One requirement of the project is to have women take control of the business, which in turn gave opportunity for new marketing promotion of tourist products - not only is the batik traditionally made it is ethically sourced and empowers woman, making it valuable to the new form of traveller tourists who wish to both visit and aid local communities.Local authorities agreed to integrate women's partnership created in the local community to transform raw materials from the nearby area for manufacturing their products. Capacity building programs included English lessons as foreign language (it should be noted that often these lessons were given the expense of the local language – giving evidence that Indonesia is changing and that Indonesians believe that learning English is more valuable than learning a 'dying language') –and business skills to keep their accounting tight and improve cost-efficiency production (Mot, 2015).

Tourism development in Indonesia is growing, and with it comes the potential for capacity building and participatory economic development. After construction of tourism facilities and infrastructure the development for institutional capacity building, programs and empowerment through tourism agencies has increasingly been brought about.

As seen in the case of the Batik in Serambi, tourism has the possibility of generating opportunity for a new generation of workers. It creates a realm for capacity building programs to deliver knowledge and skills t augment the new human resources necessary for tourism activities. As such the tourism sector has a vested interest in increasing human capabilities for the future, long -term programs are implemented at school level and university aimed at preparing the new generation. For example the newly created Werkudara community development program funds a program for high school girls the opportunity to sit the entry exam for an international scholarship to Cambridge University. Similarly, the vocational schools in Yogyakarta have English as a foreign language as part of their curriculum, but all differ on their special abilities. Skills, knowledge and attitudes are very much vocationally oriented to cover the needs of the emergent educated and able Indonesian of the future.

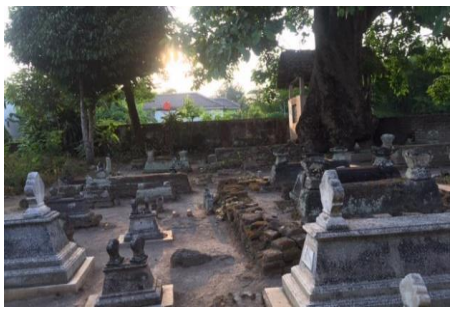
Section 5 Case-Study: Yogyakarta, Religious pluralism, resilience and eco-tourism

> *This section aims to contextualise the complexity of Indonesian culture as evidences by the numerous religions co-existing in the region of Yogyakarta. Here it will be discussed that while the international community views Indonesia as a homogenous Islamic state, the reality of the coexisting religions evidences a complex, resilient society. Yet despite this, tensions exist, particularly regarding economic development. Development projects centred on empowerment and stemming from Tourism hint to a chance for a resilient Indonesian future. However, to reap the benefits of such a future it will have to address the possible dangers of tourism as neo-colonialism and the danger it poses to culture.*

Indonesia has a long and rich history. This is evidenced with the existence of Kejawen, an Indigenous religion still being practiced to this day existing alongside Hindu, Buddhist, Islam and Catholic. Additionally, there were political whirlwinds from Kings and Queens, Sultans, Dutch occupation and eventually independence that brought many new opportunities for the Indonesian's. Evidence of Dutch occupation remains, along with

Chinese and Indian enclaves, adding to the rich tapestry of languages and dialects, with the indigenous Javanese language being taught and spoken widely.

The region of Imogiri, south-east of Yogyakarta, provides evidence of a strong respect for the past. Here I visited the cemetery of past royalty called 'Makam Rajaraja Imogiri', and was told of the stories of power, alliance and betrayal told by elders in the community who volunteer at the ancient cemetery. This is reflected in the graves of previous leaders that go on to inform current generations about stories of political alliances, military victories and the rich cultural history.



Despite this diversity, an image of Indonesia as an Islamic state is prevalent both within Indonesia and internationally. This perception has been both strengthened and challenged through daily observations in mosques as well as formal and informal conversations. The international media paints Indonesia as a fundamental Islamic state that must be carefully navigated. Incidents such as the Bali bombing, FBI and the informal conservative dress-code that must be adhered to by tourists support this view.

As such, some comment that Islam dictates the Indonesian people with its religious morals and ethics, and this has been explored in the case of Ahok vs Anies (Hodge 2017) that touched on the influence of Islam in politics and culture. To touch on this, Yogyakarta has an Islamic majority and so those in and around Yogyakarta will meet the day with the morning call to prayer sounding out from the many mosques.

However, the research conducted for this essay reveals a more inclusive culture that promotes not only tolerance, but acceptance and even celebration of all individuals, regional and district areas. There are many reasons for this and to develop them extensively is beyond the scope of this essay; however, the decentralisation of politics from Jakarta has resulted in more autonomy for the Yogyakarta region and this has translated into a myriad of community development programs that reflect the unique Jogja flavour.

An interview that was conducted with Bangbang from Imogiri on the 24th of September 2017 challenges this view and suggests that Java is in fact tolerant of diversity. Bangbang is a Catholic from East-Java who now lives and thrives in a small Muslim-majority village in Imogiri. He comes from a diverse family: his older brother is Islamic, his sister a Christian denomination, and his parents practice Kejawen. This family diversity has given Bangbeng an outlook that enables him to celebrate diversity within his local community. Furthermore, he states that he "sees the individual, rather than their religion."

This belief in diversity however makes him feel uneasy at the idea of a dominant Islamic presence that lacks tolerance in Yogyakarta. An example of this is when, close to his house a mosque sounds the call to prayer from its loudspeakers. Bangbang apologises and states that "it is really loud", before he goes on to explain a story about a Hindu temple that had a

mosque built next to it. The mosque would point the loudspeaker into the temple as an aggressive gesture, and upon retaliation the temple played music through loudspeakers back at the mosque, much to the dislike of the Islamic community.

This story explains Bangbang's fear of lack of tolerance for diversity, however it still does not discourage him, and many others like him from celebrating the diverse Javanese culture. He is a pillar of the community who participates in monthly community meetings that address issues such as community development, pollution in the nearby stream, youth unemployment, eco-tourism opportunities as well as cooking for the others for the communal catch up. During these meetings he says that, "other members of the community are more likely to discuss my lack of wife and children rather than my religion. They treat me as an equal in the community as long as I give back and support the local area." After a walk around Imogiri with Bangbang, it was clear that the pride he takes in the area is coupled with the respect that he garners from the community, regardless of his religion or marital status.

On the other hand, the idea of an Islamic state has united Indonesia and created a strong community with shared morals values and ethics. This serves to strengthen family ties and provide a solid foundation for communities, religions and Indonesia and a whole. However, the relationship between religion and the State may have gone too far and this has alienated many people who live in minority groups from engaging and participating in mainstream s

The director of 'Madina Al-Quran' (Agus Sunandar) who owns and runs a Quran design and print company states that on an international stage Islam is misunderstood. With a company slogan of 'You are What You Read', prompts fundamental teachings like tolerance, love and kindness and this was shown as he invited me to breakfast with his family and employees before a team building activity on the beach.

His company is diverse, and employs people from all over Indonesia. Strictly Islamic, Agus raises some interesting points, such as the ability to create a company that is like a family based on religious values. Obviously, a Quran printing company is not religiously diverse, when asked about a religiously diverse Indonesia he does not want to answer. Nonetheless, he celebrates my time with him and encourages a visit to see the workplace in the near future.

These two examples show both the existence of a clear Islamic majority, and diverse minority groups that coexist in Indonesia. Each inspired to explain their unique perspective of life in Indonesia however despite this, tensions exist. Particularly in regard to economic development. One of the best ways to address this tension is through education and the youth.

There are numerous organisations running programs that empower the youth through education. These include, Satan Nama's youth politics, and, Werkudara's English speaking education for orphaned youth. Additionally, a Catholic Church in Southern Jogja run programs for 63 orphaned girls from around Indonesia. Here the girls, ranging in age from 7 to 15 are provided with a safe home, and are given access to their choice of education – e.g. Catholic, or Islamic majority state schools, and upon graduation are given the option to either continue their studies, or, are helped to enter the workforce. These and other such programs give the opportunity for minority groups to participate in an inclusive Indonesia and in turn strengthen it by providing diversity and resilience.

In saying this, Indonesia has enjoyed steady growth in population and GDP. Currently sitting at 4th for population and 14th for GDP, it is predicted to ascended into the top 10 by 2020 (Brontowiyono 2017). This has resulted on their international reputation becoming increasingly influential (and scrutinised), especially in ASEAN nations, South East Asia and Australia. The New Colombo grant and ACICIS go on to strengthen the Australia and Indonesia relationship since 1994 and has grown steadily ever since. So, with ongoing aid and investment from Australia into Indonesia, it could be argued that there is an agenda for soft diplomacy. Additionally, an investment of $850 million from the Australian government for tourism across Indonesia's 34 provinces seems like a large outlay. (Melissen & Sohn 2015, Morris 2017).

While economic growth is apparent in many aspects of Indonesia, along with ongoing population growth, the current Islamic majority that controls much of Indonesian politics cannot sustain the growing social change and diversity. "Economic growth has not been accompanied by social growth; that is, it has not led to our being happier, more relaxed, less indebted, more skilled, and better connected with a stronger sense of community." (Hopkins 2010:7) In other words, strong economic growth alone will create more problems that are beyond the scope of this essay however they touch on unequal distribution of wealth that creates a larger divide and growing tensions between rich and poor.

Furthermore, this has been raised by Australian DFAT officials who state in the article Overview of Australia's aid program to Indonesia that "economic growth is now slowing and inequality rising. At least 100 million people… continue to live on $2 or less per day… Furthermore, low growth means the poor will find it harder to escape poverty" (DFAT 2017). There have been much rhetoric surrounding this issue such as support for women's financial autonomy, micro-financing, education for children and those with disabilities and combating corruption. However, this essay will focus on a call to increase tourism.

The island of Bali has embraced international tourism, and this has shaped the region into the hotspot that it is today. The transition from a rice farming area to a tourist haven has had a large impact on the day to day lives of people, mostly in the southern areas and Ubud in particular. Additionally, the younger Balinese would prefer to taxi holidaymakers rather than spend backbreaking hours in the sun farming rice - and they can make much more money doing so- however arguably at the price of dilution of the traditional cultural and way of life.

Off the back of Bali's tourism success is the plan to create "10 New Bali's" to spread tourism across the country. Yet, former chairman of the Bali chapter of the Indonesian Congress and Convention Association, "said the government needs to be 'cautious' in its pursuit of visitor targets." (Morris 2017) This could emulate Bali's tourism successes, and would undoubtedly create jobs, bring money highlight other beautiful parts of Indonesia and provide much needed opportunities for investment in some poorer regions. Furthermore, the "10 New Bali's" would create a sense of pride for locals to embrace a tourist onslaught. However as seen in many of the Balinese and especially Kuta's nightclubs, beaches and hotels, many of the travellers show little respect for the local customs and traditions. In other words, with tourism bringing money to various regions, it also creates more problems.

As mentioned in Richard Mathews' blog (2017) "What the 'Ten New Balis' Could Mean for Eastern Indonesia and Australia", many of the areas do not want to become a new Bali, instead it is clear that an educated, diverse and resilient nation must create strength and independence. It is thought that through unique culture and an amazing environment, Indonesia will attract the right tourist. Steffen (2008:53) claims that "when we can buy it anywhere, it seems to come from nowhere", and this relates to the tourist that embraces the local customs as well as gives back to the traditions that shape Indonesia, instead of the Australian in shorts drinking Bintang, eating McDonalds on a beach in Indonesia.

The future of Indonesia has great potential. Built on a proud history that celebrates diversity and community, burgeoning on the world stage with a growing economy and wonderful natural resources. It seems Indonesia has the choice between rigid order of a political Islam, or the gamble of diversity and growth. The research shapes the idea that there is an inclusive and diverse population that endeavour to provide a solid platform for all Indonesians.

However, while development projects such as those discussed, combined with education and empowerment hint at Indonesia's potential. The complexity of globalisation and tourism - a key component of Indonesia's development plan - must be recognised and addressed, as there exists the real potential for increased inequality and neo-colonial relationships. Similarly, while the religious pluralism of the Yogyakarta region speaks to the resilience of its culture, it is not necessarily immune to the added pressure of tourism and the increased influence of the 'West'. As such it is imperative that any tourism-as-development is eco-tourism, undertaken in consultation with local communities.

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Implementation of Total Quality Management (TQM), Organizational Culture and Performance: Evidence from Indonesian Micro, Small and Medium Enterprises (MSMEs)

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Abstract. Organizational performance is a description of a level of achievement of an implementation of an activity in actualizing goals and objectives of an organization contained in the strategic planning of an organization. The organizational performance can be seen from the extent to which the organization can achieve the goals. To measure this organizational performance, it can be used quantitative and qualitative approaches. Total quality management (TQM) and organizational culture include variables that affect an improvement of the organizational performance. TQM is a philosophy of quality management to improve all organizational performances based on leadership, customer focus, education and training, benchmarking, teamwork, continuous improvement processes, employee engagement, supplier quality management, recognition, and rewards. The organizational culture provides assertiveness and reflects specifications of an organization so that it differs from other organizations. The organizational culture encompasses all behavioral patterns of members of an organization and becomes a grip for each individual in interacting with both the internal and external environment within a Micro, Small and Medium Enterprises (MSMEs). Micro, Small and Medium Enterprises (SMEs) have a vital role in the growth and development of economy. Furthermore, MSMEs also exist not only in developing countries (Indonesia) but also in developed countries. Moreover, the role of MSMEs not only has a role in the growth and development of the economy, but also has a very important role in addressing unemployment problems. However, these situations are not supported by quality management as a factor to support a success in a MSMEs and the existence of an organizational culture which can help stand small and medium enterprises in a competition. The objective of this study was to determine the correlation and effect between the implementation of TQM and organizational culture on MSMEs' organizational performance in Indonesia. The data analysing technique was descriptively carried out by multiple linear regression. The result of this study is expected to know the correlation and effect between implementation of TQM and organizational culture on organizational performance in Indonesia and to provide practical knowledge for Indonesian practitioners and academics to understand the eminence of the implementation of TQM and organizational culture on MSMEs' performance.

Keywords: Organizational Performance, TQM, Organizational Culture, MSMEs

1. Introduction

The expanding the market and survive in a competitive global marketplace requires companies to provide product and service of quality. Implementation of TQM in the organization has been the answer to this challenge of global competition. TQM will bring the companies to a world class service and manufacturing organizations, by providing the kind of quality products and services required for customer satisfaction, have gained competitive

edge and greater market share [30]. It has become a practice for modern industry to improve organizational performance over the past few years. In addition, the implementation of TQM is influenced through culture. The culture is a very important variable and has a relationship between success and barrier of TQM deployment.

TQM literature indicates that organizational culture is an important aspect in the successful implementation of TQM [6][10][12][13][26]. Organizational culture has affected soft and hard TQM. The clan and adhocracy cultures provide the best working environment for the successful implementation of TQM[2]. Many companies fail to implement TQM because they do not recognize that the implementation of the procedure may be a fundamental change of direction, the values and culture of their company[8]. Other researchers show organizational culture is being recognized increasingly as an important determinant of quality management success and organizational performance[4][23][27][31]. In the Indonesian context previous research has proposed the obstacles to key issues of the quality management system are characterized as socio-cultural dynamic rather than technical-structural Indonesia[13]. Implementation of TQM has a positive and significant influence in shaping the organizational culture[3].

The key point of this study is quality management, and they are important for both practitioners and academics. The aims of this study are to investigate a relationship between organizational culture, TQM Implementation and company performance on Indonesian MSMEs. The result provides an important contribution in the better understanding implementation of TQM and ISO process. These help to build theories and models of total quality management practices in TQM and ISO implementations.

2. Organizational Culture, Total Quality Management and Performance

Understanding the relationship between organizational culture, TQM implementation and performance before the implementation of TQM in MSMEs are important. Changes in working environments produce different emphases within an organization, thus, new approaches to learning and adaptation are required. The cultural change can be initiated by top management[7]. Leaders must focus on what the objectives of the organization and implement appropriate strategies and in accordance with the subordinates to achieve the company's success.

According several earlier researches, it has been found that organizational culture is an important aspect in the successful implementation of TQM[7][12][26][13]. Hofstedes dimension national culture and organizational culture based on Competing Values Framework (CVF) impact successful TQM implementation[21][33]. The national culture has a positive effect on the organizational culture, while the organizational cultures have a significant effect on the implementation of TQM in Indonesia[21]. In the context of organizational performance, the organizational culture has a significant effect on the implementation of TQM and organizational performance[26].

3. Methodology

A survey instrument in this research is developed based on the previous research. The model is used to investigate a relationship between organizational culture, TQM implementation and performance in SMEs. In this study, the organizational culture variables were based on Organizational Culture Assessment Instrument (OCAI), as developed by Cameron and Quinn[8] is used to measure organizational culture. While the Potential TQM implementation constructs were identified from the instruments of Aziz and Morita[3]. The company performance was based on the work of Salaheldin[26] and M. Mar FF et al[20]. In the study participants are expressing their opinion, their agreement or disagreement using a seven-point Likert scale, namely: (1) Strongly Disagree until (7) Strongly Agree. Based on research objectives, to clarify relationship between organizational culture, TQM

implementation, and performance in Indonesia MSMEs, following the three hypotheses are offered in this study:

Organizational culture is defined as the values, beliefs, and hidden assumptions that organizational members share[7]. Cameron and Quinn (1999) built the competing values framework (CVF) model of organizational culture which was developed based on research on the major indicators of effective organisations. The CVF is one of the most extensive models and has been used in empirical studies on organizational culture. This framework was developed according to two main dimensions: flexibility as opposed to stability, and internal as opposed to external focus. Plotted on a Cartesian plane, these dimensions give rise to four main quadrants, each of which represents a dominant culture type: clan, adhocracy, market, or hierarchy. TQM literature indicates that organizational culture is an important aspect in the successful implementation of TQM[6][12][13]. The clan and adhocracy cultures provide the best working environment for the successful implementation of TQM[2]. Many companies fail to implement TQM because they do not recognize that the implementation of the procedure may be a fundamental change of direction, the values and culture of their company[8]. Other researchers show organizational culture is being recognized increasingly as an important determinant of quality management success and organizational performance[4][27][31].

H1. Organizational culture significantly affects TQM implementation. Organizational culture represents four factors such as clan culture (OC1), adhocracy culture (OC2), hierarchy culture (OC3), and market culture (OC4).

Organizational performance comprises the actual output or results of an organization as measured against goals and objectives[24]. Measuring performance is a critical factor and crucial for the effective organization because it requires to improve the organizational performance. Several researchers have been analyzed the impact of Organizational culture and organizational performance. That Organization culture had a positive and significant effect on the organization performances [10][23].

H2. Organizational culture significantly affects organizational performance. The performance represents two factors such as financial performance (OP1), and nonfinancial performance (OP2).

Several researchers have been analyzed the impact of TQM practices and organizational performance[15][19][25][26][28][33]. As conclusions, they all consistently found a positive and significant effect between the implementation of TQM practices and organizational performance. In our study, performance measured in two dimensions: financial and non-financial. Financial performance measured by financial measures such as return on assets, profit to revenue ratio, revenue growth and net profits. Non-financial performance are secondary measurement result of the implementation of TQM, which measured using market share, customer satisfaction, products/service defects or failures, customer complaints, employee satisfaction, employee turnover, and reputation among major customer segments. Accordingly, performance measures have been suggested by previous researcher[17][27] are used to measure performance in this research. Al-Hawary and Abu-Laimon (2013) assessed the impacts of TQM practices on service quality in Jordan cellular communication companies. Their results showed that the leadership, information and analysis, customer focus, continuous improvement, and supplier quality management had positive effects on service quality.

H3. TQM implementation significantly affects organizational performance. TQM Implementation represents ten factors such as Leadership (TQM1), Vision and Plan Statement (TQM2), Customer Focus (TQM3), Education and Training (TQM4), Benchmarking (TQM5), Teamwork (TQM6), Continuous improvement process (TQM7), Employee Involvement (TQM8), Supplier Quality Management (TQM9), Recognition and Reward (TQM10)

The population of this study is the MSMEs in Lampung, South Sumatera, Jakarta, West Java , and Bali province in Indonesia that has implemented quality management or TQM. The company information was obtained from the Indonesian Statistics Bureau. In Lampung and Surabaya province have several small and medium companies. Prior to distributing questionnaires, managers are interviewed using the telephone. In addition to those perceptual measures, we asked a yes–no question in the questionnaire to the respondent if the company had implemented a TQM or quality management, if so when they started. The respondents have to have some knowledge of the implementation of quality management. The type of sample and the number of companies are determined on the basis of information require in this study. We visited each company and checked the progress of each company.

A sample of companies was randomly selected from the database. A total of 319 questionnaires from senior executive, general manager, quality manager, managerial level and ordinary employees in these firms. The Breakdown of the respondents' profile in shown in this table:

Table 7 Breakdown of the Responden

Province	**Frekuensi**	**Percentage (%)**
Lampung	116	36,4
South Sumatera	50	15,7
Jakarta	61	19,1
West Java	42	13,2
Bali	50	15,7
Unit Businnes	**Frekuensi**	**Percentage (%)**
Manufacture	132	41,4
Service	94	29,5
Others	93	29,2

4. Result and Discussion

Data were collected from respondents for each type of firms has been analyzed using SPSS 21. Factor-analysis and Cronbach's alpha test conducted by analyzing the data collected. The reliability tests with Cronbach's alpha and the validity test with factor-analysis formed in a single factor with eigenvalue greater than one result from Aziz and Morita[3].

The multiple regression analysis used four factors of organizational culture as independent variables, TQM constructs and two factors of organizational performance as dependent variables, as shown in Table 3. The organizational culture significantly affected TQM, confirming hypothesis H1. Clan and adhocracy cultures had a significant positive effect on TQM. For hypothesis H2, only one factor of organizational culture (Hierarchy culture) had a positive and significant effect on finansial and non-financial performance.

Table 8 Profiles of the respondents by job position and industry

Job Position	**Frequency**	**Percentage (%)**
CEO/GM/Directur	154	48,3
Engineering Manager	9	2,8
HRD Manager	3	,9
Quality Manager	6	1,9
Production Manager	32	10,0
Staff	96	30,1
Others	19	6,0
Industry	**Frequency**	**Percentage (%)**
Food industry	97	30,4
Funiture and Wood Industry	42	13,2
Mining	2	,6
Clothing, Garment and Leather	39	12,2
Cemical and Petrochemical	4	1,3
Agribusiness Industry	8	2,5
Others	127	39,8

Table 9 Regression analysis between organizational culture, TQM, and performance

Predictors (Organizational Culture)	**TQM**			**Financial**			**Non-Financial**		
	R = 0,828			*R* = 0,580			*R* = 0,585		
	F-value = 136,645			*F*-value = 12.296			*F*-value = 32,550		
	Significance = 0.000			Significance = 0.000			Significance = 0.000		
	B	***t***	**Sig.**	***B***	***t***	**Sig.**	***β***	***T***	**Sig.**
Clan	,061	,986	,325	,099	1,105	,270	,106	1,184	,237
Adhocracy	,333	6,719	,000**	,182	2,526	,012*	,205	2,852	,005**
Market-1	-,067	-1,497	,135	,014	,211	,833	,082	1,265	,207
Market-2	,329	7,651	,000**	,107	1,720	,086	-,012	-,195	,845
Hierarchy	,295	4,695	,000**	,270	2,957	,003**	,281	3,096	,002**

Note: $^{*}t \geq t_{(0.05)} = 1.657$; $^{**}t \geq t_{(0.01)} = 2.356$

Organizational culture is an important aspect of TQM implementation. The clan culture emphasizes commitment, communication, employee involvement, teamwork, and development while concentrating on flexibility and discretion with internal strengthening. While the adhocracy culture emphasizes creativity, flexibility, innovativeness, and adaptability, both culture's dimensions suggest a conducive environment for the effective implementation of TQM. This result is consistent with previous studies [1][2]. The successful implementation of TQM is determined by an awareness of and adaptation to organizational culture before implementation. In addition, only market culture had a significant effect on non-financial performance in the relationship between organizational cultures and organizational performance. The market culture emphasizes productivity, profitability, and goal achievement with stability and control to enhance external competitiveness. The success for a market culture is measured by a high market share, customer satisfaction, and a strong

reputation among major customer segments. Indonesian companies can adopt a market culture to improve their non-financial performance.

The multiple regression analysis used 10 variables of TQM constructs as independent variables and two factors of organizational performance as dependent variables, as shown in Table 3.These results show that TQM implementation had a significant effect on organizational performance, confirming hypothesis H3. Five constructs of TQM implementation (leadership, education and training, teamwork, supplier quality management and recognition and reward) had significant positive effects on financial performance, while benchmarking had a significant negative effect. Analysis shows that the five constructs of TQM implementation (leadership, teamwork, continuous improvement process, supplier quality management and recognition and reward) had significant positive effects on non-financial performance, while benchmarking and vision and plan statements had significant negative effects.

These results are consistent with those of the previous studies [26][27]. Thus, leadership correlates to financial and non-financial performance. Leadership can be impactful in a variety of ways. For Indonesian companies, leaders can institute education and training to improve employee skills and achieve organizational goals. They can also develop teamwork to manage change, implement plans, solve problems, and create a sense of empathy and engagement. Teamwork can improve the quality of products and services, lower rates of failure and defective products, and was fundamental to successful TQM implementation. Additionally, companies require continuous process improvement to increase productivity, reduce failure rates, improve process efficiency, and stimulate innovation. This is also essential for supplier quality management to improve product quality and organizational performance. A continuous supply of raw materials with the required quality is vital in all stages of manufacturing. Long-term relationships with inspection teams can help minimize the cost of raw materials[17]. In addition, recognition and rewards are important business tools. They can help improve performance within an organisation and can effectively stimulate employee commitment to quality. Companies must develop a formal compensation system to encourage, evaluate, reward, and recognize individual and team efforts at quality enhancement and improved customer satisfaction[4].

Table 10 Regression analysis between TQM constructs and performance

Predictors (TQM constructs)	**Financial**			**Non-Financial**		
	R = 0,632			*R* = 0.605		
	F-value = 20,533			*F*-value = 17,824		
	Significance = 0.000			Significance = 0.000		
	β	***T***	**Sig.**	***B***	***t***	**Sig.**
Leadership	,064	,914	,362	,181	2,511	,013*
Vision and Plan Statement	,288	3,572	,000**	,304	3,676	,000**
Customer Focus	,182	2,777	,006**	,105	1,561	,120
Education and Training	-,112	-1,474	,142	-,143	-1,821	,070*
Benchmarking	,053	,803	,423	,091	1,337	,182
Teamwork	-,147	-2,232	,026*	-,108	-1,591	,113
Continuous Improvement Process	-,132	-1,676	,095	,049	,610	,542
Employee Involvement	,208	2,601	,010**	,152	1,851	,065*
Supplier Quality Management	,239	3,618	,000**	,140	2,069	,039*
Recognition and Reward	,066	,857	,392	-,076	-,969	,333

Note: $^{*}t \geq t_{(0.05)} = 1.657$; $^{**}t \geq t_{(0.01)} = 2.356$

Furthermore, Table 4 shows that benchmarking and vision and plan statements have significant negative effects on organizational performance. However, previous researchers have found benchmarking to have a significant positive effect[30], as it is one way to improve product quality, reduce production cost and increase sales. In addition, vision and plan

statements results revealed that there is no clear long-term vision towards improving organizational performance. Whereas Zhang[33] proposed vision, and plan statements provide a clear overview of strategies for an organisation to achieve its goals. Vision provides direction and the path for transformation. On the other hand, Table 3 shows that employee involvement did not have a significant effect on organizational performance. This could be due to Indonesian companies not having employees who are thoroughly engaged in performance improvement. The aim of employee involvement is to encourage them to contribute more to the firm. However, unfortunately, some companies only view employees as one of the company's resources. Thus, managers should trust and care for their employees, and encourage and motivate them to develop and utilize their full potential.

5. Result and Discussion

Numerous hypotheses testing MSMEs show a number of relationships between the variables as follows:

- Organizational culture has a direct impact on TQM implementation. Clan and adhocracy cultures have significant positive effects on TQM. However, only hierarchy culture shows a positive effect on non-financial performance.
- TQM constructs play a positive role in improving organizational performance. TQM implementation requires leadership, education and training, teamwork, continuous improvement process, supplier quality management, and recognition and rewards. These constructs are vital to improving organizational performance.

The results of this study indicate that organizational culture has an effect on TQM and organizational performance. Additionally, TQM constructs have a positive impact on organizational performance.

This research addressed the issue of culture and its relationship with the implementation of TQM. Despite our findings, and there are opportunities for further research. First, the instruments in this study can be used for larger sample sizes that have more mixed demographics. Second, the data collected in this study was subjective and dependent on the perceptions of the respondents. Further research could include observations using a longitudinal case study. Third, further research could consider financial statements and other performance measures as indicators of company performance.

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Analysis of Community Capacity Building in Social Forestry Development: A Review

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Abstract. Social forestry has shifted the forestry development paradigm of conventional forest management to community-based forest management. History of community-based forest management has been developed in Java began during Dutch colonial on forest production in 1873 and today It has grown widely, both within and outside the forest area. However, until now social forestry has not been able to overcome the population pressure problems in the form of deforestation and forest degradation on forest areas. Therefore, it is very important to recognize and elevate the role of local communities in forest management. The success of social forestry can be achieved by developing a pattern of cooperation through capacity building of local communities in community based fores management. To develop community capacity, it needs to know the basic concept of community capacity building in social forestry system. A review of community capacity in social forestry are very useful for developing a conceptual framework of local community capacity in building of social forestry system. Community capacity in social forestry system is developed to realize forest sustainable and community welfare around the forest.

Keywords: Community, Capacity Building, Social Forestry

Introduction

History of participatory forest management has been developed a long time ago in Indonesia It has started in Dutch colonial since 1873, by application of intercropping system on teak production forest management in Java. Participatory forest management has become an international movement, since published in 1978 at the 8th FAO World Forestry Congress in Jakarta with one of the themes is "Forestry for Local Community Development" (Fisher, et al., 2007). Social forestry practices as a participatory forest management program was initiated by Perum Perhutani, namely: Prosperity Approach program, year 1972-1981, Forest Village Community Development Program, year 1982-1985, Social Forestry Program, year 1986-1995, Integrated Forest Village Community Development Program in 1996-1999, Community Based Forest Management Program, year 2000 until now (Pujo, 2017).

Social forestry development paradigm has shifted from conventional forestry (timber based forest management) to community-based forest management. The Indonesian government has recognized the need to involve communities in forest resources management in the early 1980s. Social forestry have become part of Perum Perhutani's policy in managing forest resources in Java. Social forestry practices implemented to overcome the population pressures on forest in developing countries, including Indonesia (Pujo, 2017). However, social forestry system has not been able to overcome the problems of population pressure on forest areas yet until now. This indicated by high rate of deforestation and forest degradation in Asia and South Asia (Dove, 1995). It seen from deforestation rate periode of 2005-2010

which averaged 0.7 million ha / year In Indonesia (FAO, 2010).

The poverty problem of community around forest area is one prime causes the population pressure on forests. Population pressure on forests greater were about 20.37 % of the total population of Indonesia, which live in village area (in and around forest areas), classified as poor (BPS, 2010). Based on several studies have shown also that social forestry practice has been unable to alleviate poverty in rural communities around the forests in Java (Nurrochmat, 2000; Rosyadi and Nuryartono, 2003; Uzair, 2008; Wasito and Sumarwan, 2011; Maryudi, 2011) .

Ineffectiveness of social forestry systems in addressing population pressure is thought to occur because the pattern has not established good cooperative relations in forest management yet between forest manager and local community. This is due to the lack of power and interests of local community in forest management. It can be shown from Community Based Forest Management (CBFM) model in BKPH Parung Panjang, KPH Bogor, for example, that Perum Perhutani still dominate in forest management (Ansori, 2012). The lack of cooperation due to the interests differences between local community and forest managers. Due to the interests differences, CBFM systems in KPH Bandung Selatan, for example, would lead to land using competition between forest protection activities undertaken by forest managers with land use activities undertaken by local communities (Purwita et al., 2009). This indicates that social forestry developed system has been unable to accommodate the power and interests of the parties. Therefore, it is very important to recognize and elevate the role of local communities in social forestry management.

Recognition and legitimacy is initial success of overall stakeholder collaboration. Cooperation between and within local communities is an important precondition for successful of forest management (Bizikova et al., 2012). The success of conservation can only be achieved by developing capacity of local communities in forest management on the basis of mutual benefit and bring together the community's interests and interests of the parties (Fay et. al., 2007). Therefore, It is very important to review basic concept development of community capacity in the system to be developed in social forestry. This review uses two main concepts, namely: community capacity and social forestry .

Social Forestry: Definition and Characteristics

In "Dictionary of Forestry" term of social forestry (SF) is a forestry and reforestation program by directly involving local community, including the values and local institutions (Helms, 1998). Social forestry is a forestry whichs aims at producing flows of production and recreation benefits for community or forestry activities that ensure production and amenity benefits to public wether in public land (state) or private land (Westoby, 1968). Social forestry has objective to meet the basic needs of local population from forest ie, fuel, fodder, food, timber, and environtment benefits (Tiwari,1983).

Some definitions of social forestry has been stated by several experts on International Seminar of Social Forestry in Yogyakarta, 29 August to 2 September 1994 (Simon, 1994), namely:

1) According to Rebugio and Wiersum, SF is a collective name of various forest management strategies vary that emphasize equitable distribution of benefits on forest products for local community, increase the participation of local organizations and communities in forest management and wood biomass.

2) According to Simon, SF is the strategy to solve local problems with maintaining the surrounding environment.

3) Perum Perhutani define SF is a forest management system that emphasizes active community participation in forest management activities that aim to establish forest plantations (reforestation success) and simultaneously improve the wellfare of local communities.

4) Ministry of Forestry defines social forestry as forest resource management system on state land or private land by involving local communities as the main actor and or partners in order to achieve forest sustainability and improve their well-being. Beside to achieve forest sustainability, social forestry as a forestry development policies also intended to promote business competitiveness based forestry development system, regional governance and local community-based institutions.

For this reason (point 4), SF synergize the potential of government resources, private and public as well as natural resources to create sustainable forest management system and also to improve the welfare of communities around forest areas (Ministry of Forestry, 2004). Ministry of Forestry has established a system of social forestry which is implemented by Community Based Forest Management (CBFM). The concept of CBFM is a new paradigm of forest development more reliance on public interest (especially forest communities) through a collaboratove approach where the community is a main actor in forest development. The purpose of collaborative approach is to achieve sustainability of forests functions and benefits (Sustainable Forest Management) which is implemented through cooperation with various parties (stakeholders). Based on objectives and the approach which is used, It can be formulated several principles in practice of CBFM, namely: 1) Collaboration or partnerships, which required the equality of parties. 2) Understanding the role of each party. 3) Sharing, means share input and output. Inputs include share space or space in the forest, or the means of production, including labor costs. 4) The balance of economic and environmental benefits. 5) The legality or the rule of law (Ministry of Forestry, 2010).

Social forestry as a strategic activities of CBFM has been implemented, both initiated by the government or state-owned enterprise (Perum Perhutani) or private. In Java, Perum Perhutani as state-owned enterprise has developed CBFM systems based on the decision letter of directors of Perum Perhutani Number 136/Kpts/Dir/2001. CBFM is intended to encourage a "sense of belonging" of the community and enhance the optimal and proportional division of roles and responsibilities in forest resources management. There are six principles that should be exist in a CBFM approach within social forestry systems, namely: (1) CBFM is a system of forest management, (2) Intended to increase quality of life, (3) Intended to improve the environment quality, particularly forest resources, (4) Respect and recognize diversity initiatives, (5) Encourage multi-stakeholder collaborative process, and (6) Supported by government policies. As a system, CBFM should include the balance of environmental, economic, social and cultural benefits (Arnold, 1991).

Based on the various definitions, term of social forestry can be defined as a system of forest resource management by involving local people as main actors and actively partner, both on state or private forest land, to solve the problems of local community with an emphasis on equitable distribution of benefits in order to achieve sustainable forest management and well-being of local communities. Social forestry is a bottom-up approach involving local communities power over resources and decisions in managing forest resources. Devolution of forest management through social forestry system can achieve development goals.

As a system, SF is not concerned with wood products only, but also consider non timber forest products. The both principle of SF regarding the security and long-term access to benefits of forest resources for local communities and indigenous peoples. It required the certainty of people's rights to forest resources. Local communities are the closest stakeholder that interact directly with the forest and they are a party that should will gain immediate impact (positive or negative) of forest management. To achieve local community well-being, SF should be able to mobilize community participation and open up economic opportunities and developed local economies. Economic activity must developed to encourage the utilizing forest resources in a sustainable manner. However, social forestry system should conducted by applicaton of sustainable social forestry manner in managing forest management. To reach sustainable social forestry developmnet is required the role and local community capacity in sustainable forest management. Therefore, It is very important to understand community capacity consept, that could be explained in details below.

Community Capacity: Definition and Characteristics

Capacity refers to ability or conduct (ability for or to do); ability (capability), an eligible state (a condition of being qualified). Community capacity is a characteristic that affects the ability of communities to identify, mobilize and resolve social problems and public (Goodman et al., 1998), as well as combining various forms of capital and institutional context in relation to produce outcomes (Beckley et al., 2008). Various capital, according to Ahmed et al. (2004) are interconnected. Use one of the capital will create new capital and increase productivity on the other capital. Capital can be transformed from one form to another (Fey et al., 2006). Ability to convert capital (Simmons et al., 2011) to performance (Brown et al., 2001) or outcome (Beckley et al., 2008; Benett et al., 2012).

Chaskin (2001) identifies the concept of capacity, namely: individual, organization, connection or participation that describes the relationship between capacity and performance. Chaskin find common factors that enfluence of community capacity characteristice, namely: (1) the existence of resources (2) networks of relationships, (3) leadership, and (4) support for some kind of mechanisms for or processes of participation by community members in collective action and problem solving. Liou (2004) and UNDP (1998) grouped into three levels of community capacity characteristics, namely: micro (individual and family), meso (organizational) and macro (social). To achieve performance, assets or capital mobilized and implemented through agency or actor, namely: individuals, organizations and networks (Chaskin, 2001).

Capacity concept is widely used in other development sectors, especially health, education, economic development (Labonte and Laverack, 2001; Smith et al., 2006; Laverack, 2006; Higgins and McCorkle, 2006; Simmons, 2011), tourism (Aref, et al, 2010) and climate change (Berman et al., 2012). While the community capacity concept in area of social forestry is limited. To achieve the performance of social forestry development needs capacity to mobilize forest resource as capital or assets through agency or actor, namely: individuals, organization and networks.

Based on the theory above, It can be explained that community capacity consept has an important role to mobilize capital in a community then converted it to achieve development performance. To reach the performance required tranformation process. The tranforamtion process to achieve performance required community as a main actor, behavior process and community capacity characteristic. All of this can be explained in details below.

Community Capacity Building

According to Thompson et al., (2003) states the components of Community Capacity Building (CCB) includes the individual level, to develop human resources and community leadership; levels of organization, to develop the organization's ability to serve the community in the development and social levels, to emphasis on relationship between community residents, local groups and local community organizations to build community development. However, the literature and experience in field measurements focused capacity development at organizational or personnel / human resources level (Merino and Carmenado, 2012) to build community capacity. Therefore, to develop community capacity, we have to focus on indiviadual or organizational level.

To develop community capacity is required understanding the characteristic community capacity. Merino and Carmenado (2012) and Park et al. (2012) divides the characteristic community capacity in two major groups, namely individual capacity and social capacity. Park et al. (2012) stated that individuals capacity characterized in two dimensions, namely: technical capacity and capacity behavior. Technical capacity, among others, financial skills, technology skills, political skills, planning and management skills. Behaviors capacity related to personal skills needed in relationships with people and groups, such as leadership or entrepreneurship. Capacity needed for improving social skills that enabling community-

based organizations or companies succeed in technical contextual and behavior capacities. Behavior capacity among other commitments, trust, network building, entrepreneurship, norms, team work, organizing groups, sense of community, shared values, negotiating skills and political contextual capacity include vision and strategy, legal and financial skills, or institutional development. Merino and Carmenado (2012) also summarizes characteristics of organizational capacity and grouped according to levels: the individual and social level. Characteristics of community capacity at the individual level, are: leadership, entrepreneurship, skills, organization, management and planning, on the level of social, among others: the participation and cooperation, trust, communication, networking, norms, team work, vision and strategy.

To enhance community capacity, it also needs to understand interaction process in a community. Construct of community capacity by Chaskin, et al., (2001) and Wallerstein et al., (2008) focuses on mechanisms through micro to macro interaction in a community of individuals that accumulate in the long term create capacity at the community level that affect individuals in community. Taylor (2012) stated that community-based organizations have important role in influencing the success or failure of public development. To achieve development goals, community capacity is influenced by socioeconomic variables and ecological variables. Socioeconomic characteristics are the traits inherent in each individual within a local community such as: gender, type of occupation, level of income, land area, and long experience. Construct various levels of social structure have important role in affecting the community capacity in health management development (Jung and Viswanath, 2013).

Develop capacity means helping individuals, groups, and communities to empower the expertise, resources and geographical advantages to consider the use of force and the opportunity to increase the communities capacity (Liou, 2004) through community participation, community competence, community empowerment, community development and social capital. Developing capacity also means the process of developing ability to take action in order to mobilize or convert capital (human capital, social capital, economic capital, natural capital) to achieve the desired objectives (Nelson et al, 2010; Simmons, 2011) through adaptation strategies (Cinner et al ., 2011). The concept of capacity development is the process of generating the performance of an act, to: strengthen ability; 'make a community to thrive; development involving action; 'fix and help; 'lift ' etc.. All of this is required for achieving development goals (Simmons, 2011).

From the theory mentioned above, community capacity building is important to reach success of public development. To achieve this development goals, needs to build community capacity by mobilizing community participation, community competence, community empowerment, community development and social capital. Community capacity mobilized throught transformation process to generate the development performance, which is illustrated in Figure 1. All of the community capacity theory that mentioned above is required for development of social forestry,

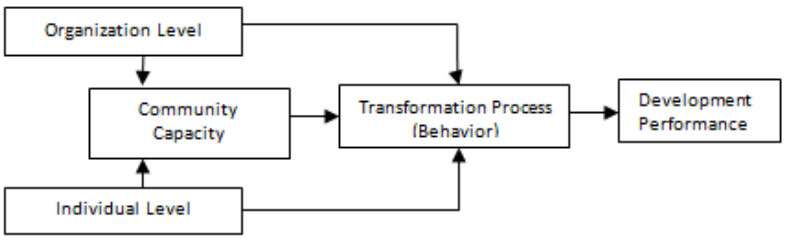

Figure 1. Framework of community capacity mobilizing in development sector

Analysis of Community Capacity in Development of Social Forestry System

Why do social forestry need community capacity

According to Nair (1993), social forestry is a practice of tree planting and using to pursue social objectives or goals: poverty alleviation through benefits delivery to local people (Nair, 1993). Task Force (1987) defines social forestry as terms for public, private and communal initiatives for ensuring "active participation of rural people in planning, implementation and benefit sharing of tree growing schemes" (Task Force, 1987). To reach success social forestry need collaborative approaches to forest management provide benefits to local people; exchange costs of conservation; continued access to forest products or through income generation; and to contribute to conservation. (Fisher, 1995;) to solve problems social and ecological system (Scarlett, 2013). Success of conservation can only be achieved by developing the capacity of local communities in forest management (Fay et. al., 2007). Social forestry also defines as application of agroforestry tools or the integration of tree growing into farming systems either spatially or temporarily (Gregensen, 1989).

Judgment must be used in deciding how and when to integrate trees into farming systems, because trees may also compete with agricultural crops if not introduced appropriately (Gregensen, 1989), and how to build cooperation between forest manager and local community in forest management, It is needed community capacity. From the definition also showed that to achieve success social forestry, community capacity is an important thing required. Community capacity is very urgent in social forestry development, because to develop sustainable social forestry required community capacity, namely: both technical and behavior capacity. Social forestry is a forest management system that involves the participation, institutional development, decision-making and sharing (power and benefit, conflict resolution), trust and social capital. So, to mobilize community participation in social forest development, It is required community capacity to build cooperation. This indicates that the community capacity characteristics are closely related to the characteristics of social forestry. There is a closely linkage between community capacity and social forestry. All of this theory shown that community capacity is required for developing social forestry.

How to build community capacity in social forestry development

The concept of social forestry is main focus to improve community-wide involvement in forestry development. Salam and Noguchi (2005) found that participants are interested and committed to develop social forestry in Bangladesh because of the benefits which is generated. Although social forestry was introduced in India in 1980, but initially did not get much success but increased participation of new communities began to appear after 2000. The practice of social forestry in Elain and Elrawashda, Sudan shows the State recognition the importance of forest conservation and local communities welfare benefits, lead to local community institutions more effectively protect forests, generate revenue, managed to organize the distribution of benefits and motivate villagers to participate (Kobbail, 2010). Local potential and community participation will be explored and optimally empowered as strength development.

Changes in forest management paradigm that is managed by Perum Perhutani (state-based interprise) towards community based through social forestry is not yet able to overcome the pressure of population to the forest area. Limited access to resources in forest management has led a bad relationship between forest managers and community around forest. Limited access of community in forest management due to the different interests of forest utilization. To overcome this, the role of communities in forest management needs to be improved by developing local community capacity through collaborative partnership with mutual benefit.

Social forestry is a mechanism for stakeholder involvement in process of forest management. Social forestry with collaborative approach involving various actors who have their own interests that are the manager, local communities and NGOs (Non Governmental Organization). The local community and other stakeholder can gain access in forest management. Community involvement is very important thing and certainly going to

determine the direction of social forestry management. Through the collaborative approach, interests of all stakeholders can be accommodated, and looked at the dignity and role of each stakeholder as an equal entity in accordance with the prevailing value system, to achieve a common goal.

Recognition the role of local community in forest management can improve equality relationship in implementing the collaborative approach so as to reduce the threat of population pressure on forests. Patterns of relationships built through mutually cooperative behavior that allows public access can affect the success of forest management with a social forestry system on forest land. The passage of social forestry management processes in forest management is illustrated through three main phases, including: (1) characterization of the capacity of the community, (2) the process of transformation capacity, and (3) collaborative management.

Therefore, community capacity building in forest management by involving indvidual interaction mechanisms in a community. Interaction between individuals can generate capacity at the community level and also affects individuals in the community. So, community capacity building in social forestry also affected by the community capacity characteristics at individual level and community characteristics at community level.

Community capacity at individual level are influenced by socioeconomic characteristics. Community capacity at individual level and social level influence in mobilizing community capacity at the group level to produce collaborative forest management in social forestry development through a process of capacity transformation. Transformation process occurs through a process of community capacity to shape cooperative behavior in social forestry development, while the process of capacity transformation to produce collaborative management in social forestry development is affected by five dimensions, namely: governing, administering, organizational autonomy, mutuality, and norms.

Social forestry is the process of cooperation between the various actors in forest resources management by placing the active involvement of local communities as main actor and or partners with the aim of solving problems of local communities and ensure equitable distribution of benefits in order to achieve sustainable forest management and welfare of the local community. The successful development of community capacity affect the successful development of social forestry system. To understand the concept of community capacity building in collaborative forest management with social forestry system in detail, It can be explained in Figure 2.

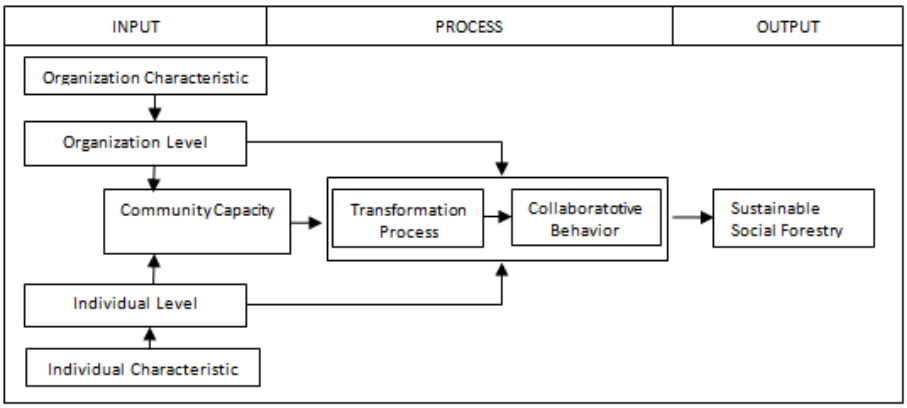

Figure 2. The concept of community capacity building in realizing the sustainable social forestry

Based on Figure 2, It can be explained that there is interconnection between community capacity and sustainable social forestry. Sustainable social forestry generated by transformation process of community capacity through collaborative behavior process. Community capacity characteristic is very important variable that influence the success of behavior tranformation process to produce sustainable social forestry. Therefore, to achieve sustainable social forestry, development of community capacity is very important to be elevate. Based on all theory above, It is very clear that community capacity have close relationship with sustainable social forestry to achieve sustainable forest management in Java.

Conclusion

Implementation of social forestry needs judgment in deciding how to grow the tree, how and when to integrate trees into farming systems, because trees may also compete with agricultural crops if not introduced appropriately, and how to build cooperation between forest manager and local community in forest management, It's all required community capacity, both technical and behavior capacity.

Social forestry is a forest management system that involves the participation, institutional development, decision-making and sharing (power and benefit, conflict resolution), trust and social capital. So, to mobilize community participation in social forest development, It is also required community capacity to build cooperation. This indicates that the community capacity characteristics are closely related to the characteristics of social forestry.

This review shown that there is a linkage between the concept of community capacity building and social forestry development. To achieve success of social forestry need community capacity to participate in forest management activities and share of responsibility in managing forest resources; The success of sustainable social forestry need actively involve local people in deciding which activities to develop in order to achieve a forest management system which is economically feasible, socially adaptable and ecologically sound. To achieve this social forestry goals, collaborative approaches to forest management that provide benefits to local people and exchange for the costs of conservation is required. Community capacity need to be elevate through transformation process to generate collaborative forest management with social forestry strategy. Finally, the successful development of community capacity affect the successful development of social forestry system.

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Empowering Corporate Social Responsibility to Foster Inclusive Development in Indonesia towards Sustainable Livelihood

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Abstract. It is undeniable that development can lead to improvements in living standards of people. On the other hand, development can also bring negative impacts to humanity. One of the negative impacts is social inequality. Inequality is contrary to the principle of inclusive development. It is one of major problems in some emerging countries, including Indonesia. The responsibility to solve this matter does not only belong to government, but also all stakeholders, no exception for businessmen. Business is an important element that encourages economic growth of the nation. Business is mainly dealing with economic matters. However, other than having objectives to achieve financial profit, business also has responsibility to society and environment which is commonly called as Corporate Social Responsibility (CSR). CSR is an important effort in sustainability concept. Thus, CSR becomes a necessary thing in Indonesia. CSR has been included into some Indonesian formal policies and legal regulations. Using qualitative method by applying content analysis of policies and regulations related with CSR, this paper aims to describe that CSR is a potential mechanism that should be empowered to combat inequality in accordance with inclusive development towards sustainable livelihood.

Keywords: Corporate Social Responsibility, Inequality, Inclusive Development, Sustainability

1. Introduction

The purpose of development is basically to bring goodness, prosperity, and improvement for human civilization. The development objectives proclaimed by the government of the Republic of Indonesia are also in accordance with the objectives of the establishment of the state contained in the constitution, the purpose of the national development of the Republic of Indonesia is to protect the entire nation, to realize the common prosperity, to educate the life of the nation, and to implement world order based on independence, eternal peace, and social justice.

However, development does not only result in good things, but also can lead to negative impacts, such as inequality. Inequality often occurs due to uneven development. The striking and inequality in development between the region, the country and even the area within the country that we observe today have been analyzed from various perspectives. The measurements of these discrepancies have changed over time with complex indexes [1].

One of tools to measure inequality is the Gini Ratio. According to the Central Bureau of Statistics (Badan Pusat Statistik/BPS), the Gini Ratio is worth between 0 and 1. The value of 1 indicates a complete inequality or perfectly inequal, in which all residents occupy one location in a country and no residents in other locations. The value of 0 indicates perfectly equal, ie the population is perfectly distributed throughout the territory of a country. Thus, the greater the Gini Ratio, the greater the inequality between the population distribution and the number of locations [2]. The Gini Ratio of Indonesia tends to fluctuate over the last three years, which is 0.329 in 2015, then declines to 0.316 in 2016, and again increases in 2017 to 3.20 [3]. Indonesia ranks second in terms of wealth inequality in ASEAN. The proportion of

Indonesian people with wealth less than USD10,000 reach 84.30%, while those whose wealth of more than USD1 million is only 0.1%. Range of wages in Indonesia in 2016 starts from USD85,56 to USD230,64. This very far-reaching range is the most varied benchmark of saving / investment value in Indonesia [4]. Economic inequality will lead to the implications for social welfare and social conflicts [5]. It shows that inequality problem is a matter of concern in which the solution should be immediately found.

The solution to the problem of inequality must be achieved through the synergy of several parties that involve the government and all members of society, including the business community. Business, in addition to having a goal to gain the maximum financial profits, is also required to be socially responsible for the welfare of the surrounding community. Corporate Social Responsibility (CSR) initiative is no longer regarded as merely a marketing gimmick, but it is time for CSR to be more useful and empowered to contribute positively to the development of the surrounding community. Thus, business through its CSR initiative is expected to contribute to become one of the solutions for social inequality problems. This paper aims to illustrate that CSR is also reliable as one of the potential mechanisms in the effort to reduce social inequality to achieve the goals of inclusive development towards sustainability.

2. Literature Review

This paper consists of three main concepts, i.e. Corporate Social Responsibility, Inequality, and Inclusive and Sustainable Development

2.1 Corporate Social Responsibility

The concept of CSR has been actually existing for more than half a century. The underlying concept of CSR was put forward by Bowen in 1953, that every businessperson has an obligation not only to achieve the objectives of profit in his business, but also to fulfill the demands of providing value to the surrounding community [6]. Thus, CSR is a commitment of the company to seek the welfare of the community through business activities and resource utilization owned by the company [7]. The development of CSR concept has evolved within the last five decades. In 1950s, the main concern of CSR was on business's responsibility to society and doing good actions for society. In the 1960s, people and notions played an important role in the characterization of the social changes that took place during this decade. In the 1970s business managers adopted traditional management functions when facing CSR issues. In the 1980s, business and social interests got closer and the company became more responsive to stakeholders. Within the 1990s the notion of CSR was almost universally accepted, as well as CSR combined with the strategy literature. Finally, in the 2000s, CSR is regarded as a crucial strategic issue [8].

2.2 Inequality

Inequality of income is caused by some collective problems, such as conflicts among people, instable macroeconomic variables, unskilled labor, small amount of investment in human capital, and poor performance of financial institution [9]. United Nations states that economic inequality includes inequality of income, monetary, living conditions, rights, and obligations [10].

2.3 Inclusive and Sustainable Development

The objectives of development are defined in detail by the United Nations Development Program (UNDP) as an inclusive and sustainable development. The program established by UNDP encourages economic growth to reduce poverty, reduce inequality, create jobs and provide a secure livelihood for the people. Thus, inclusive development can be defined as the development that can provide equitable benefits for the entire community in which no parties are harmed by other parties [11].

The concept of sustainable development was firstly proposed at the World Commission Forum on Economic and Development (WCED) meeting in Bruntland in 1987. WCED formulated the concept of sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* [12]. This definition emphasizes the concept of development on the long-term dimension. In

this case, the development which is related with natural resources and environment is not only intended for the benefit of the current generation, but also must be enjoyed by future generations. The concept of sustainable development is also the result of The United Nations Conference on Environment and Development which took place in Rio de Janeiro on 13-14 June 1992. One of the agreed outcomes in this conference is that humans are the central actors of sustainable development. The development is aimed to reach healthy and productive life within a harmonious relationship with nature. The purpose of this conference is to build global cooperation in development involving government and society. The concept of sustainable development was also reinforced by The World Summit in 2002 in Johannesburg. This meeting declared cooperation between nations to support the achievement of welfare through poverty alleviation and protection of the environment.

The importance of sustainable development is also strengthened by the enactment of the Sustainable Development Goals by the United Nations on 25 September 2015 which contains seventeen development goals to be achieved within fifteen years, i.e. *no poverty*; *zero hunger*; *good health and well-being*; *quality education*; *gender equality*; *clean water and sanitation*; *affordale and clean energy*; *decent work and economic growth*; *industry, innovation and infrastructure*; *reduced inequalities*; *sustainable cities and communities*; *responsible consumption and production*; *climate action; life below water*; *life on land*; *peace, justice and strong institutions*; *partnership for the goals*.

3. Methodology

This paper uses a qualitative method by applying content analysis of policies and regulations related with CSR. It aims to describe that CSR is a potential mechanism that should be empowered to combat inequality in accordance with inclusive development towards sustainable livelihood.

4. Discussion

CSR and business concepts are often perceived as two sides of a coin those are conflicting to one another. It cannot be denied, the main purpose of any business is profit. Every company is established to run the business with the goal of achieving financial benefits. While CSR, is a concept that requires business to provide social value for the community. However, the dynamics of the industry today are moving very fast and causing many changes that bring demands and harsh criticism to the business world to be more concerned about social issues. CSR then becomes an important program that must be run by the business world in the global and national context. CSR is a concept that aims to achieve harmony between the principles of financial business-oriented and efforts to deliver social value to the community (society).

Due to its importance, Indonesia puts the CSR into several regulations. The followings are the legal regulations dealing with CSR that practically aims to achieve equitable development and reducing inequality;

a. Government Regulation No. 47 Year 2012

This regulation is about Corporate Social and Environmental Responsibility. It aims to realize sustainable economic development, improve the quality of life and environment, encourage harmonious and balanced corporate relationships in accordance with the environment, norms and culture of local communities.

b. Law No. 25 Year 2007

This regulation is about investment. It aims to apply GCG principles; respect the cultural traditions of the surrounding community; fair business competition climate; environmental sustainability; safety, health, comfort, workers' welfare.

c. Law No. 22 Year 2001

This regulation is about oil & gas business. It aims to increase state revenues to contribute enormously to the national economy and develop and strengthen Indonesia's trade and industry position; create jobs, improve the welfare and prosperity of the people of a fair and equitable, and still maintain the environmental sustainability.

d. Regulation of Ministers of State-Owned Enterprises No. PER-02/MBU/7/2017

This regulation is about Partnership and Environmental Program of State-Owned Enterprises. It aims to encourage the acceleration of micro and small business independence in order to create a just, prosperous and equitable society, to develop and empower micro and small businesses in terms of access to capital, management and other activities

e. Law No. 13 Year 2011

This regulation is about handling poverty. It aims to prosper the poor with more planned, directed, and sustainable ways.

5. Discussion

CSR is an important program that aims to harmonious relationships between corporates and stakeholders, independence of community, poverty alleviation, efficiency, social welfare, sustainable development, good quality of life and environment. CSR is a potential mechanism that should be empowered to combat inequality in accordance with inclusive development towards sustainable livelihood. Inclusively, CSR is related to equity, while sustainably, CSR deals with long-term dimensions.

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Implementation electronic supply chain management (e-SCM) for Indonesia batik small and medium enterprises (SME) based on literature review

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Abstract. Nowadays, we're facing 4th Generation Industrial Revolution (Industry 4.0) refer to the Internet of Things (IoT) concepts in industrial applications, which influences creative economics industries. Indonesia creative economics industries growth rapidly including Batik sector. Batik is Indonesia unique heritage culture icon which has been get officially UNESCO acknowledgment as the "Intangible World Heritage" on 2nd October 2009. Based on Indonesia Ministry of Industry data on 2016, there are 294 Batik Small and Medium enterprises (SME) registered in all regions of Indonesia. Then, export value of Batik commodities already increase around 10% from previous data. Author found that many researches has been study Supply Chain Management (SCM) concept application into Batik EMS in research journals and books. However, still not found literature indicate study about Electronic SCM (e-SCM) for this sector. So, this study purpose to analyze of implementation e-SCM for Indonesia Batik SME use literature review method so can supporting next steps for research review in future times.

Keywords : Supply Chain Management (SCM) , Electronic Supply Chain Management (e-SCM), Batik Small and Medium Enterprises (SME).

1. Introduction

Batik is Indonesia unique heritage culture icon which has been get officially UNESCO acknowledgment as the "Intangible World Heritage" on 2nd October 2009 (Ismail., et al, 2012). Since 4th or 5th century, batik has been exist at Indonesia area with various design, colors and dye techniques. Especially at Java area concern preserving batik for hundreds of years until today, so Java is oldest batik production area. Biggest areas developed Java batik located at Yogyakarta, Solo, Pasuruan, Bangkalan, Pekalongan, Cirebon, and Jakarta city. Besides that, there are other Indonesia areas also produce batik with design motifs which have same best quality with Java, such us Bali (Ubud), Kalimantan (Pontianak) and Sumatra (Padang and Jambi). Every area have special characteristic design and motifs which content symbols unique (Pangestu, 2008).

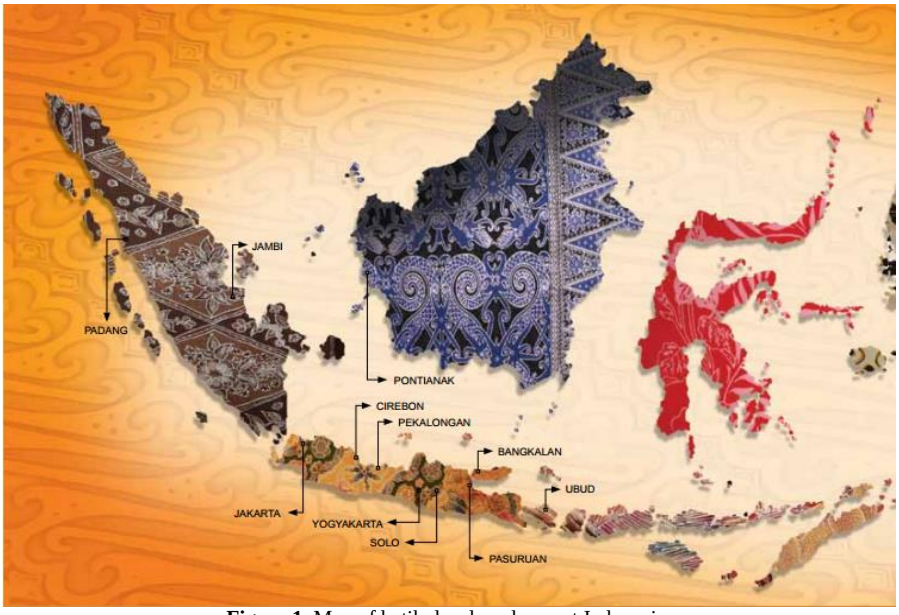

Figure 1. Map of batik developed area at Indonesia.

Nowadays, we're facing 4th Generation Industrial Revolution (Industry 4.0) refer to the Internet of Things (IoT) concepts in industrial applications, which influences creative economics industries (Lee,. et al, 2014). The Internet of Things (IoT), also called the Internet of Everything or the Industrial Internet, is a new technology paradigm envisioned as a global network of machines and devices capable of interacting with each other (Lee, 2015). The basisc idea of the IoT is connected into Internet for everything activities (Fleisch, 2010). All sectors industries now pay attention to IoT , not only big players but also Small and Medium enterprises (SME).

Nurhayati (2014) claim the ASEAN Economic Community (AEC) regulation that affected Indonesian batik industry face a tough challenge in product competitiveness, specially for batik SME as dominant economic players. Current expectation by Supply Chain Management (SCM) application in Indonesia batik SME can improve product competitiveness. Author found that many researches has been study SCM concept application into Batik EMS in research journals and books. However, still not found literature indicate study about Electronic SCM (e-SCM) for this sector. So, this study purpose to analyze of implementation e-SCM for Indonesia Batik SME use literature review method so can supporting next steps for research review in future times.

1.1 E-SCM definition

Before discussing the definition of e-SCM, should be understand the SCM basic meaning. SCM defined as all activities that are interpreted starting from the process of supplying some raw material sources, manufacturing processes, warehousing and distribution of goods to customers which all coordinated into a process chain (Lummus and Vokurka, 1999). Lambert and Cooper (2000) represented SCM meaning is a combination of several business processes ranging from suppliers to end customers where the process is related to products, services, and information that can bring value. Chopra and Meindl (2004) mentioned that SCM refer to overall firm activities for fulfillment customer demands, not only producer/manufacture and supplier relationship but also include the work relationship of logistics, warehouse, retailer, and end customers. This overall activities for get additional value purpose so can increase profit or expand business. Ravindran and Warsing (2013) also explain supply chain as interaction of suppliers, manufacturers, distributors, retailers and end

customers activities which all activities perform for get additional value to fulfill those demands. It's show into figure 2.

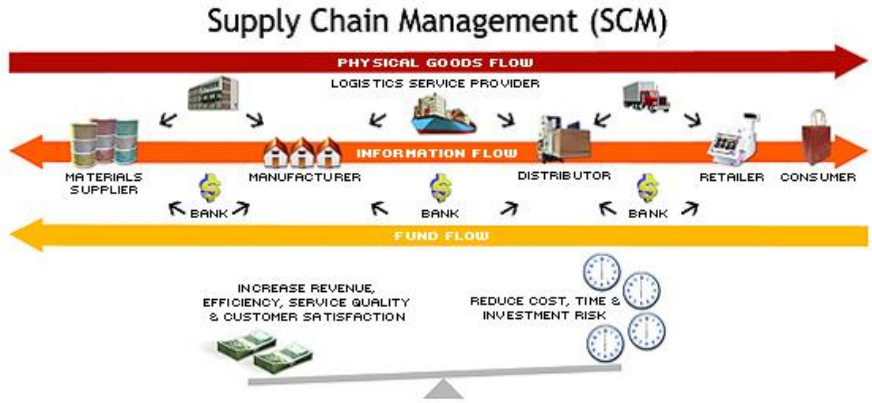

Figure 2. Illustration SCM

Together with the development of the internet especially in the industry field then emerged e-SCM which can be interpreted as integration of internet applications in SCM system (Giménez and Lourenço., 2008). The statement is also supported by Lancaster et al (2006) which states that e-SCM is the use of Internet technology in SCM which aims to increase the speed of information flows from suppliers to end customers, where the information obtained is real time data. E-SCM is also defined as merged field between internet application and network of SCM (Akyuz and Rehan, 2009). Illustration e-SCM show in figure 3.

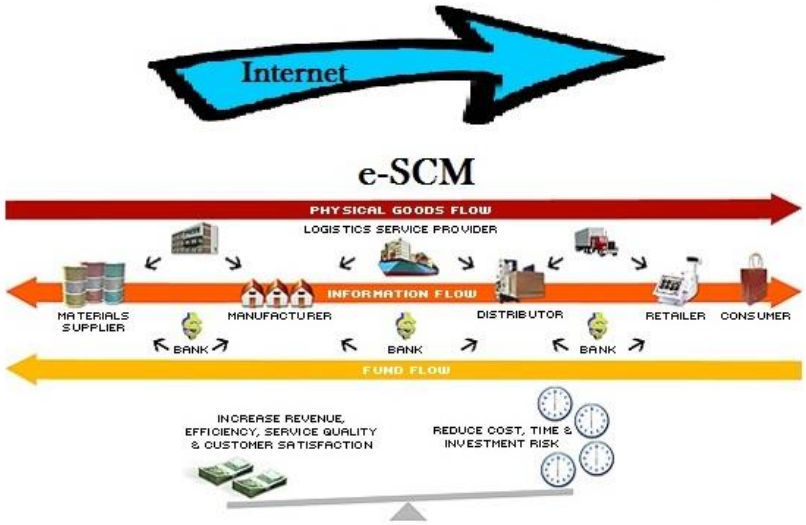

Figure 3. Illustration e-SCM

1. 2 Indonesia batik industry

Indonesia creative economics industries growth rapidly including Batik sector. Based on Indonesia Ministry of Industry data on 2016, there are 294 Batik Small and Medium enterprises (SME) registered in all regions of Indonesia. Batik industry including the leading industry, where the current batik business has involved a workforce of 1.3 million people with the number of batik consumers as much as 110 million people and the amount of batik product sales of Rp5. 9 trillion. Indonesian batik products have contributed greatly and one source of non-oil and gas foreign exchange. Then, export value of Batik commodities already increase around 10% from previous data. The biggest export destinations of Indonesian batik are USA, Germany, England, Japan and South Korea.

2. Methodology

The methodology chosen for this study is literature study with data from several scientific journals only. Collection of this journal on the following points:

2.1 Based on search engine

Science journals obtained by searching on the site https://scholar.google.com/ only and non-commercial value (free) in English version. It is based on easier access to get it because author hope can be used as inspiration for many people to read, learn and then implement it.

2.2 Based on keywords

Keywords used for searching which focused for the writing purpose only, so results obtained are appropriate and can be directly analyzed. The selected science journals are journals containing keywords both in the title and keywords of abstract.

2.3 Based on publisher

In addition of 2 points as above, the selection of the source journals based on the publisher. Selected mostly only a few publishers which already have good credibility in their scope. So, the data obtained from source journals is expected to be data from good research. The following journal publishers are used, as below :

- Elsevier Ltd - www.sciencedirect.com
- Emerald Group Publishing Ltd - http://www.emeraldinsight.com/
- Taylor & Francis – www.tandfonline.com/
- IOSR Journal – www.iosrjournals.org/
- IISTE – ww.iiste.org/

2.4 Based on publication year

Guidelines for journals selection as a research source based on the publication year. Selected in 2000s until now. But the actual journal obtained only from 2002s to 2015s with follow attention to 3 points as previous mentioned before. Author reason provide publishing journal restrictions for data collection refer to internet trends development in the industry.

3. Result and Discussion

3.1 Based on classification data collection

Based on 4 point of journals selection for literature review source data, author obtained 20 science journals which summarized as follows

Table 1. Classification Data Collection

Classification data collection	Outcome	Number of Journals founded
Keywords in tittle and abstract	electronic supply chain	1
	electronic supply chain	1
	management	4
	e-supply chain	6
	e-scm	2
	batik	4
	batik industry/industrial	2
	batik Small Medium Enterprises (SME)	
Publisher	Elsevier Ltd	13
	Emerald Group Publishing Ltd	5
	Taylor & Francis	1
	IOSR Journal	1
Publication year	2002	1
	2004	1
	2006	1
	2008	3
	2009	2
	2012	4
	2013	2
	2014	3
	2015	3

Table 1 data show there have been several studies that discuss about each topics of e-SCM and batik which arranged into science journals and published during period 2002s-2015s in English version. The most science found journals with e-SCM keywords, there are 6 journals. It shows that nowadays e-SCM has as application trend in a company along with the development of internet (Giménez and Lourenço., 2008). This data supported by the second top ranking with e-supply chain keywords. Then, the third highest ranking found is the batik industry / industrial keyword. So, it shows that the batik industry development has as research attention for the purpose of progress. Therefore, batik SME also received attention because it's part of batik industry proved by the journal journals which the fourth rank after batik industry.

Refer to science journal publisher, the most frequent source journals in Elsevier Ltd publisher there are 13 journals or 65% of the total and almost all journals contain specified keywords. Thereafter, followed by Emerald Group Publishing Ltd by 25%, while 2 other publishers each only 5% or 1 journal. Percentage data are presented in the following pie diagram on figure 4 .

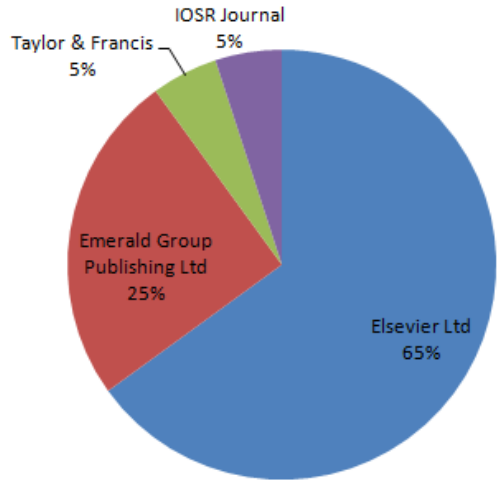

Figure 4. Pie Diagram of Journal Publishers.

Based on publisher year, 2000s until 2006s found 1 science journals only for each year, after that found more science journals. So, it can be explained that the internet expansion can impact to SCM development which use internet application became e-SCM (Giménez and Lourenço., 2008), as well as the development of Indonesia batik SME is a creative industry representation (Meutia and Tubagus. 2012).

3. 2 Based on type and content of source science journal

All source science journals refer to all keywords, obtained journal type as research review journal in percentage of 85%. While the literature review journals only 15% only. Accordingly, it can be explain that a lot of research done by the previous author refer to many topics relevant with keywords. This journals data presented in Table 2 and represented also in Figure 5 below.

Table 2. Science Journal Type as Source

Science Journal Type	Number of Journal Founded	Journal Reference (see Appendix for bibliographic details)
Literature Review	3	[8], [14], [17]
Research Review	17	[1]-[7], [9]-[13], [15], [16], [18]-[20]

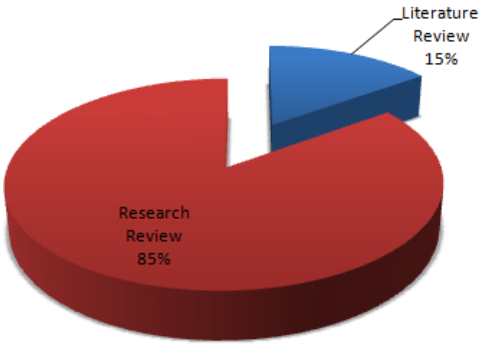

Figure 5. Type of science journal source

Besides the science journal type analyze, author also reviews content of this 20 source science journals looking for correlation between e-SCM, Indonesia Batik, and Industry / SME. Then, there are 4 areas of correlation founded. This can be illustrated in Figure 6 and table 3 below.

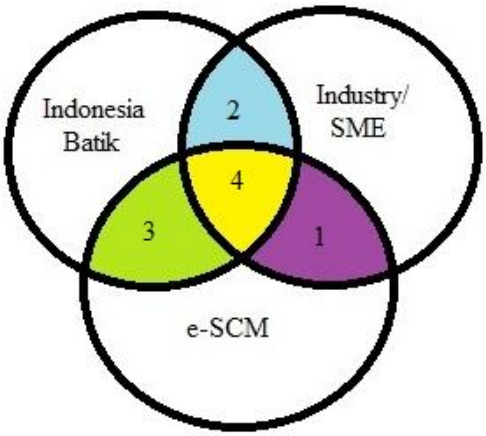

Figure 6. Correlation between e-SCM, Indonesia Batik, and Industry / SME

Table 3. Correlation data

Zone	Correlation	Number of Journals founded	Journal Reference (see Appendix for bibliographic details)
1	e-SCM and industry/SME	13	[1], [2], [4], [5], [7]-[9], [11], [14], [17]-[20]
2	Indonesia batik and industry/SME	5	[6], [10], [12], [13], [16]
3	Indonesia Batik and e-SCM	2	[3], [15]
4	Indonesia Batik, e-SCM, and Industry/SME	0	

3.2.1 Zona 1 : Correlation between e-SCM and industry/SME

Found 13 science journals that one of the content discusses about relationship e-SCM implementation in the industry. The 8 journals are mostly a research review journals, there are 10 journals. While the other 3 journals are literature review. Journals discusses about impact and role of the internet for SCM needs as well as answer some solutions from current SCM problems (Loa et al., 2008). Then Wu and Chuang (2009) in their research, stated that the e-SCM distribution effectiveness in an industry is dependent on industry type, size, and product. Thereafter, the e-SCM positive and negative impacts in industry were studied by Barutcu and Tunca (2012). The positive impact is easier SCM manage in faster time process, cause indirectly increase profit with the existence of operational cost reduction. However, the negative impact is the existence of a very high and unhealthy competition between suppliers.

3.2.2 Zone 2 : Correlation between Indonesia batik and industry/SME

There are 5 science journals concern discuss Indonesia Batik Industry/SME refer to development, product innovation, marketing strategy, and business performance. All journals type are research review and published between the timeframe of 2012s to 2015s. This indicates that the increasing awareness at the community level to conduct research for Indonesia Batik Industry/SME progress, this data match with the research results data of Indonesia Ministry of Industry which an increase every year for this industry mainly because SME role as well.

3.2.3 Zone 3 : Correlation between Indonesia Batik and e-SCM

There are only 2 journals that discuss about Indonesia Batik with e-SCM. Both journals are research review and published in 2012s to 2014s. However, the section of the two journals is not about 100% e-SCM but only SCM parts, still not discuss about internet role. It's explain how Indonesia Batik has SCM implemented but in a simple scale especially in customer service (Novani et al., 2014) and production process (Ismail et al., 2012).

3.2.4 Zone 4 : Correlation between Indonesia Batik, e-SCM, and Industry/SME

There are not yet found journals that discusses correlation between Indonesia Batik, e-SCM, and Industry/SME. However, from studying journals classified in the 3 zones mentioned can be used as research direction for this fourth zone. So, this study purpose to analyze the implementation of e-SCM for Indonesia batik SME use literature review method so can support next steps for research review in future times. Implementation e-SCM for Indonesia batik SME should be integrated internet role into SCM during batik SME operation, so can achieve cost reduction around 8-12% as like as implementation e-SCM to other industry (Piera et al., 2014).

4. Conclusion and Future Development

From this study it can be concluded that many have done research on e-SCM and Indonesia batik SME in some aspect, but not yet research that discuss correlation. It's because still no e-SCM implementation into Indonesia batik SME. It would be very unfortunate if ignored, because there is already research results for the implementation of e-SCM in a company give result in cost reduction around 8-12% (Piera et al., 2014). Hopefully, with this study there will be some who start applying e-SCM in Indonesia batik SME so can be community economy improvement, especially in some rural areas. In the preparation of this paper there are some limitations that are expected to be attention for further research, there are :

- The source data only collect from science journals, there should be some other sources such as textbooks and newspapers.
- Science journals only collect from non commercial value (free) access, should be collect from payable science journals with relevant topics so that it can get more data for analyze.
- Science journal only downloaded from biggest publisher such us Elsevier Ltd, Emerald Group Publishing Ltd, Taylor & Francis, and IOSR Journal. Author found those journals from other publishers who have relevant topic but are not used.

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Solid Waste Management in Four Villages of Jatinangor Sub-district, Sumedang

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Abstract. We investigated solid waste problems in four villages of Jatinangor sub-district, Sumedang-West Java, i.e. Sayang, Cikeruh, Hegarmanah, and Cibeusi villages. The villages were chosen since the area have been growing fast in term of population, housing and other facilities due to the establishment of some universities (UNPAD, IPDN. IKOPIN and ITB) since 1980s. Currently there are estimated about 40,000 students whereby at least 70% of them are staying in Jatinangor. Total villagers in the four villages (July 2017) was estimated 39,400. If we assumed per-capita solid waste produced is 0.3 kg/day, it is estimated that total solid waste produced by population in the four villages is around 13,4 ton/day. The four villages have been dealing with solid waste problem mostly by dumping and burning the waste in open field or in incinerators. Only Hegarmanah village which already has an integrated solid waste treatment, including incinerator and composting facilities, although it has not been optimally operated yet due to technical and managerial problem. Some solid waste, approximately 18-20 m^3 (about 4 tons), have been collected and disposed by an NGO using 1 unit of truck to the landfill site in Cimalaka sub-district which is located about 36,3 km from Jatinangor, which took 6 hours round trip. We suggested more intensive tiered coordination among stake holders needs to be conducted, and critical issue such as stake holders responsibility and income distribution should be settled. Standard Operating Procedure (SOP) for solid waste management in the area should be agreed upon. Composting activities for organic waste should be conducted to reduce solid waste volume. Moreover involvement of universities which provide long-term and sustainable assistance for solid waste management in the area is also needed.

Keywords: Jatinangor villages, solid waste management, rural areas

1. Introduction

Jatinangor area which is located in Sumedang Regency. West Java, has experienced a rapid development since the establishment of several universities in the area since the 1980s. The presence of several universities has increased the population of four villages in Jatinangor more than doubled from the previous one. The students rented rent or boarding in the houses provided by residents in the area around the campus. Four villages in the area of Jatinangor which has rapidly increasing population are Sayang, Cikeruh, Hegarmanah and Cibeusi Villages. Four campuses are located in or close to these four villages.

The addition of residents in Jatinangor is accompanied by the emergence of various facilities and other infrastructure such as appartments, hotels, malls, restaurants, and stores [1]. All these activities produce a lot of solid waste both organic waste such as food scraps and inorganic waste such as plastic bottles, bags of crackle, cans, bottles, batteries, paper, etc.

Often found waste discharged at random roadside indicating that waste management in Jatinangor has not been able to handle the daily waste production in the area.

An information about the volume of waste generated by the community is still limited to rough predictions delivered through local media by practitioners in the field. A survey is required to obtain a more accurate prediction. Quantification of waste is important in the planning and design of cost and effective waste management [2]. Determining the amount and type of waste is the first step in the formation of integrated waste management. In general, the waste produced is influenced by social, economic, cultural, climatic, and geographical factors [3].

We conducted a survey of waste management in four villages in the Jatinangor area to get an overview of the volume of waste produced by the population ad how people manage their waste. Based on the acquired data, we conducted a serie of training and workshop on soild waste management to some representatives of the community.

2. Materials and Method

Data collection on waste management in Sayang, Cikeruh, Hegarmanah, and Cibeusi Village was conducted through direct survey to the field. Information was obtained from discussions with local government officials, NGOs, and janitors. The village profile data is obtained from the archives at the sub-district office.

Determination of waste quantity was done through observation at 29 community units (RW) in Sayang, Cikeruh, Hegarmanah, and Cibeusi Villages. Waste was divided into 4 categories: organic waste, recycleable waste, toxic waste (B3) , and other waste. Waste was weighted after 24 hours of waste disposal in each house.

Organic waste has been processed in the village of Hegarmanah into compost. Compost produced from Hegarmanah Village was compared to compost produced from integrated waste treatment plant (IPST) at ITB Ganesha campus and Jatinangor campus. Compost quality observed from nutrient content and compost effect on pepper plant growth. Compost analyzed its nutritional content in Integrated Tester Laboratory of Vegetables Research Institute, Lembang. To observe the effect of compost on plant growth, chili seeds (*Capsicum anuum* L.) were used. The three types of compost were used on planting medium with the ratio of the soil: compost = 3: 1. Chilli plants growth was observed in term of its increase in plant height and number of leaves until the 5th week.

Training on waste management and processing including composting, waste collecting bank and visit to IPST Kampus ITB Jatinangor was conducted for representatives of waste managers and technicians in the four villages. The workshop was conducted to make an SOP for waste management.

3. Result and Discussion

3.1 Villages

Sayang, Cikeruh, Hegarmanah and Cibeusi Villages located in Jatinangor sub-district. Jatinangor Subdistrict (Figure 1) is one of subdistricts in Sumedang Regency with an area of 26.2 km^2. Among the four villages, Hegarmanah Village has the largest area i.e. 3.31 km^2. Hegarmanah Village also has the largest population than the other four villages.

Basically, population increased will be directly proportional to the amount of waste generated. The four villages deal with waste mostly by throwing and burning waste either by using incinerators or on open land. In some places there is also a waste sorting activity before being burned.

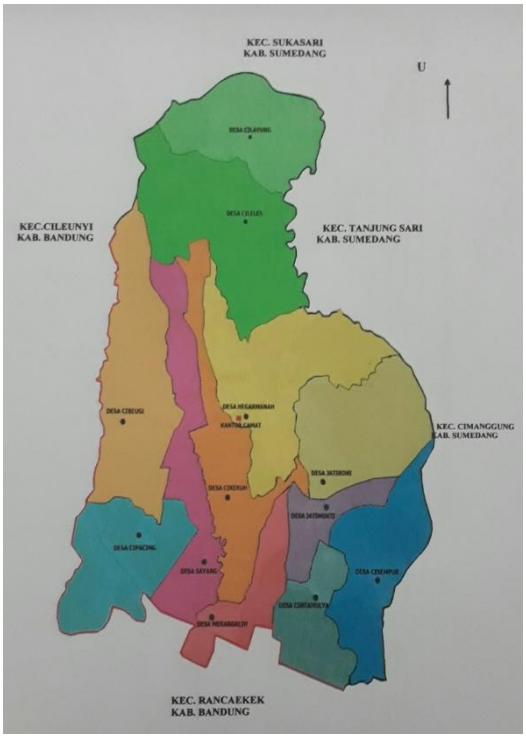

Figure 1. Jatinangor Map [4]

Table 1. Population of four villages (data on July 2017) [1]

Village	Total population		
	M	W	Total
Sayang	5013	5023	10036
Cikeruh	5372	5135	10507
Hegarmanah	5475	5239	10714
Cibeusi	4291	3852	8143
TOTAL			39400

Cibeusi Village does not have a site designated to waste collection due to its limited and high land prices. Meanawhile in Sayang Village almost all RWs have land designated to waste collection and in some RWs already have incinerators. Cikeruh village also has several locations for waste collection and has recently acquired equipments to process waste but has not been used due to some technical constraints. Hegarmanah village since late 2016 has owned waste processing facility owned by BUMDES Hegarmanah, but not yet fully operates due to constraints of management and transport facilities for collecting wastes. The waste processing unit also has composting facility.

There is an NGO that collect waste in Jatinangor to be sent to a landfill area (TPA). The wastes are transported directly from houses and offices that are customers of the NGO. The waste is transported to the Cimalaka landfill, located approximately 36.3 km from Jatinangor. But this NGO is also very limited in collecting vehicle, which only has 1 unit of

waste truck. So it can only collect about 18-20 m^3 (± 4 tons) of waste per day from about 400 customers.

3.2 Quantity of Waste Generated and Composition of Waste

The average waste per capita produced in the 4 villages is 0.31 kg / day. For comparison, per-capita waste produced in rural areas in China was 0.25 to 2.1 kg / day [5]. The estimated daily waste generated is 11.81 tons. The results of the estimated quantity of waste generated in each village as shown in Table 2

Table 2. Quantity of Waste

Village	Population	Waste (kg/people/day)	Total Waste (kg/day)	Total Waste (ton/day)
Sayang	10.036	0,27	2.757	2,76
Cikeruh	10.507	0,28	2.977	2,98
Hegarmanah	10.714	0,20	2.130	2,13
Cibeusi	8.143	0,48	3.944	3,92
TOTAL	39.400		11.807	11,81

The percentage of waste composition produced is shown in Table 3.

Table 3. Composition of waste

Material	Composition (%)	Total Waste (ton/day)	Total Waste (ton/year)
Organic	54,76	6,47	2.359,81
Recyclable (bottle, newspaper, paper, metal, can, plastic)	17,04	2,01	734,13
B3 (hazardous and toxic materials incl. lamp, baterai, elektronical waste)	6,90	0,81	297,29
Others	21,31	2,52	918,26
TOTAL	100	11,81	4309,50

Each day organic waste produced 6.47 tons and 5.34 tons of non-organic waste. Waste is dominated by organic waste of 54.76%. For a comparison, other study have shown that waste is dominated by organic waste as much as 69% in Mahalung, Solapur, India [6].

3.3 Compost Analysis

The standard value of quality of compost from organic waste is determined by SNI 19-7030-2004. Compost from organic waste must meet several requirements, such as the maturity of the compost, which is indicated by the characteristics of black, soil-smelling, has a texture such as soil, and temperatures such as ground water temperature. In addition to maturity, the compost also should not contain pollutants, and some other parameters [7].

Compost content analysis showed that compost from Hegarmanah village did not fulfill the standard determined by SNI for water content and C/N ratio, while other compost (JTN and GNC) met the standard (Table 4), although in terms of NPK content, the three compost

meet the standard of SNI. Plant growth is affected by the adequate N, P, and K content of the fertilizer [8]. The effect of Hegarmanah compost addition to the growth of chilli plant was also lower than that of Ganeca and Jatinangor (Figure 2). In terms of number of leaves produced, showed that the number of leaves on the plant with HGR compost experienced the same number of leaves as GNS and lower than JTN (Figure 3). The increase in leaf number of the plants with JTN, GNS, and HGR compost was influenced by nitrogen (N-total) contents, therefore nitrogen availability is adequate for plant growth[8].

Table 4. Compost Content from three sources

Parameters	Source of compost			SNI Standard
	JTN	GNC	HGR	
Water content (%)	48.56	37.42	58.17	50 (max)
C-Organic (%)	14.99	14.46	17.13	9,8-32
N Total (%)	0.75	0.87	1.84	0,4 (min)
C/N	20	17	9	10-20
P_2O_5 (%)	0.25	0.34	0.65	0,1 (min)
K_2O (%)	0.36	0.37	2.5	0,2 (min)

* JTN (Jatinangor), GNC (Ganeca), HGR (Hegarmanah)

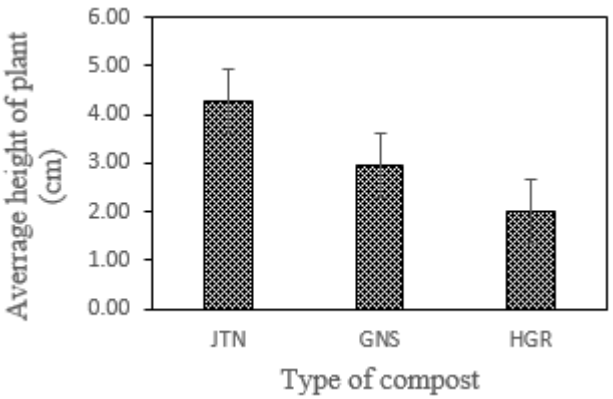

Figure 2. Height of chilli plant

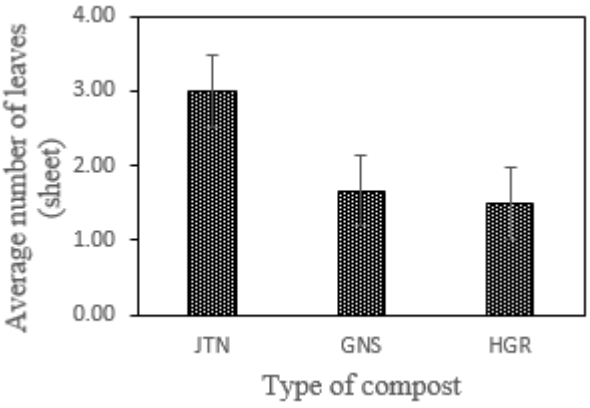

Figure 3. Number of leaves

3.4 Training and Workshop

Training and workshop were conducted by involving employees in the villages offices in Jatinangor sub-district for around 50 people. Soil auger to make biopori was given to each village. and the assistance is done at the location or field for the community interested in composting organic waste produced either through biopori methods or other hole digging patterns. In addition, environmental management campaigns are also provided through the provision of leaflets and installation of posters that we make. The workshop for SOP processing and waste management will be done by accommodating the aspirations of all waste management stakeholders in the four villages.

4. Conclusions

1. Communities in the four villages in Jatinangor namely Sayang, Cikeruh, Hegarmanah and Cibeusi villages have shown some concern for waste management, especially in Sayang village, although management is limited in term of collection, sorting and incineration. Some people show little concern about the waste problem around them and throw away the waste as they please. There is a need for environmental campaigns and assistance in waste processing and management in the community.
2. In the village of Hegarmanah there has been IPST with composting facilities and incinerator but still not operated properly due to managerial and technical problem. A good coordination between stake holders for the operation of IPST facilities in Hegarmanah is an urgent agenda.
3. Routine coordination at district, sub-district, village and RW / RT levels for waste management is feasible and needs to be agreed upon by SOPs and division of tasks between different levels of government as well as their linkages with NGOs and BUMDES.

Acknowledgment

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The Important of Digital Marketing to Enhance Marketing for SMEs

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Abstract. Digital marketing is a tools that can streamline and simplify the marketing performance for young entrepreneur in particular SMEs. One of the popular in Digital marketing is online marketing using websites and social media. Currently many of SME in Indonesia who haven't yet understand about digital marketing and its benefits, and there are still many who using conventional marketing as their marketing media. Using digital marketing is much more efficient and better than conventional marketing. The benefits are very pronounced is less resource but still can reach many customer around the world with ease method. For penetrated to digital marketing, SMEs need to have knowledge and expertise about online marketing. But the problem are, many limitations still owned by SMEs in Indonesia so they haven't been able to use the digital marketing as their marketing media, one of them is do not understand and they failed against technology that continues to grow. Whereas the opportunities and the benefits it brings will be much greater. So the purpose of this paper is to find a way for SMEs in Indonesia to be able to improve its marketing through digital or online marketing. The method used on this paper is descriptive analysis based on the study literature. The result showed that the needs of training and coaching provided to SMES regarding the digital and online marketing, especially training in using technology should be held in order to increase their knowledge and skills, in the hope they can take advantage of digital technology to expand their business.

Keywords: Marketing, Digital Marketing, Online Marketing, Small-Medium Entrepreneur (SME)

1. Introduction

Industry is one of the driving force of the economy of the nation. With the advent of attempts in any scale (small-medium-upper) could push the industry in the country. Business small and medium class is the type of business that is often come in and out in any different industry. This type of business can be very easily popping up because there is no barriers entry to join the industry but that business also can easily came out or fail. This is because many businesses (SME), which cannot survive due to many factors cause.

Tehrani (2005) as the founder, chairman, CEO & Editor – in – chief said "Companies exist for two and only two reasons; namely Marketing and Innovation. Without these, no company would get anywhere". Based on that quote, marketing and innovation are essential in building a business. A good and proper marketing will drive business to success. This is the one that should be emphasized for business owners especially for lower class medium enterprise (SME) in order to survive and continue to thrive in the industry they compete. Surely all businesses directly and indirectly they will do the marketing activities for their products and business, but the problem are how effective, efficient, and precise the marketing strategy that they do so they can get the maximum results for their business. In the world of marketing, there are things that must be understood by business owners. Every so often, marketing reinvents

itself. Marketing is something that will changes all the time, and when it comes to marketing, it's only fifty percent true. Marketing will change following the changes of time. While the method of marketing always changes but the marketing principles will stay the same. Every changing nature of marketing, there will always be a great challenge in figuring out what the formula for success today versus yesterday is (Tehrani, 2005). If yesterday traditional marketing is one of the best of strategy in marketing, but today can be different. As the times changing, digital marketing could be one strategy that is right for the moment. Everybody knows that the latest evolution in marketing focuses on online marketing. Today, the internet has changed the world civilization. Many people today cannot be detached from the internet in running their daily life. One of the famous is internet as social media. For that, a marketer must be able to adapt to the changing times in order to create the right marketing strategy.

Method for marketing are divided into two large groups that are traditional marketing and online marketing. Numerous small business are struggle in choosing which sort of marketing to do, in light of the fact their budget only stretch to one or the other, not both particularly for the SME. The use of print advertisements on daily papers and magazines is a straightforward case of traditional marketing. Then again, when a business contributes on building a site, publicizing the brand name through various web-based social networking, for example, Facebook, Twitter and YouTube, this kind procedure is called digital marketing. Then, which one is better? Each method have advantages and disadvantages itself. But today, the world has changed into an extremely digital environment. Many of our daily task are using digital such as magazines, online banking, our reading now has change to e-readers, and even the transportation. Many digital/internet application has create to simplify today's people activities. The rise of digital age, cause a presence of mind to put resources and invested into a digital campaign. Traditional marketing will eventually diminishing with the digitally world even though still has a place. In today's business, it is basic to have a website and utilize the web as a way to communicate with the consumer. If a business want to reach a largely local audience, traditional marketing strategies can adopt successfully, but it is important to take advantage from digital marketing as to keep up in today's world (weebly.com)

The problem are, many businesses cannot make use of digital media as a tools of marketing their company especially for SME, when in this current digital marketing is media marketing that most appropriate, effective and efficient to use than traditional or conventional marketing. although some business aware with the needs of digital marketing, but they can't use the digital well so that it does not give a positive impact to their business that ultimately cannot survive their business in the industry. This paper want to find what factors that impede the development of marketing in SME at media in term of digital marketing as well as find a way as the solution for their problem.

2. Literature Review

2.1 Definition of Digital Marketing

Marketing is a progression of procedures for making, communication, and conveying value to customers, and overseeing customer relationship that additionally has the partners of an association to secure the profit (Solomon, 2006). In easy way, marketing is how to promote and introduce our product to the market. Kotler (2013), a marketing scholar, proposed 12 ideas for marketing, including (1) Marketplace, Market space, and Meta market, (2) Marketers and Prospects, (3) Needs, Wants, and Demands, (4) Product, Offering, and Brand, (5) Value and Satisfaction, (6) Exchange and Transactions, (7) Relationships and Networks, (8) Marketing Channels, (9) Supply Chain, (10) Competition, (11) Marketing Environment, and (12) Marketing Program. That 12 points are the components that should be concern and fulfill by the company in doing marketing (Dwivedi & Merrilees, 2013).

Marketing has numerous type or tools, that are very famous in today society is digital marketing. Digital marketing is a tools for promoting the product using digital and internet when seeing and buying the product can do virtually even communicate with media that is

online. Huang (2009) define digital marketing as a non-conventional marketing model. Digital marketing generally is utilizing data innovation and computerized instruments as the media for promoting the company (Blickle, Witzki, & Schneider, 2009). The venture could anticipate and design the web promoting as indicated according to the trend of digitalization, personalization, and networking. Internet marketing or e-marketing is very famous media in digital marketing era, that are an individual or an endeavor transmitting data, information, knowledge, and intelligence through digital instruments, formalization in selling to customers, and further changing the purchase decision for marketing activities (Lin, 2009). Digital media channels that use for most promoting in a company can create the evolution in business world. Digital marketing have numerous advantage that are two-way interactions, allowing the marketers to proceeding continuously, and keep personalized conversation with costumer. Digital marketing also exhibited the qualities of thick and steadfast media, high intuitiveness, smaller restrictions to production scale, and inspected sole medium effectiveness (BusinessNext, 2011).

The different of traditional marketing and digital marketing is often associated. That are three characteristics of digital marketing comparing with traditional marketing proposed by Huang (2009). (1) High Efficiency. Casualness instruments could help advertisers in the vertical and even combination. (2) Penetrating Power. Different sorts of media and correspondence channels permitted advertisers all the more effortlessly reaching with potential clients. (3) Interactivity. The ongoing data estimation permitted the potential clients' requests being all the more precisely and customized reacted (Chailom & S, 2011).

2.2 SME growth and sustainability in Indonesia

Small scale business in Indonesia is the subject of discussion and that should concern by the Government because these small companies are spreading everywhere, and can give a potential job opportunities. Small industries development contributes with a wide path, creating employment opportunities, and provides the flexibility needs and innovation in the economy as a whole. In quantity, the SMEs are indeed superior, it is based on the fact that most of the effort in Indonesia (over 99%) the shape of small and medium scale businesses (SMEs). According to data of ministry of cooperatives and SMEs, in 2007 the number of SMEs (including micro enterprises) reached 49.82 million units, and its rose significantly became 51.26 million units. It's became a fresh breeze for Indonesia's economy, and government are increasingly aware of the benefits provided to SMEs in an effort to improve the nation's economy. In addition, SMEs also the large economy in Indonesia and prove to be a safety valve of the national economy in times of crisis, as well as being denominator economic growth amid the crisis. But the amount of the turnover and assets, if the overall turnover and assets of SMEs in Indonesia combined, not necessarily the numbers can rival the one of national company (Tambunan, 2012). SMEs are in most business sectors are there in Indonesia. Nugrahani (2015) said the development of private sector, especially SMEs, has the potential to keep the stability of the economy, the increase of manpower, increase GDP, to develop the business world, and the addition of the national budget (APBN) and a grant (APBD) through taxation. The current role of SMEs appear to have not so perceived, due to lack of strength to compete with foreign products, the lack of marketing and also a classic problem, namely capital. This is a problem that must be solved together.

Despite that level of sustainability for SMEs in Indonesia need to be upgraded due to the type of this business it's very susceptible to the industrial conditions that fluctuations. Many SMEs are popping up in the industry but not least that SMEs also was out and failed. This is due to less powerful competitiveness that SMES have let alone with the competitors from abroad that made the competition getting tougher (Nugrahani, 2015).

3. Methodology

The method used on this paper is descriptive analysis based on the study literature such as journal articles, books, online articles, proceedings, and other sources that support for this research and online survey to 100 respondents. The respondents chosen randomly, with the limitation: owned their SME and located in west java as to simplify this study. The survey

was questioning about their digital marketing media. Observation and Semi-formal interview also conducted to several SME that still hasn't using digital/online as their marketing media to know the reason for not using it.

4. Finding and Arguments

Digital marketing is important in order to enhance the marketing for SMEs in Indonesia. In the previous study state that digital marketing can improve your marketing activities to get the maximum result for the company. But in reality not all the SME are aware with media digital as their marketing. While some business are aware but they still cannot use the media digital appropriately so it has not been getting the maximal for the company**.**

The online survey were distributes to the respondents. The respondents on this research is SME but because of the limitation, the respondents only SME in west Java especially Bandung and chosen randomly. The number of respondents are 100 SMEs by slovin method. On this online survey, the respondents are questioning a general and several question regarding the digital marketing. The purpose of this survey is to know how much the SME that has been using digital/online marketing and how effective their use the online media according to the media shown on table1 and 2 below. Table 1 shows how many SMEs that have used digital marketing with media they owned – the media that is mentioned in the table1 (website, social media, e-commerce), while table 2 is the effective values felt by the respondents when using online marketing. In table 2 the respondents who answered "YES" to the question in table 1 are given follow-up question namely how effective and efficient their use of online media as a tools of their marketing. The scale that given is likert scale from 1 to 5. Large numbers they give means the more satisfied they are with the use of the digital media and reverse for the least number.

Table 1

	YES	NO
Have a website	36%	64%
Have a social media (Instagram, facebook,line@ etc.)	82%	18%
Join e-commerce (lazada, bukalapak, tokopedia, etc.)	49%	51%
Not using any online marketing	16%	84%

Table 2

effectiveness	average (scale 1-5)
effectiveness on using website	2.769
effectiveness on using social media	3.292
effectiveness on using e-commerce	4.330

Various digital or online media that can be used as a tool of marketing are website, social media such as facebook, instagram, line @, twitter and also media e-commerce such as lazada, bukalapak, blibli, tokopedia and etc. On the table 1, it is seen that almost a half of the respondents are using digital/online marketing. Only 16% of the respondents that are not using any online marketing, on the other hand they are still using traditional marketing such as brochure, pamphlet, and any printing etc. the digital marketing that SMEs use the most is the online marketing using social media. As it known social media can be used as a tool of marketing because a lot of the community that use it, besides the use of relative easiest and least cost than the website and join the e-commerce become one of the factor. Only 36 % of respondents who already owned their website for their company when the existence of this website is important enough as their company's credibility and customer confidence against their company. Whereas, there are 49% of respondents who have enrolled on the media

advertisement like e-commerce lazada, bukalapak and etc. It is indicate that SMEs pretty aware with the advancement of technology and the development of the current era.

However, as seen from table 2 regarding the effectiveness or satisfaction of respondents against online media they use, on average the value are relative low. Its means the respondents give a small value for each category/variables. From 36% of respondents who have a website, they gave an average rating only 2.7 against their satisfaction in using the website. Means they have not been completely satisfied or have yet to feel the benefits of the use of the website. Same with other variables that are social media and join the e-commerce that have average rating of 3.2 and 4.3. It seen join e-commerce has the highest satisfaction level from the others, it is because we can see today's society has been widely know media e-commerce and use it as their online shopping media because of the ease way that the community feel. But surely there's a fee that must be paid by the business to market their product on the applications of e-commerce. The low value indicates effectiveness SME hasn't been able to operate online media correctly and appropriately. Digital marketing is supposed to be a convenience for those SME owners in marketing their business to the wider community, but if they have yet to feel the benefits of the significant use of digital media means the use of their online media is still not right. Because unlike traditional marketing that can be applied easily, for digital marketing need a skills and knowledge in applying them.

Seeing the low effectiveness values that SME give against the use of digital marketing, it cause by several factors. These factors was obtained from results of interviews to some of the respondents regarding their response to digital marketing, that are;

- Less understand usage of online marketing (such as the use of the website and social media)
- Only followed the trend without understanding it.
- Technology blind
- Do not want to elaborate (some thought, the use of online marketing is quite difficult and vex them)

The core of the point above is, many SMEs are not familiar yet with the use of technology that exists today. They do not understand how to use right on online media and effectively. Because the owners of SMEs are still predominantly by the generation X and Y while currently this era has been in generation Z. So that the SMEs must conform to the behaviour patterns of generation Z that rely heavily on technology.

Proposed solution

In the previous explanation, which became the largest SME problem in using digital marketing or online marketing is primarily the lack of knowledge and expertise in the matter. They have not been able to operate online media appropriately, effectively and efficiently as they should be expected, so the best solution of this problem is holding training for SMEs particularly in West Java as the object of research on this paper. Training is intended as a way for understanding the SME, to make the SME become an expert in order to utilize digital media well, then with digital marketing they can increase their marketing to a broad market. As digital marketing now is currently the urgency for the Regent's business that should be their power and opportunity in order to survive in the industry. In the next, the social media and websites they have can they operate properly then the value of effectiveness can be higher.

Training can be administered by the educational institutions or Government institution for the development of SMEs to be more insightful and go forward, so SME can compete in their industry not only national but also international. Due to the use of digital marketing, the opportunities of SME to advance to the international business is very big, surely if they can use the media digital properly and appropriately. With this training SMEs will be taught also how to use the correct as well as the strategy in using online media in the business world. Not only training, mentoring also needed by the SMEs. Currently

SMEs requires an escort business who are experts in the technology. In addition to training, mentoring for SMEs can also be made for more intense results.

Digital marketing media would seem diverse outcomes in view of unmistakable groupings. Such plentiful assortments of computerized showcasing media and the particular attributes permit the users following the qualities to operate. Among digital marketing media, mobile phones, mobile devices, and website are frequently proposed by researcher that they are viewed as the trend of present day and future media to design the digital marketing strategies in advance. Then the training should be focus on the media that often used in digital marketing. One of them is website that are very common. With the training and mentoring, the goal is SME will be able to utilize and operate their website well following with other media in digital marketing.

5. Conclusion

The strategy of marketing always change following the changes of the times. Business owners should be able to follow the changes in the existing era so that they can continue to make innovation and marketing. There are two types of media marketing i.e. traditional marketing and digital marketing. Traditional marketing is a marketing technique in one direction that's been done since before Digital Marketing exist. An example is marketing through newspapers, television, Radio, magazines and more. While digital marketing is doing marketing efficiently using technology and other social media so that it can be reach a broad market in a short time. If seen from the benefits, digital marketing is far superior rather than traditional marketing. But if views today, many business owners especially SME are still not able to make use of digital media as a tools of their marketing. The problem lies in the lack of knowledge and skill they have. Some SMEs have switched using digital marketing namely online marketing as their marketing media for their products and their company. However, not all the SME are success in applying digital marketing in the company, so that the results they get still not maximal. Whereas the main purpose of the use of digital marketing is to maximize marketing activities in order to get maximum results for the company. For that as the solution, conduct training, coaching and mentoring towards SMEs regarding the use of digital marketing appropriately is extremely necessary. Training needs to be provided by the government and university for SMEs in Indonesia in order to understand the procedures of website creation and usage, the right tricks or strategy in the use of social media and such. So the goal are, the SMEs in Indonesia will be more proficient in using digital marketing and getting the maximal results for the company. Ultimately SME in Indonesia can continue to live and go forward to compete with other competitors in particular the foreign and international competitors.

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