

## Development of Green Dormitory Standard for Mahasarakham University

Kunnika Wattanasaroach, Nongnapas Thiengkamol, Charlie Navanugraha and Tanarat Thiengkamol  
Environmental Education Program, Faculty of Environment and Resources Studies,  
Mahasarakham University, 44000 Mahasarakham, Thailand

**Abstract:** Development of Green Dormitory Standard (GDS) based on the principle of ISO 14001 which is an international standard of effective Environmental Management System (EMS). The green dormitory is a continual improvement for environmental quality by controlling the impacts of dormitory resident activities. Mahasarakham University and its network dormitory provide the dormitory for the undergraduate students whom require an accommodation. The purposes of this study were to develop GDS based on the principle of ISO 14001 for Mahasarakham University and its network dormitory and to train GDS for undergraduate students to accomplish a better practice for environmental conservation. The 10 sets of GDS were implemented to meet at least the legal requirements. The GDS was trained for undergraduate students to be able to practice in different aspects such as electricity and pipe water conservation, solid waste management and so on. The mixed research method was used for data collection. It composed of the qualitative and the Participatory Appreciate-Influence-Control Technique (PAIC) approaches. The sample was selected by using the Purposive Sampling Technique. Focus Group Discussion (FGD) was done with the university dormitory officers and network dormitory owners or representatives. The test and questionnaire was employed as the instruments for data collecting of the PAIC approach. The descriptive statistics with percentage, frequency, mean and standard deviation and the inferential statistics with t-test and one way ANOVA were used for data analysis. Holding the meeting for university dormitory officers and network dormitory owners or representatives of 30 peoples were divided into 4 small groups to do FGD. In each small group did brain storming to develop green dormitory standard based on principle of ISO 14001 and presented for other participants. Finally, they proposed green dormitory standards at the end of meeting with covering 10 sets of standards that are: Environmental policy composes of 4 standards, planning for implementation composes of 8 standards, communication composes of 5 standards, wastewater management composes of 5 standards, solid waste management composes of 4 standards, energy conservation of electricity and water composes of 8 standards, equipment maintenance composes of 4 standards, dormitory safety composes of 3 standards, green area increment composes of 4 standards and preparation for emergency composes of 5 standards. The results illustrated that before and after the PAIC process implemented, the environmental knowledge achievement, the environmental sensitivity, the environmental practice and understanding on GDS were determined. It was found that there were high statistically significant difference between pre- and post-test in ( $p < 0.001$ ) four aspects of knowledge achievement, environmental sensitivity, environmental practice and understanding on GDS. The three dimensional evaluation was used to evaluate the participation of participant, the finding revealed that the mean scores of among self-, friend-, and facilitator-evaluation showed no statistically difference ( $p > 0.05$ ). This indicated that three evaluations on participation during the training process were congruent. During PAIC implemented, the 4 focus groups discussion were done, the overall results showed that there were 4 projects purposed including Solid Waste Reduction, The Modern Dormitory Concern GDS Energy Saving and The Volunteer for GDS to be implemented according to the action plans on Green Dormitory Standard Management. The pilot project selected for implementing was three from four proposed projects. These projects were Solid Waste Reduction, Energy Saving and The Volunteer for GDS. The recommendation from the finding that the university dormitory officers and network dormitory owners and representatives suggested to introduce the GDS to implement to enhance benefit of both owners and renters by saving the expenses including decreasing the pollutions of waste and wastewater. Moreover, Mahasarakham University should hold training with PAIC for all students to understand GDS in order to accomplish the effectiveness and efficiency of environmental quality as a whole university to meet the real sustainable development.

**Key words:** Waste water, green dormitory standard, FGO, friend-evaluation, self-evaluation, energy conservation, Thailand

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## INTRODUCTION

Thailand enacted different law related to the environmental quality control since B.E. 2518 called Act of Promotion and Conservation of Environmental Quality B.E. 2518. There were different revising during B.E. 2521 and B.E. 2522. However, in the period of Prime Minister Anan Punyarachun had drafted called Act of Promotion and Conservation of National Environment Quality B.E. 2535 with the aim of decentralization of planning and action of environment to local participation. This act has been active until present. It gave the importance of monitoring and accountability that were the important keys of pollution control. Consequently, environmental problem solving is accounted of every duty to collaborate for preventing present and future environmental quality control.

All human activities of livelihood have caused environmental impacts in various facets whether air pollution from fossil fuel in the industrial process and transportation or wastewater drainage from household, factory or agricultural activities impacted to quality of soil, water and air as well. Results in environmental quality degradation and destruction of natural resources, it is difficult to avoid but it should be raised awareness for global citizen. Therefore, the appropriate technology and environmental education process must be implemented at all agents regarding local, country, region and international level with the public awareness raising, attitude and behavior changing, public consciousness and responsibility building (Thiengkamol, 2011a).

Nevertheless, if they realize and aware of having appropriate practice for all daily activities of environment and natural resource conservation whether in terms of energy conservation, best practice for waste management and pollution control with systemically environmental management, particularly with green dormitory standard based on principle of ISO 14001 of Environmental Management System (EMS). It will lead to the real sustainable development principle 8 of Reduction of Unsustainable Patterns of Production and Consumption and principle 10 of People Participation (United Nation, 1992).

In during 5 decades of social and economic development of Thailand, governments announced different policies of environmental quality promotion and maintenance to prevent and solve the environmental problem but there is only governmental sector took the role but it lacked of real participation of all sectors,

especially the people participation. This might be lacked of giving environmental education through all system educations covering formal, non-formal, informal and lifelong education process. As a result, people lacked of knowledge and understanding, awareness, consciousness, attitude and belief to practice themselves towards environment and natural resource protection because they do not realize that they are an important part to take a responsibility for natural resource and environmental conservation (Thiengkamol, 2011a).

In order to educate people to gain more knowledge and understanding on natural resource and environmental conservation, it need to use environmental education process through PAIC Training Technique which comprises of the similar features in terms of stimulation of awareness and consciousness raising, attitude and practice changing, inspiration on and public mind creation and participation through the focus group discussion and brain storming process integrating during PAIC training process implementation (Thiengkamol, 2011b, c). For green dormitory development, it also required the knowledge of GDS based on principle of ISO 14001 environmental management system to combine into the training process in order to meet the better practice and behavior of environmental conservation (Thiengkamol, 2011a, 2010; Arunrimorakot, 2005). All mentioned before, the researcher is interested to study on development of GDS based on the principle of ISO 14001 for Mahasarakham University and its network dormitory through the concept of GDS based on the principle of environmental management system of ISO 14001 integration in PAIC training process. Managing the dormitory to meet GDS based on the principle of ISO 14001, it takes an important role to promote and support environmental quality and the quality of life of Mahasarakham University students both individually and collectively for society as a holistic approach. As a result of good environmental quality management with GDS based on the principle of ISO 14001 integrated with environmental education process, the undergraduate students of Mahasarakham University will be protected and provided with environmentally sound dormitory of university including the dormitories which are the network. They will be a prototype of green dormitory for other province in the same region or other region of Thailand.

Zhongsuntharawong (2003), gave the meaning of Environmental Management that referred to the process of work plan arrangement or activity to allocate the

utilization of natural resources in order to respond the requirement of human being to accomplish the highest goal of development. It is a stability of economic, social and maintenance of good environmental quality based on the principle of maximization of utilization with sustainability and caused a less damage to environment as most as possible. Punjasuwan (2005) compiled and gathered the meaning of Environmental Management that referred to method of implementation or way of practice systemically for sustaining environment as long as possible through prevention, conservation and improvement to maintain the good environment. He also suggested that the best way of natural resources and environmental management is prevention which are processes or actions to diminish and eliminate the environmental impact before causing damage to humans. Theoretically, ISO 14001 could serve as a comprehensive framework for significantly improving performance in an organization with environmental management capacity, especially at least in accordance with the legal compliance or as a set of common sense guidelines for enhancing performance in an organization to effectively implement for environmental quality maintenance for well being of human. The most common of environmental problems included 6 aspects as follows:

- Energy consumption
- Wastewater management
- Solid waste management
- Green area increment
- Safety
- Facilities

Environmental education is an effective learning process that develops people's knowledge and understanding and raises his/her awareness about the environmental problem, performs the essential skills and evaluation for challenging, fostering attitudes, belief and value, inspiring his/her commitments to make decisions and taking responsible action for environmental conservation including strengthening his/her competency for self, family and community (UNESCO, 1978; Thiengkamol, 2005a, b, 2011b-d) including for developing people to understand that they have a relationship with the environment so whatever they do, they will affects it. This education is there to help create public consciences within people and stimulate them to have responsible behavior by using appropriate technological education to develop the quality of life and the environment (Stapp and Dorothy, 1981; Schmieder, 1977; Chunkao, 1993; Thiengkamol, 2005a, b, 2010, 2011d). Participatory-Appreciation-Influence-Control (PAIC) Training

Technique contains different features that are pertinent to environmental education concept. PAIC is able to stimulate the participants to change their attitude and behavior with their own perception through the focus group discussion and brain storming process. Moreover, they will be trained to evaluate participants' participation by evaluation technique of Three Dimensional Evaluation (TDE). TDE included evaluation; Self-, friend- and facilitator-evaluation (Thiengkamol, 2004; 2010, 2011b, c).

**Purpose of study:** The purposes of this study were as following:

- To develop GDS based on the principle of ISO 14001 for Mahasarakham University and its network dormitory
- Train GDS for undergraduate students to accomplish a better practice for environmental conservation

## **MATERIALS AND METHODS**

The research design is mixed research method composes of the qualitative approach with Focus Group Discussion (FGD) Technique and the experimental research with PAIC approach. The FGD was used for data collecting from 28 university dormitory officers and network dormitory owners or representatives of Mahasarakham University by dividing into 4 small groups. The 30 undergraduate students of Faculty of Environment and Natural Resources Studies, Mahasarakham University were selected by using the purposive sampling technique to be the participants for PAIC training process. Development of training manual of GDS based on principle of ISO 14001 environmental management systems that was integrated with environmental education principle. The content contained of GDS based on principle of ISO 14001 with integrated environmental education principle, environmental sensitivity and environmental practice by using GDS (CEDPA, 1999; UNESCO, 1978; Went-Dse-Zel, 2002; Thiengkamol, 2004, 2011d; Arunsrimorakot, 2005; Punjasuwan, 2005).

The training manual and research tools were verified the content validity by 5 experts of 2 environmental education, 2 environmental management and 1 social science. The tools composed of test, questionnaire and evaluation form. The questionnaire was used for determining and evaluating their environmental knowledge achievement, the environmental sensitivity, the environmental practice environmental practice by using GDS including the participation during training. The experiment of training process was done with 30

undergraduate students selected by purposive sampling technique from Faculty of Environment and Natural Resources Studies, Mahasarakham University. The PAIC training technique was implanted with integration of focus group discussion and the brain storming included SWOT (Strength-Weakness-Opportunity-Threat) analysis (Langly, 1998; Weiss, 1995; Sproull, 1955).

The Three Dimensional Evaluation (TDE) was used to determination the congruence of three aspects evaluation; self-, friend- and facilitator-evaluation for training participation (Thiengkamol, 2004, 2005a, 2010, 2011b, c). Pre- and post-test one group design was used to test for before and after training process with PAIC. PAMEI Technique was employed for identify the performance, assessment, monitoring, evaluating for participants practice for green dormitory management of the trained students according to the proposed projects (Thiengkamol, 2004, 2005b, 2010, 2011b-d).

## RESULTS

**Focus group discussion:** During the meeting, 12 university dormitory officers and 18 network dormitory owners or representatives that were divided into 4 small groups to do FGD. Each small group did brain storming to develop green dormitory standard based on principle of ISO 14001 and presented for other participants in every small group. Finally, they proposed green dormitory standards at the end of meeting with covering 10 sets of standards that are: Environmental policy, planning for implementation, communication, wastewater management, solid waste management, energy conservation of electricity and water, equipment maintenance, dormitory safety, green area increment and preparation for emergency. Each set contains GDS as shown in Table 1. Moreover, they also set criteria for evaluation to grade the dormitory to be green dormitory according to the following 5 rates:

Table 1: Set of GDS and standard items

Set of GDS	Standard items
Environmental policy	S1: Define the environmental policy S2: Communicate to dormitory officer and renter to know the policy S3: All dormitory officer and renter know the environmental policy S4: Revise the environmental policy
Planning for implementation	S1: Every dormitory officer understands the environmental problem occurrence in the dormitory S2: Arrange the regulation of evaluation for characteristics of environmental problem S3: Environmental problem must be analyzed to cover the regular, irregular and urgent events S4: Vigorousness environmental problem must be remedy S5: Define guideline for revision of environmental problems S6: Dormitory officer and renter must be acknowledge on environmental law S7: Define duty of responsibility environmental aspect S8: Establish the team work of environmental aspect
Communication	S1: Communicate environmental aspect in dormitory such as board for environmental information, environmental policy S2: If there is any environmental complain, it must be implemented for resolution S3: Define the mean of communication of environmental aspect both formal inside and outside S4: Hold training of environmental aspect for officer and new one S5: Record the training history of every officer.
Wastewater management	S1: Have appropriately primary wastewater treatment and have pond for store the whole wastewater of dormitory S2: Collect waste from primary treatment pond regularly S3: Collected waste from primary treatment pond must be correctly disposal S4: Examine the wastewater quality at least one a year S5: If wastewater quality examination is not qualified, it needs to refer to action plan to control quality of water drainage
Waste management	S1: Separate solid waste by 3 types of bin that are general waste, recycle waste and dangerous waste with cover S2: Attach the label for each types of waste S3: Provide area for bin standing properly and far from the water drainage S4: Disposal waste to the correct bin S5: Record for unused waste S6: Provide the storage house for waste during waiting for disposal
Energy conservation of	S1: Have economized way for water and electricity consumption such as define the time for turn/off electricity and water of air conditioner S2: Communicate or explain to officer and renter to know about the utilization control of water and electricity use such as have sign or announcement board
Equipment maintenance	S1: Record for tools and equipments S2: Have yearly plan of tools and equipment maintenance S3: Implement according the maintenance plan
Dormitory safety	S1: Provide adequate and save car park S2: Record people enter and car registrar number S3: Have security guard >24 h

Table 1: Continue

Set of GDS	Standard Items
Green area increment	S1: Provide recreation corner S2: Pay attention for green area increment S3: Provide proper green area S4: Provide public relation or campaign to stimulate officer and renter to pay attention to environment
Preparation for emergency	S1: Provide telephone number of fire station, police and hospital S2: Fire execution tank must be in ready to use and have enough number for number of rooms S3: Officer and renter should be able to correctly use it S4: Have clear map for fire escape S5: Attach clear map for fire escape at the door inside the room

- A 5 stars green dormitory having scores of all set with total score of 90-100 scores
- A 4 stars green dormitory having scores of all set with total score of 80-89 scores
- A 3 stars green dormitory having scores of all set with total score of 70-79 scores
- A 2 stars green dormitory having scores of all set with total score of 60-69 scores
- A 1 star green dormitory having scores of all set with total score of 50-59 scores

**PAIC training process:** General characteristics of sample group of 31 undergraduate students of Mahasarakham University who participate in the PAIC training process were selected by basing on the willingness to attend the training, time devotion for participation through training process. Most of them were female with 58.06%, studied in the 1st year with 58.06% and studied in the program of Environmental and Natural Management Program, Faculty of Environment and Natural Resource Studies. Additionally, they lived at dormitory with 77.42% as shown Table 2.

**Pre- and post-test of undergraduate students:** After training with PAIC Technique was implemented on training of GDS based on principle of ISO 14001 to develop green dormitory with knowledge and understanding about GDS and environmental knowledge about energy consumption, waste management, green area increment, safety and facility providing. The results illustrated that before and after the PAIC process implemented, environmental knowledge achievement, the environmental sensitivity, the environmental practice of GDS were determined. It was found that there were high statistically significant difference between pre- and post-test ( $p < 0.001$ ) in four aspects of knowledge achievement, environmental sensitivity, environmental practice and understanding on ISO 14001 management system as shown in Table 3.

**Achievement of three dimension evaluation of undergraduate students:** Three dimensional evaluation for 30 undergraduate students were employed for

Table 2: Characteristics of undergraduate students

Characteristics	Participants	
	Frequency	Percentage
<b>Sex</b>		
Male	13	41.94
Female	18	58.06
<b>Class (years)</b>		
1st	18	58.06
2nd	7	22.58
3rd	6	19.36
<b>Program</b>		
Environmental education	5	16.13
Environmental management	14	45.16
Environmental technology	12	38.71
<b>Live at</b>		
Dormitory	24	77.42
Rent house	2	6.45
Home	5	16.13
Total	31	100.00

Table 3: Pre- and post-test of undergraduate students (N = 31)

Experimental groups	Mean±SD	t-value	Sig.
Pre-test of environmental knowledge	16.387±4.387	7.517	0.000**
Post-test of environmental knowledge	21.613±1.838		
Pre-test of environmental sensitivity	15.161±3.257	4.984	0.000**
Post-test of environmental sensitivity	17.968±2.105		
Pre-test of environmental practice	16.484±4.024	3.497	0.001**
Post-test of environmental practice	18.871±1.500		
Pre-test of practice of GDS	13.484±6.334	5.031	0.000**
Post-test of practice of GDS	19.097±1.248		

\*\*Significant level at 0.01

Table 4: Achievement of three dimension evaluation of undergraduate students

Source of variation	Sum of squares	df	Mean square	F-value	Sig.
Between group	29.768	2	14.884	1.767	0.155
Within group	758.070	90	8.423		
Total	787.838	92			

\*Significant level at 0.05

determination the congruence of three aspects evaluation; self-, friend- and facilitator evaluation by using one-way ANOVA to investigate the mean scores difference of three groups. The finding revealed that the mean scores of among self-, friend- and facilitator-evaluation showed no statistically difference ( $p > 0.05$ ) as shown in Table 4. This indicated that three evaluations on participation during the training process were congruent. This meant that the opinions of participant, his friend and his facilitator were not different. PAIC Technique stimulates the students to participate for green dormitory development projects. Focus groups discussion was

done; it was revealed that the undergraduate students were able to express their abilities in the brain storming process to create 4 projects as followings:

- Solid waste reduction
- The modern dormitory concern GDS
- Energy saving
- The volunteer for GDS

From 4 projects, the students had selected the 3 practical pilot projects with possible and interesting projects for implementation as followings:

- Solid waste reduction
- Energy saving
- The volunteer for GDS

### **DISCUSSION**

From meeting of 30 Mahasarakham University dormitory officers and network dormitory owner and representatives, there were 7-8 participants in each small group. Each group did the brain storming to set the GDS by using the ISO 14001 environmental management system as guideline to propose the GDS. Since, GDS has not been set before for the dormitory. Mahasarakham University and network dormitory realized to the importance of environmental quality, therefore they intend to implement according to the set GDS that got from the brain storming during FGD and they also set the criteria for university committee who look after the network dormitory. The developed GDS will assist the committee to be able to systemically monitoring and evaluation to give stars according to the performance of each dormitory. Moreover, it is not the environmental management system to qualify the network dormitory but it is also used by other dormitory of Mahasarakham province or for other provinces of the country that want to control and maintenance the environmental quality. Nevertheless, the student aspect cannot be omitted as well since they are our next generations that are the hope of nation and world to be leader to bring present and future to meet genuine sustainable development. They should know and understand the way to conserve energy through carefully use water and electricity to reduce their own expenses in the same time.

Furthermore from the prior study and research, it was found that the consumption behavior of students were the key factors to decrease the water and electrical consumption, particularly challenging them to change their belief and attitude and to take a participation to decrease waste accumulation. This was consistent to different studies of Nuui-Im (1997), Chin-Aruncha (1998) and Kongduang (1999) that ISO 14001 environmental management system was also important key of success of

green dormitory management to cover 6 aspects as mentioned above. The student who was trained GDS with PAIC will understand concept of green dormitory that was pertinent to various studies and research of Suebchuewong (2002) and Chaodumrongsakul (2003). Additionally, in accordance with different studies of Thiengkamol (2005a, b, 2010), Jumrearnsan and Thiengkamol (2011) and Jansab (2006).

### **CONCLUSION**

The findings revealed that PAIC can initiate and stimulate the participant creative thinking to propose the projects for implementation and it also inspires attitude and behavior changing for environmental conservation participation including taking responsibility daily life activity to conserve environment and natural resource.

### **RECOMMENDATIONS**

The recommendation from the research results are as follows:

- The university dormitory officers and network dormitory owners and representatives suggested to introduce the project of train GDS for every student of Mahasarakham University for enhanced benefit of both owners and renters to save the expenses and keep the better environmental quality
- In order to decrease the pollutions of waste and wastewater, the Mahasarakham University should inform to the network dormitory to implement according to GDS
- PAIC Technique should be introduced to increase students environmental knowledge, environmental sensitivity and understanding on GDS based on principle of ISO 14001 environmental management system to practice better behavior of environmental conservation

### **IMPLEMENTATIONS**

The Recommendations for policy, plan and project implementation as follows:

- The government should issue law to enforce every dormitory to practice according to the GDS based on principle of ISO 14001 environmental management system to control the water pollution and waste reduction including providing safety and green area increment
- Every college and university in Thailand should have the regulation to control water pollution and waste reduction including providing safety and green area dormitory

- Every college and university in Thailand should let lecturers and teacher to receive the PAIC training for utilization and application for GDS based on principle of ISO 14001 environmental management system to meet a better environmental quality
- The administrators of college and university should support the lecturers, officers and students of every faculty and department to implement and evaluated the projects of green dormitory implemented. Moreover, they should provide the budget to support green dormitory project

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