

Evaluating the Implementation of Green School (*Adiwiyata*) Program: Evidence from Indonesia

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ABSTRACT

One of the strategic efforts to teach education for sustainable development is implement a green school (called, hereafter, *adiwiyata*) program through formal education. The aim of this study is to evaluate the implementation of *adiwiyata* program in 33 schools in Indonesia. The main findings indicate that: first, the results of the context evaluation from the aspects of awareness and public expectations; the relevance of the programs; government's regulations and policies categorized as excellent. Second, the results of the input evaluation were referred to the characteristic aspects of the headmasters, teachers, administrative staffs, individual services officers, and school committees; the characteristics of students; curriculum; and the characteristics of environmentally-friendly infrastructure and facilities which are all categorized as good. Third, the results of the evaluation process were obtained from the aspects of learning preparation, learning process, and collaboration with other institutions which are classified as good. Fourth, the results of the product evaluation were based on the aspects of student's achievements and competence, and public response and satisfaction which are categorized as good. Therefore, *adiwiyata* program can be continued as an effort to promote the sustainable development paradigm.

KEYWORDS

adiwiyata (green schools) program, evaluation, CIPP model, sustainable development

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Introduction

The environment issue nowadays is an emerging, actual, and essential topic. Environmental degradation has become one of the proofs that human activity has a direct impact on the environmental preservation, environmental

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damage, and environmental pollution. Therefore, in order to sustain the condition of the environment, all human activities should be in accordance with the concept of sustainable development.

Sustainable development is a holistic paradigm of the United Nations (UN). The concept of sustainable development was described by the Brundtland Commission Report in 1987 as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (UNESCO, 2012a).

To realize the sustainable development paradigm, the UN has set The Eight Millennium Development Goals (MDGs) which had been implemented starting in 2000 to 2015. The eight MDGs are: (1) eradicating extreme poverty and hunger, (2) achieving universal primary education, (3) promoting gender equality and empowering women, (4) reducing child mortality, (5) improving maternal health, (6) combating HIV/AIDS, malaria, and other diseases, (7) ensuring environmental sustainability, and (8) global partnership for development (UN, 2015a; Pisciotta, 2015).

Of the eight MDGs the above, it is clear that one of the goals of sustainable development is to ensure environmental sustainability, and technically, it can be done through a global partnership. Furthermore, the UN through UNESCO also developed education for sustainable development (ESD) which had been implemented in 2005-2014. ESD consisted of four main activities, namely: (1) teaching sustainable development, (2) encouraging research on sustainable development; (3) green campuses and supporting local sustainability efforts; and (4) engaging and sharing information with international networks (UNESCO, 2012a).

Of the four ESD activities in the above, it is clear that one form of ESD undertaken by establishing green schools/green campuses. Furthermore, to realize the more comprehensive sustainable development paradigm, 193 UN state members have agreed The Seventeen Sustainable Development Goals (SDGs) which have been implemented starting in 2016 to 2030 (UNRIC, 2015; UN, 2015b).

The environmental education issue has emerged since 1975 at the International Conference on Environmental Education in Belgrade, Yugoslavia. The conference resulted “The Belgrade Charter – a Framework for Environmental Education” (UNESCO, 1975). Furthermore, the world’s first intergovernmental conference on environmental education was organized by UNESCO in cooperation with UNEP and convened in Tbilisi, Georgia (USSR) from October 14-26, 1977 (UNESCO, 1977; Chin, 2004). The international conference of environmental education was to establish Tbilisi Declaration (1977) in which the goals of environmental education are: first, to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas (UNESCO, 1977; NAAEE, 2004); second, to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment; and third, to create new patterns of behavior of individuals, groups, and society as a whole towards the environment (UNESCO, 1977).

In Indonesia, following the mandate of the Constitution of the Republic of Indonesia of 1945 Article 28h stated that a healthy and good living environment is a fundamental right of every citizen of Indonesia (PCA, 2011). Therefore, the efforts to achieve the mandate has stipulated in Law Number 32 of 2009 on the Protection and Environmental Management (MJHR, 2009). For this reason, the environmental education was chosen by The Ministry of Environment and the Ministry of Education of the Republic of Indonesia through *adiwiyata* program.

The form of the agreement was evidenced by the joint signing of an agreement between the Minister of the Environment and the Minister of National Education on June 3, 2005, which was intended to increase knowledge and understanding of the environment to the students and the community. The realization of the agreement, on February 21st, 2006, has been proclaimed *adiwiyata* program with the aim purposes to achieve the school community who are aware with the environmentally-based culture. (MoE, 2011). For this reason, it is necessary to evaluate the implementation of the *adiwiyata* program in Indonesia.

Definition of *adiwiyata* schools (green schools)

Each country has its own definition of green schools; there is no standard definition of green schools. In current trend, there are some terms such as “green”, “healthy”, “sustainable”, and “high performance” are often used interchangeably (ZAS Architects Inc.). The terms “*adiwiyata*” in Indonesia comes from two words from Sanskrit, *Adi* and *Wiyata*. *Adi* means big, grand, good, ideal or perfect, while *wiyata* means the place where a person gets knowledge, norms, and ethics in social life. The combination of the two words *adiwiyata* has the meaning: a right and the ideal place which can be obtained through all science, norms, and ethics and it can be the basis for the creation of human well-being and toward the ideals of sustainable development (MoE, 2011).

However, whatever the terms used to define the green school, there are some common principles which are often used to describe green schools, namely: protecting the environment, lowering operating costs, improving health and quality of the learning environment, and integrating the learning opportunities with the environment (ZAS Architects Inc.).

The United States Green Building Council (USGBC) has defined “a green school as school building or facilities that create a healthy environment that is conducive to learning as well as saving energy, resources and money” (Ramli et al., 2012). Besides, green schools are the result of a consensus process of environmental planning, design, and construction of buildings that takes into account performance over the life cycle of 50-60 years entirely (Gordon, 2010; Ramli et al., 2012).

Furthermore, the sustainable school or green school can create a better learning environment (Olson and Kellum, 2003; Ramli et al., 2012). A sustainable school not only includes the concept of sustainability, but also as a teaching tool for the concept of sustainability (Ramli et al., 2012).

Definition of green schools in Indonesia refers to the Regulation of Minister of Environment Number 05 of 2013 on Guidelines for *Adiwiyata* Program. It is mentioned in the ministerial regulation that *adiwiyata* school is a good and ideal school as a place to obtain all the science, norms, and ethics that

can be the basis for the creation of human well-being and the models of sustainable development (MoE, 2013).

Assessment system for Indonesian *adiwiyata* (green) schools

In Indonesia, *adiwiyata* schools should meet four components, namely: 1) environmental policy, 2) the implementation of environmentally-based curriculum, 3) participatory-based environmental activities, and 4) environmentally-friendly infrastructure and facility management (MoE, 2011).

National Award on *Adiwiyata* is usually awarded annually to the schools that have achieved minimum score of 72 (of the implementation of the four components) at the time of the evaluation conducted by a national evaluator team. In more technical, design evaluation of the implementation of the *adiwiyata* schools in Indonesia is as shown in **Figure 1**.

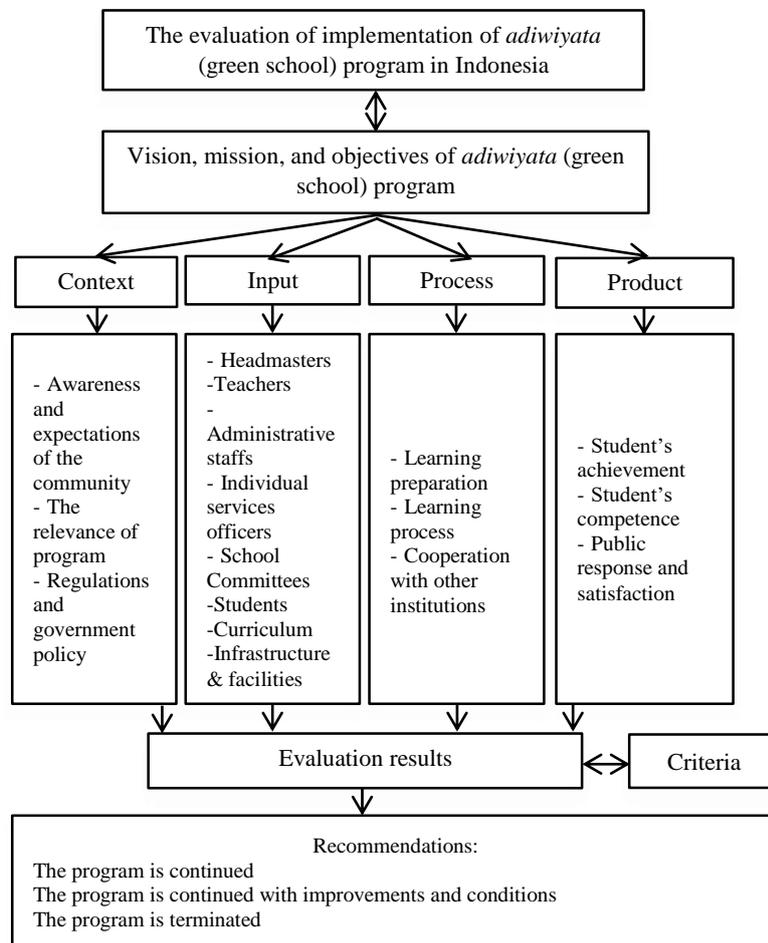


Figure 1. The evaluation design of the implementation of *adiwiyata* program

Method

This is an evaluation research. The evaluation was conducted in 33 selected schools in Indonesia. The adiwiyata schools were evaluated consisting of six elementary schools (SD), 15 junior high schools (SMP/MTs), nine senior high schools (SMA) and three vocational high schools (SMK). The study was conducted from June 2012 to June 2014. The evaluation model is a context, input, process, product (CIPP) model, which has been developed by Stufflebeam and Shinkfield. Evaluation is a process of delineating, obtaining, and providing descriptive and judgmental information to guide decision-making (Stufflebeam & Shinkfield, 1988).

The decision-making process was taken by comparing the findings/facts obtained in the context, input, process, and product to the established standards or criteria previously, namely by the Technical Instructions of Adiwiyata School Assessment stipulated in Appendix III of the Ministerial Regulation on Guidelines for Adiwiyata Program.

Respondents were 33 headmasters, 231 teachers, 132 administrative staff, 990 students, 66 special service officers, 198 school committees and school partners. While data collection techniques in this study were: (1) observation, (2) interviews, and (3) documentation.

Data were analyzed with the descriptive quantitative using percentage. The results of the analysis for the context, input, process, and output evaluation refer to **Table 1** below.

Table 1. Interpretation of the evaluation results

No.	Percentage (%)	Category
1	81-100	Excellent
2	61-80	Good
3	41-60	Enough
4	21-40	Poor
5	0-20	Very Poor

Results

Context evaluation

Context evaluation was used to measure the achievement of the first and third components of *adiwiyata* school program, namely environmental policies and participatory-based environmental activities. It consists of three aspects, namely (1) awareness and expectations of the community, (2) the relevance of program, and (3) regulations and government policy.

Awareness and expectations of the community

Of the interviews with six people members of the school committee at the schools, it was obvious that the boards of the school have high interest and expectation to the success of the adiwiyata schools which are aware and have environmental culture. This concern was proven through the 1-18 Memorandum of Understanding (MoU) documents at the schools which have been signed between the school committee and school partners, with the average of seven MoUs at every school. In addition, the school committee and school partners

have been involved in several environmental actions organized by the schools, namely the activities of planting one million trees in commemoration of World Environment Day, June 5, the members participate in guest teachers in composting process, as the speaker in making bio-port, as a trainer in the making Wastewater Treatment Plant (WTP), as the speaker in the manufacture of organic waste chopper machine. Moreover, the shape of the concern and support from the school committee and school partners can be seen in several forms, such as the provision of environmentally-friendly facilities at schools, training related to safeguard and environmental management, guidance on the protection and management of the environment, and procurement of waste management facilities.

Corroborated the facts above, the awareness and expectations of the community to the implementation of adiwiyata program in Indonesia, are categorized as positive and excellent.

The relevance of program

From interviews with two community leaders where the schools reside, it was known that the implementation of adiwiyata program has been very helpful in efforts to reduce waste at schools and surrounding; the better treatment is such as the quick response to the garbage, instead of putting the garbage in front of the schools waiting for being transported and dumped into landfills by the officers. The reason is thus at school should provide separate bins for the rubbish (e.g. organic, inorganic, and hazardous or toxic wastes) and it should implement 3R program (Reduce, Reuse, and Recycle) for the garbage at schools and surrounding.

From interviews with the school headmasters, seven teachers, six school committees, four administrative staffs, two special service officers (school gardeners and caretakers), and 30 students, they are likely unanimously said that adiwiyata program is suitable and proper with the potential and environmental conditions at the schools. Through the implementation of adiwiyata program, sewage or garbage at the school can be reduced, reused and recycled. Even through the 3R program as part of the green school program, the results of the organic waste, plastic, glass and paper processing can be used as a source of income for the schools, by selling the compost and even souvenirs made of the processed garbage at the schools. Therefore, the concept of environmental education can be taught in a way to integrate it with a compulsory subject at schools and monolithic local content subject of environmental education. A mandatory subject that is combined with environmental education and monolithic local content subject of environmental education have a minimum value of mastery learning ranging from 70 to 85.

The relevance of the implementation of adiwiyata program in Indonesia, can be categorized as excellent and relevant.

Regulations and government policy

Adiwiyata program is apparently a joint program between the Ministry of Environment and the Ministry of National Education, Republic of Indonesia. The form of the agreement was presented through the signing of an agreement between the Minister of the Environment and the Minister of National

Education on June 3, 2005, which is intended to increase the knowledge and understanding of the environment to the students and the community. One of the realizations of the agreement, on February 21, 2006, has been proclaimed *adiwiyata* program with the aim to achieve the school communities who are aware and have environment culture.

In terms of legal aspect, *adiwiyata* program is supported by some laws, regulations, and MoUs, namely: 1) the Constitution of the Republic of Indonesia of 1945, 2) Law Number 20 of 2003 on National Education System, 3) Law Number 32 of 2009 on the Protection and Environmental Management, 4) the Regulation of the Minister of the Environment Number 05 of 2013 on Guidelines for *Adiwiyata* Program, 5) MoU documents with the Environment Development Center, Semen Gresik Foundation, 6) MoU documents with the Environment Agency at District/City level, 7) MoU documents with the Department of Education, Youth and Sports at District/City level, and 8) MoU documents with both public and private institutions.

Supported with several legal bases, it can be asserted that the government regulations and policies on the implementation of *adiwiyata* program in Indonesia, can be categorized as excellent and well-supported.

Regarding the context evaluation in terms of the awareness and expectations of the community, the relevance of program, government regulations and compared with established criteria can be categorized as excellent.

Input evaluation

Input evaluation was employed to measure the achievement of the second and fourth components of *adiwiyata* program, which is the implementation of environmentally-based curriculum and management of the infrastructure and environmentally-friendly facilities. It consists of four aspects, namely (1) the characteristics of headmasters, teachers, administrative staff, individual service officers, and school committees, (2) the characteristics of students, (3) curriculum, and (4) the characteristics of environmentally-friendly infrastructures and facilities.

The characteristics of headmasters, teachers, administrative staff, individual services officers, and school committees

From the interviews with the headmasters, seven teachers, four administrative staffs, two individual service officers, and six school committees, they all know and understand the vision, mission, and objectives of the school (100%) related to the effort of environment protection and management, namely 1) preservation of environmental functions, 2) the prevention/control of environmental damage, and 3) the prevention/control of environmental pollution. This condition shows that all respondents have comprehensive knowledge of environmental protection and management in realizing the sustainable development paradigm through school community.

The characteristics of the school headmasters, teachers, administrative staffs, individual service officers, and school committees in relation to the implementation of *adiwiyata* program in Indonesia can be categorized as excellent.

The characteristics of students

From the interviews with 30 students at each school, it can be seen that as many as 19-22 students or 63.33%-73.33% of students know and understand the vision, mission, and objectives of the school in relation to environmental protection and management. The data mean that there were still 26.67%-36.67% of the students who do not know and understand the vision, mission, and objectives of the school in the environmental protection and management. They are likely the students who were not members of the green school team and did not follow the extracurricular activities related to environmental activities, such as Scouts, Student's Organization, Nature Lovers (Student's Mountaineering Club), Youth Red Cross, School Health Unit, and Youth Scientific Group. Therefore, it needs intensive coaching to them.

The characteristics of students for the implementation of *adhiwiyata* program in Indonesia, can be categorized as good.

Curriculum

From the observation and documentation, that vision, mission, and objectives at every school can be understood that they have direct concern with three issues related to environmental protection and management. The three environmental protection and management are namely: environment conservation, the prevention of environmental damage, and the prevention of environmental pollution which are clearly visible stated on the indicators of the schools' vision, mission, and objectives.

The curriculum structure that contains environmental protection and management can be seen from the syllabus of compulsory subjects, i.e., normative subjects (Religion; Civics Education; Art and Culture; and Sport Science, Health, and Physical Education) and adaptive subjects (Science, Social Science, Biology, Geography, Indonesian, Chemistry, Sociology, English, etc.), and they were integrated with environmental education. In addition, there is one local content subject of environmental education which is implemented monolithically. However, specifically for vocational high schools, productive subjects have not yet been integrated with environmental education. For this reason, to strengthen the knowledge, attitudes, motivation, awareness and environmentally-friendly behavior of the students, the schools also organize some extra-curricular activities such as self-development through Nature Lovers, Scouts, Youth Red Cross, Youth Scientific Group, School Health Unit, and Student's Organization.

All subjects are integrated with environmental education and local content of environmental education has a minimum value of mastery learning ranging 70-85.

While the school budget for the environmental protection and management activities at the school was evaluated ranging from 9.87%-32.09% or the average of 23.17% of the activities plan and school budget, where the requirements to become an *adhiwiyata* school at the national level should allocate at least 20% of the activities plan and school budget.

The curriculum structure for the implementation of *adhiwiyata* program in Indonesia, can be categorized as good.

The characteristics of environmentally-friendly infrastructure and facilities

Based on the observation and documentation of the existing infrastructures at each school, it can be seen that the schools maintain three environmentally-friendly infrastructures according to their function as follows:

- a. The room has good arrangement of light and natural ventilation;
- b. The schools manage and maintain both shade and greening trees;
- c. The schools use paving and grass-block around the buildings to prevent flooding;

Based on the observation and documentation of the facilities at the schools, there are some innovations of the school community in creating environmentally-friendly facilities for environmental learning as follows:

- a. Organic waste chopping machine is used for the organic waste to make compost;
- b. The composter to make compost from organic waste;
- c. Bio-port Infiltration Hole (BIH), which serves to prevent inundation and flooding, prevent erosion and landslides, increase the reserves of clean water, make compost and fertilize the soil.
- d. Wastewater Treatment Plant (WTP), which operates to change wastewater into clean water that can be used for watering the plants and washing. In the WTP, there are many materials such as alum, zeolite stone, fibers, sand, pebbles, and charcoal. Alum serves as a coagulant. These coagulants increase the particle size of sludge and other particles floating in the water so it can be deposited. Zeolite stone helps to reduce the content of iron (Fe), manganese (Mn), zinc (Zn) and lead (Pb) contained in the water. Zeolite stone is also able to reduce levels of ammonia in the wastewater. Fibers serve to filter out particles that escaped the previous filter layer and flatten the flow of water. The sand is used to hold the sludge. Coral acts as a filter and helps aeration oxygen, while charcoal surface has pores function as tiny absorbent particles, odor, and color of the water.
- e. Infiltration wells. First, infiltration wells serve to reduce the flow of the surface so as to prevent/lessen the occurrence of floods and waterlogging at the school neighborhood. Next, they maintain and improve the ground water level, reducing erosion and sedimentation, reducing seawater intrusion to an adjacent area of the coast. Finally, they prevent soil degradation (land subsidence), and lessen the concentration of water pollution/soil.
- f. The disaggregated trash (leaf litter, plastic/glass waste, paper waste, and hazardous and toxic substances).
- g. School forest for open green spaces for school community as an oxygen generator. In addition, it is used to teach about biodiversity to the students.
- h. The greenhouse, it is a nursery-shaped house and used to sow and wean the seed/seed sprouts temporarily until they become seedling ready for planting in the field. Sowing is an activity to get seeds/sprouts in a medium like pot/polybag in the nursery, while weaning seeds are separating or moving the seedlings of the group to be the individual plants in a separate container by the size of the growth.
- i. AC water storage reservoir. There are some benefits of conditioned water, which can be used for: 1) watering plants, 2) adding electrolytes in batteries, 3) filling the radiator water on the vehicle effectively (avoiding

corrosive), 4) cleaning floors or glass, 5) washing, and 6) filling the tank (to prevent mildew).

j. *Takakura* composting method. *Takakura* is organic waste treatment system using a household-based source in the form of compost.

k. Waste Bank. The waste is produced from leftover or unused goods (effluent) or still used again by their owners, and the waste bank is used to store the trash, both organic and inorganic garbage. Subsequently, the organic waste is recycled into compost, while inorganic trash like bottles of mineral water, iron, glass, plastic, fabric remnants or old clothes, old tires, cans, and others from industrial waste can be reduced and reused as a raw material manufacture of souvenirs. The results of selling the processed organic fertilizer and souvenir are used to fund the extracurricular activities and environmental protection and management.

l. Fishpond. It is used for catfish, carp, and tilapia by utilizing waste water from the mosque ablution at the school. In addition, to further increase the sense of love for the animals, some schools also provide a mini zoo.

m. Healthy canteen. Schools provide a healthy and environmentally friendly canteen for the school community with three attempts. First, the school canteen does not sell food and beverages that contain hazardous materials. Second, the school canteen does not sell food and beverages contaminated and expire. Third, the school canteen does not sell food and beverages are packaged using plastic, styrofoam and aluminum foil.

The characteristics of the environmentally-friendly infrastructures and facilities for the implementation of *adwiyata* program in Indonesia, can be categorized as good.

Based on the input evaluation in terms of the characteristics of the headmasters, teachers, administrative staff, special service officers, and school committees, characteristics of the students, curriculum, and the characteristics of the environment-friendly infrastructures and facilities compared with the established criteria, it can be categorized as good.

Process evaluation

Process evaluation was employed to measure the achievement of the second and third components of *adwiyata* program, namely the implementation of environment-based curriculum and participatory-based environmental activities. It consists of three aspects, namely (1) learning preparation, (2) learning process, and (3) cooperation with other institutions.

Learning preparation

Based on the documentation of the syllabus and lesson plans at the selected schools, there were only 8-12 subjects that are integrated with the environmental education of the 15 subjects (only 53.33%-80%). Subjects that are integrated with environmental education were limited to the normative and adaptive subjects. In particular vocational schools, the productive subjects do not combine the environmental education materials. Besides, there is also the local content of environmental education subject is implemented monolithically in each school. Based on the observations and documentations, the concept of

integrated environmental education monolithically at the schools was performed both inside and outside the classroom.

Based on the interviews and documentation with seven teachers, it was noted that there were 4-5 teachers or 57.14% -71.42% of total teachers who have developed local issues (in rural area) and global issues related to environmental protection and management. For example was local environmental problems that have been included by the teachers are garbage, air, water, and land pollutions, illegal logging, extinction, biodiversity, landslide, flood, tornado, noise (audio pollution), drought, deforestation, forest fires, and haze. The global environmental issues that have been included by teachers are the energy crisis, depletion of the ozone layer, climate change, biodiversity, greenhouse effect/global warming, hazardous and toxic materials, and oil spills.

Based on the documentation and interviews with seven teachers, it was noted that there were 4-5 teachers or 57.14% -71.42% of total teachers in each school that has developed assessment indicators and instruments related to the environmental protection and management.

Furthermore, based on the results of the documentation, it was also known that from 15 lesson plans made by teachers in each school, only 8-12 lesson plans or 53.33%-80% of total lesson plans related to the environmental protection and management.

The learning preparation by teachers for the implementation of adiwiyata program in Indonesia, can be categorized good.

Learning process

Based on the observations and documentation at each school, it was shown that only 15-18 students out of 30 students or 50%-60% of total students who have produced real works related to the environmental protection and management.

Furthermore, only 12-15 students from 30 students or 40%-50% of the students who have communicated or presented the results of the environment learning through wall magazines, bulletins, tabloids, magazines, educational exhibitions, school websites, radio, television, and newspapers. However, none of the students have communicated the results of the environment learning through scientific journals.

Based on the interviews and documentation, it was known that there were 40-45 people from 48 people at the schools or 83.33%-93.75% who have been involved in the school building and environment maintenance. However, based on the interviews and documentation at each school, averagely there are only three environmental actions organized by school partners attended by the teachers. Interestingly, there were four environmental activities organized by school partners followed by the students. The data show that students have more activities in the environment protection and management than the teachers. It also supported by evidence that the headmasters at each school have become once as a guest speaker in the framework of the learning environment in the form of a workshop held by the school partners.

The learning process was also carried out by the environmental extra-curricular activities such as Nature Lovers (Mountaineering Club), Scouts, Youth Red Cross, School Health Unit, Youth Scientific Group, and Student's Organization. The activities include recycle the organic waste, plastic, and paper

through the 3 R (reduce, reuse, and recycle) program. Reducing is to reduce waste by using items that are still usable. Reusing is to use again certain goods that are still fit for use. Recycling is to reprocess the organic waste and make use of the organic waste safely and appropriately (e.g., composting of organic waste).

Besides, environmental education is also done by training of breeding and cultivation of medicinal plants and vegetables at schools. The students are taught to plant and cultivate some vegetables and plants such as kaempferia galangal (kencur), turmeric, aloe vera, ginger, galangal, ginseng, roselle, java ginger (temulawak), tomato, taro, orthosiphon aristatus, kaffir lime, eggplant, and red pepper.

The learning process in the implementation of *adhiyaya* program in Indonesia, can be categorized as good.

Cooperation with other institutions

Based on documentation and observations, it was noted that the cooperation that has been built with other institutions of each school amounted to 3-18 cooperation in the form of a MoUs, in average, there were 8 MoUs that support *adhiyaya* program, including:

- a. Elementary School (SD), both public and private schools.
- b. Junior High School (SMP/MTs), both public and private schools.
- c. Senior High School (SMA), both public and private schools.
- d. Vocational School (SMK), both public and private schools.
- e. Environmental Development Center, Semen Gresik Foundation.
- f. Environment Agencies at Provincial and District/City level.
- g. Department of Education, Youth and Sports at Provincial and District/City level.
- h. Community Health Center.
- i. Public and private universities.
- j. Public and private companies.
- k. Mass media (television, radio, and newspapers).
- l. Non-governmental organizations (NGOs) on environmental concern.

The cooperation with other institutions with the concern with environmental issues in relation to the implementation of the *adhiyaya* program in Indonesia, can be categorized as good.

Regarding the evaluation process of learning preparation, the learning process, and cooperation with other institutions compared with established criteria, the implementation of *adhiyaya* program can be categorized as good.

Product evaluation

Product evaluation was used to measure the achievements of the second and third components of *adhiyaya* program, namely the implementation of environment-based curriculum and participatory-based environmental activities. It consists of three aspects, namely (1) student's achievement, (2) student's competence, and (3) public response and satisfaction.

Student's achievement

Based on the documentation, it was proven that with adiwiyata program may improve the student's academic and non-academic achievements at the selected schools. It can be seen from the student's academic achievement in the field of quiz competitions, the competition on technological innovation, science Olympiads, scientific writing competition, and national test scores. Likewise with student's achievement in non-academic fields is reputable, such as sports competitions, martial arts, school health unit, the Youth Red Cross (PMR), and Scouts.

Zint, Kraemer, and Kolenic (2014) stated that students involved in the steps of scientific inquiry, reflection, and participation in various types of environmental action would have a higher score significantly in environmental achievement characteristics compared with students who did not have these experiences.

The student's achievements in the implementation of the adiwiyata program in Indonesia, can be considered as good.

Student's competence

Based on the observations and documentation, it was proven that adiwiyata program may improve the student's competence. This condition was shown through the increasing student's competence in the field of student's competency competitions (familiar known as LKS for vocational school students in Indonesia) which is held annually at the school, district/city, provincial and national levels. For vocational school students, moreover, one of the required competence areas of expertise also has new competence in creating organic waste chopping machine, fuel saving technologies, electricity saving technology, and other environmentally-friendly technologies. These facts show that the adiwiyata program may enhance student's creativity, achievement, and competency in Indonesia towards achieving green jobs/green skills.

The student's competencies in the implementation of adiwiyata program in Indonesia, can be considered as good.

Public response and satisfaction

Based on the results gained through the interviews with six parents of students at each school, it was shown that they are satisfied with the education process at adiwiyata schools for two reasons. First, of all, students are not only taught to master the all real subjects and certain expertise competencies, but also students are taught environmental education so that they have sense of awareness, motivation, knowledge, skills, and eco-friendly behavior in the form of concrete action to achieve the sustainable development paradigm. Second, especially for senior high school (SMA) and vocational high school (SMK) students, they are also equipped with the skills to make the appropriate technology in the form of environmentally-friendly technologies to support sustainable development.

The level of public response and satisfaction in the implementation of the adiwiyata program in Indonesia, can be considered as good.

Regarding the product evaluation concerning with the student's achievement, student's competence, and public response and satisfaction compared with established criteria can be categorized as good.

Discussion

Despite the fact that the evaluation of adiwiyata program at the national level, showed real achievements based on the established criteria, but the implementation of the program still has several deficiencies in realizing the environmental protection and management towards sustainable development. The disadvantages of the implementation of adiwiyata program at some schools to be evaluated can be seen from the four components of adiwiyata. Firstly, environmental policy. The limited of the environmental policy in relation to the implementation of adiwiyata program at the school come from several causes. First, the schools do not have environmental review upon the documents to resolve the problems and environmental issues at the school. Second, the environmental policies have been implemented in general particularly at vocational schools in which do not have not competency-based skills. Third, the vision, mission, and education objectives in the environment protection and management have not been fully understood by the students. Fourth, there are still four schools that have not been allocated minimum budget (20%) for the activity plan in an effort on the environment protection and management. Therefore, the principals of the adiwiyata school should immediately restructure the existing environmental policy at their school.

Secondly, the implementation of the environment-based curriculum. Another shortcoming in the implementation of the environment-based curriculum at schools is, namely, that there is still confusion among some schools in terms of whether the environmental education at schools is ideally implemented in a monolithic or integrated. For schools that implement an integrated environmental education, it is only limited to the normative and adaptive subjects. Wahyuhadi (2012) in his research concluded that the topics integrated with environmental education at vocational school SMK Negeri 1 Salatiga, Central Java, Indonesia were confined to subjects of English, Science, Religion, Social Studies, and Physical Education, and the topics were not led into productive subjects that are specialized at vocational school. Second, shortcoming is that there were 28.56% - 42.86% of teachers who have not yet knowledgeable upon the local issues and global issues related to environmental protection and management. Third, the lesson plans have not yet reflected the relationship among some aspects such as learning objectives, learning models, learning methods, educational resources, and learning assessment which are related to environmental education. Vocational teachers, in particular, should master several different teaching methods; they may choose appropriate teaching methods for lessons and measures that are relevant for evaluating learning outcomes which correspond to the learning objectives, learning content, and tend to use models to the student-centered learning (Diep and Hartmann, 2016). Fourth, there were still 28.58% - 42.86% of teachers who have not mastered the concept of how to integrate environmental education into their subjects, including how to develop learning indicators of competencies achievement and assessment instruments. Fifth, for vocational high schools, schools have not yet developed green curriculum to develop green jobs or green

skills. On the other hand, Gleissner (2013) stated that one of the steps to develop green technical and vocational education and training (TVET) is that the “development of curricula for education and training for green jobs.” In addition, Gleissner (2013) added that one of the steps to develop greening TVET is the “development of learning/teaching materials.” TVET should focus on a subject discipline, knowledge and skills development to be useful in problem-solving in complex situations (Hartmann, 2016). Furthermore, ESD is one of the strategic efforts to ensure sustainable life and work. Integrating ESD into TVET is essential to improve the knowledge and skills that support economic development and to enhance the quality of life (UNESCO, 2012b).

Thirdly, participatory-based environmental activity. The other drawback of the implementation of participatory-based environmental activities at schools was from several aspects, such as not all school stakeholders have been involved in the environmental actions, both inside and outside the schools. Most of the environmental actions undertaken by adiwiyata schools were attended by the “green school team” and some students who participate in extracurricular activities related to the environment at the schools. Second, there has been lack of involvement of school partners in environmental activities, despite being stipulated in the 3-18 MoUs between the schools and the school partners. Third, there are still 40%-50% of students who do not produce real works or projects related to the environment protection and management. Therefore, it is important to hold such learning innovation workshop for the teachers to integrate all subjects with environmental education, develop proper lesson plan, and develop assessment instruments and indicators of green jobs or green skills-based competencies achievement. In addition, it is necessary to maximize the cooperation between the school and school partners to improve the quality of implementation of the adiwiyata (green school) program. Gleissner (2013) stated that one of the measures to develop green TVET is the development of cooperation networks between companies (private sector), schools, public institutions and vocational research institutions.

Fourthly, environmentally-friendly infrastructure and facility management. Deficiencies in terms of the green facilities at the schools come from several factors. First, the partial green facilities at the schools do not reflect the needs of the schools because apparently they are not based on the environmental review. Second, there is an environmentally-friendly facility but it is not user-friendly, especially for children like the waste chopping machine. Third, there has been lack of green facilities utilization to student learning activities, both inside and outside the classroom. Fourth, specifically for vocational schools, some environmentally-friendly facilities are not even available, such as the manufacturing technology of alternative energy (biogas, bioethanol, biodiesel, solar cells, and wind energy), technology to reduce noise, technologies to reduce air pollution, and technology to reduce vibration. Fifth, there was inefficiency of the average use of electricity, water, and stationery at the schools amounted only to 15.25%, whereas the minimum standard should be 20%. Based on “A Capital E Report” written by Kats, Perlman, and Jamadagni (2005), it is concluded that green schools use an average of 33% less energy than conventionally-designed schools. Also, United States Research Council added that the design of green schools had estimated an average water use reduction up to 32% (Ramli et al., 2012). Sixth, the school canteen is still selling food and beverages that contain harmful ingredients such as sweeteners, preservatives,

flavoring, dyes, and chewy maker ingredients, and they are not packaged using environmentally-unfriendly materials such as plastic, styrofoam, and even aluminum foil.

Therefore, adiwiyata schools should have four efforts to manage the green facilities. First, the adiwiyata schools should maximize the environmentally-friendly facilities utilization to support the environmental education by employing the facilities as learning resource in the lesson plans. Second, the schools should use energy efficiently (electricity, water, fuel, and stationery) to lower the costs and energy consumption. Third, the schools should enact policies to the cafeteria/canteens to perform at least three attempts to improve service quality and environmentally-healthy canteens (e.g. they should not sell food/beverages that contain harmful ingredients, polluted/contaminated, expired, and packed by using plastic, styrofoam, and aluminum foil). Fourth, the schools should maximize the role of the school committee and school partners to help providing the environmentally-friendly facilities to suit the needs and environmental education issues at the schools. It is supported by the opinion by Gleissner (2013) who stated that one of the measures to develop greening TVET is “the development of infrastructures for training and education.”

Conclusion

The context evaluation consisting of three aspects conclude that: first, awareness and community expectations are categorized as excellent. Second, the relevance of adiwiyata program is categorized as excellent and relevant to the needs of the community, local potential and environmental issues. Third, regarding regulation and government policy aspects, central government, provinces, or regions (districts/cities) are categorized as strongly supportive to the implementation of adiwiyata program in Indonesia. In general, the evaluation context can be categorized as very good.

The input evaluation consisting of four aspects conclude that: first, regarding the characteristics of the headmasters, teachers, administrative staffs, individual service officers, and the school committee, all of them know and understand the vision, mission, and education objectives (100%), and it is categorized as excellent. Second, regarding the characteristics of the students, only 60%-73.33% of students know and understand the vision, mission, and school objectives in the environment protection and management, which is categorized as good. Third, regarding curriculum, curriculum structure that contains environmental protection and management has been included into the syllabus of required subjects, i.e., normative subjects and adaptive subjects which are integrated with environmental education and the local content subjects of environmental education employed monolithically, and it is categorized as good. Fourth, concerning the characteristics of environmentally-friendly infrastructures and facilities at the schools are considered safe. In general, the input evaluation is considered as good.

The process evaluation consisting of three aspects conclude that: regarding the learning preparation, first, there are only 8-12 subjects that are integrated with the environmental education of the 15 subjects, only 53.33%-80% of the total subjects. Second, 57.14% - 71.42% of the teachers who have developed local (regional) issues and global issues related to the environment protection and management. Third, 57.14% - 71.42% of the teachers at each school who have developed indicators of learning and assessment instruments

related to the environment protection and management, so that this aspect is considered as good. Concerning the learning process, first, 50% - 60% of the students who have produced real works related to the environment protection and management. Second, 40%-50% of the students who have presented the results of the environmental learning through several media. These media are namely wall magazines, bulletins, tabloids, magazines, educational exhibits, school websites, radio, television, and newspapers. Third, in average, there are three environmental actions organized by school partners attended by teachers, and four environmental actions were organized by school partners followed by students so that this aspect is considered as good. Regarding the cooperation with other institutions, there are 3-18 MoUs for the collaboration in the form of supporting *adhiyaya* program, so that this aspect is considered as good. In general, the evaluation process is considered as good, but there are some required improvements for the implementation of *adhiyaya* program in Indonesia.

The product evaluation regarding student's achievement and competence, and public response and satisfaction aspects, it is categorized as good.

Based on the conclusion, the author would like to give a recommendation to the Minister of Environment and the Ministry of Education of the Republic of Indonesia to continue *adhiyaya* program because it has proven to promote the sustainable development paradigm.

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Disclosure statement

The Authors reported that no competing financial interest.

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