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Success Stories of GREEN and CLEAN Hospital Practice in Thailand

กระทรวงสาธารณสุข
MINISTRY OF PUBLIC HEALTH
กรมอนามัย
DEPARTMENT OF HEALTH

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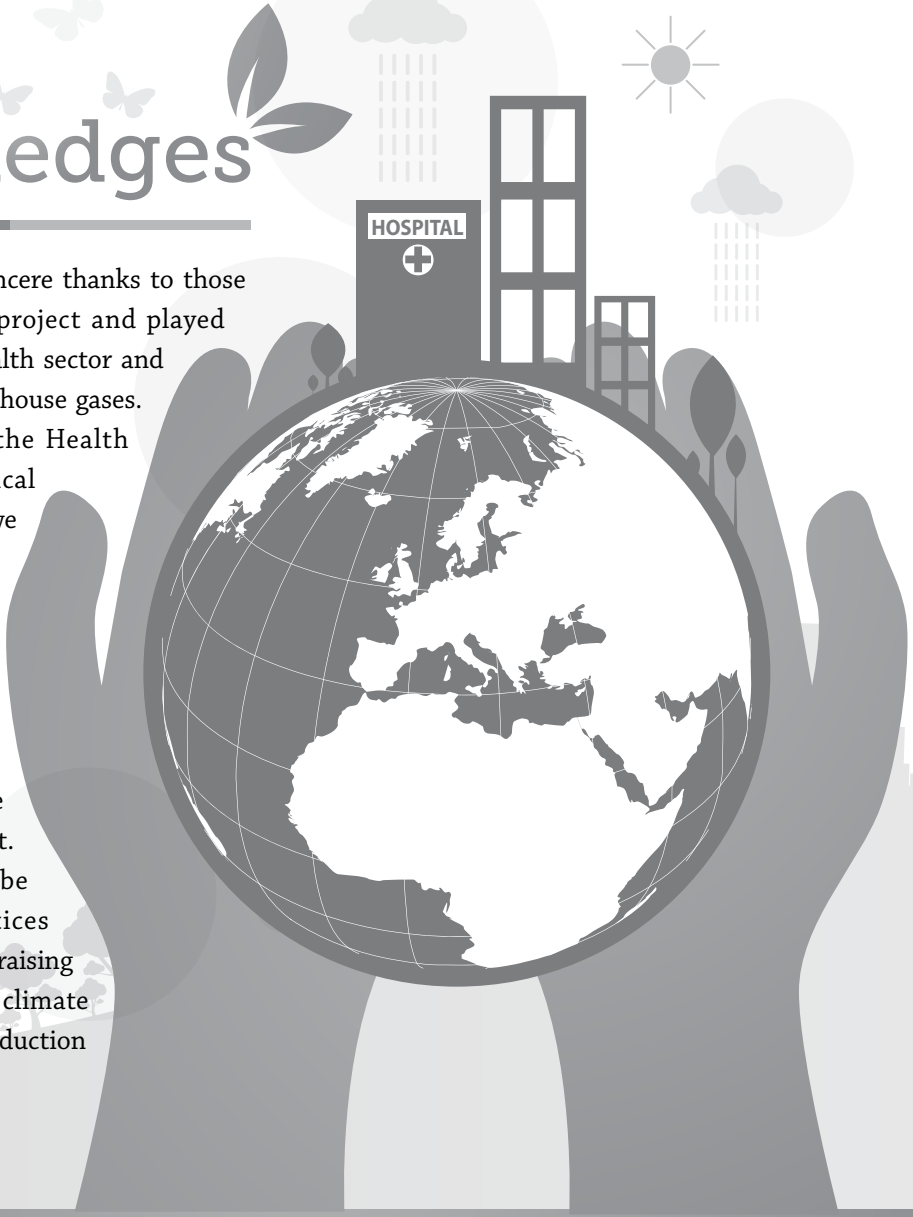

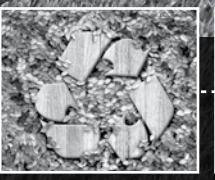


Preface

Climate Change is caused from the increase of greenhouse gases emission in the atmosphere, which leads to global temperature increase. The effects of climate change include global warming, rising sea level, season and rainfall change. These effects directly and indirectly impact people's lives. The main cause of climate change is from the amount of greenhouse gases emission from various human activities such as energy, transportation, agriculture and waste. Health sector's activities also cause greenhouse gases emission such as energy and waste disposal. Therefore, healthcare facilities should be a part of reducing greenhouse gases in their organizations.

In Thailand, The Ministry of Public Health is aware of the crisis as well as the role and the participation in reducing greenhouse gasses in national and international level. Thus, The Department of Health has implemented **"GREEN and CLEAN Hospital in 2011"**. The objective of the implementation is to have health service centers under Office of the Permanent Secretary for Public Health be the leader in implementing sustainable sanitation and environmental friendly by following GREEN and CLEAN principle, and developing to be GREEN and CLEAN hospital model. Since the project has implemented from 2011-2014, there are 4,176 healthcare facilities have joined the project and 171 healthcare facilities have become GREEN and CLEAN hospital model.

The GREEN and CLEAN hospital model do not only inspire healthcare facilities but also other organizations including community and schools to realize of being a part to reduce greenhouse gases emission in their organizations and their community.

This document presents the examples of the implementation and factors of success of GREEN and CLEAN hospital model in Thailand which is hoped to be a guide for other organizations that are interested in participating in reducing greenhouse gases.

Department of Health
Ministry of Public Health
February 2016

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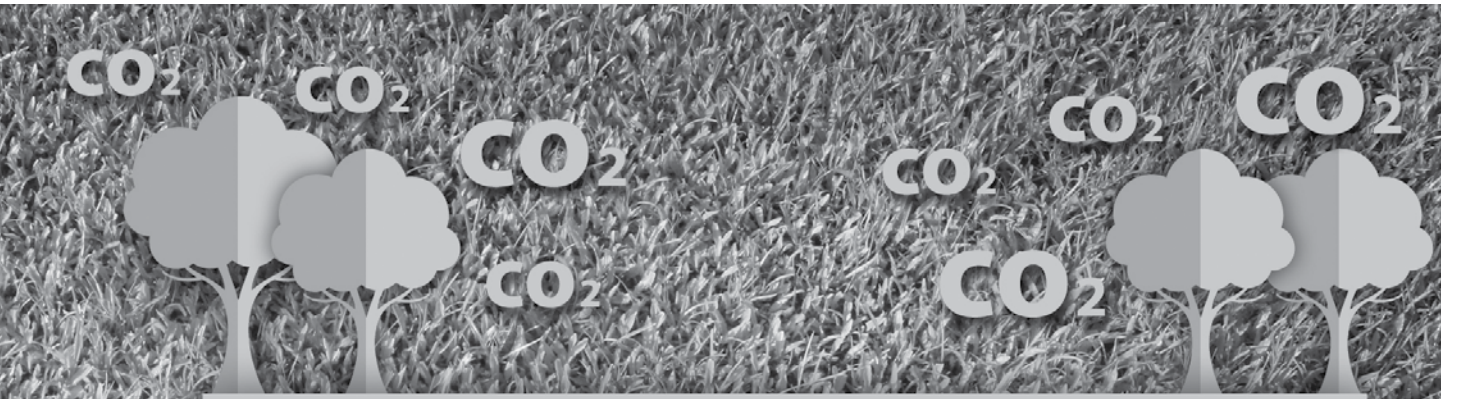

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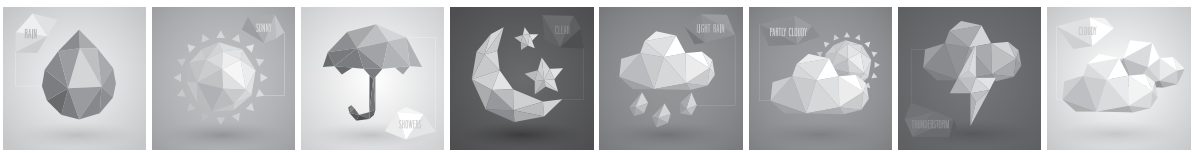
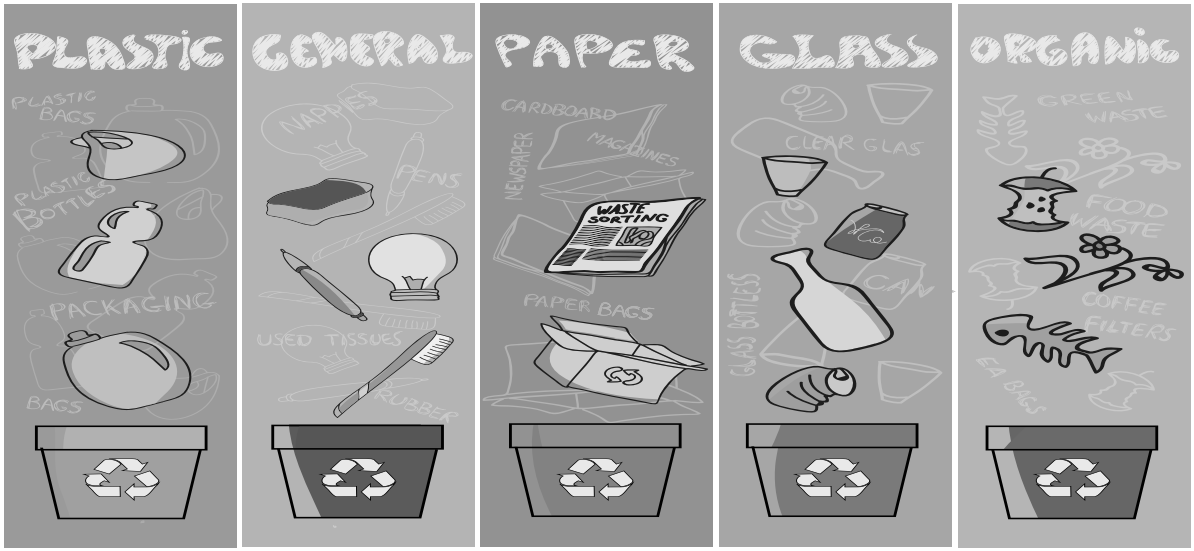
Introduction

CHAPTER I Introduction

Climate change is the world's biggest problem that has a significant impact on human's life and property. It damages infrastructure, transportation, construction and agricultural produce. It also causes sanitation contamination and environment change, which then leads to epidemic and death. According to the Intergovernmental Panel on Climate Change's report, **"Global temperatures have noticeably risen."** In the past 50 years greenhouse gas levels have increased through human activities. Especially through fossil fuel combustion which converts carbon to carbon dioxide and greenhouse gases, which are then released into the atmosphere. The present level of greenhouse gases is about 387 parts per million (ppm.). As a result, global temperatures have risen around 0.75 degree Celsius (°C) in the last 100 years, and they have been higher for the last 30 years than in the past decades since 1850 (WHO 2014).

Healthcare facility is a very important organization in preparing to cope with climate change. It includes the prevention and reduction of any health risks, along with participating in reducing greenhouse gases in both an active and supporting role. The active role is to improve waste disposal in recycling, incineration, prohibition and sanitary landfill, as well as reducing energy usage in hospitals and using alternative resources, such as solar energy or natural energy. The supporting role is to build understanding and awareness for people and local communities, as well as encouraging them to participate in reducing world temperatures. They can participate by using resources more efficiently, consuming natural food instead of processed food, using local products in daily life and reducing waste to limit disposal energy.





The Department of Health under the Ministry of Public Health is aware of the problems and participation in reducing greenhouse gases. The disposal activities such as waste, sewage and wastewater are the cause of the increased amount of greenhouse gases, like carbon dioxide, methane and nitrous oxide being released in the atmosphere. Moreover, a healthcare facility provides health services, including preventing, promoting, preserving and restoring. As a result, the activities occurred by the large amount of people who come to receive the services, as well as the personnel of the healthcare facility, cause a large amount of waste, such as scraps, sewage, wastewater and infectious waste and chemical substances. The improper disposal of this waste affects not only the environment and health, but also causes an increase in greenhouse gases that cause climate change.

Therefore, the Department of Health launched the GREEN and CLEAN hospital project in 2010 by following the GREEN and CLEAN concept. The main idea of the concept is to change the idea of disposal to sustainable and ecological sanitation.

Figure 1: GREEN and CLEAN Concept

Objectives

1. To promote collaboration among healthcare facilities under the Ministry of Public Health and to campaign for responding climate change with GREEN and CLEAN concept.
2. To enable healthcare facilities under the Ministry of Public Health to be project prototype.
3. To increase knowledge and understanding on the health impacts related to climate change for public health personnel.

Target groups

Healthcare facilities under the Ministry of Public Health

GREEN and CLEAN Concept

The GREEN and CLEAN concept is based on sustainable sanitation and eco-friendly purpose as follows,

GREEN Activities

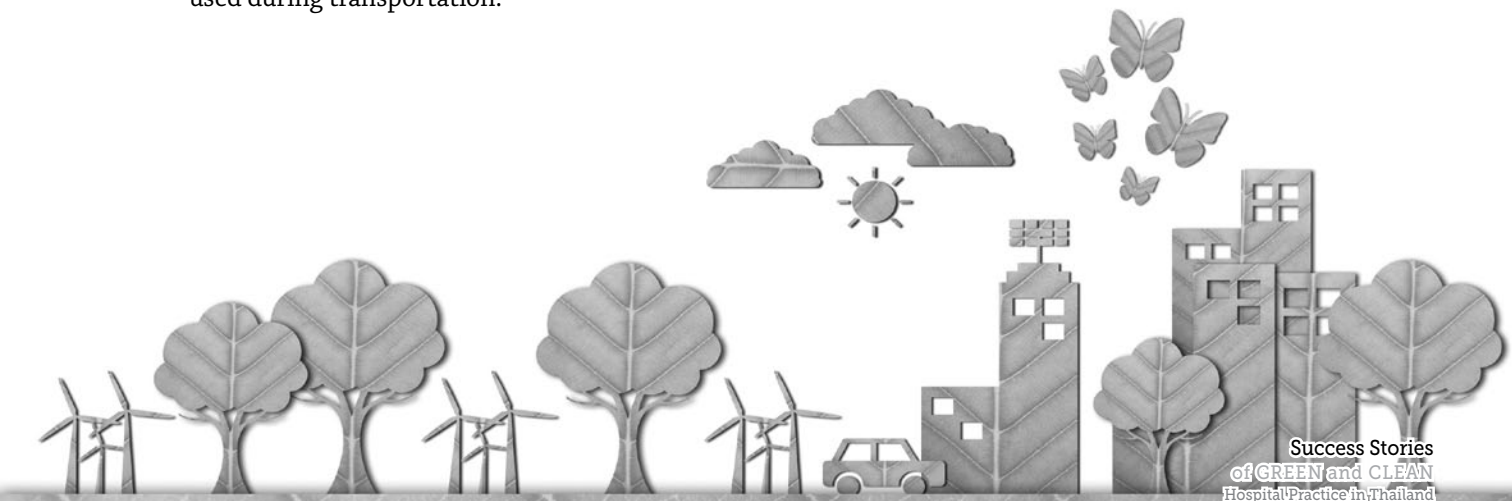
G (Garbage): Solid waste usage and management by using worthy before disposing, based on the 3Rs Concept namely: reduce, reuse and recycle, including avail of waste by decomposing of vegetables, fruits, food scraps and solid waste.

R (Restroom): Improvement of toilets in health services to meet the Thai Public Toilet standards (HAS) and reducing the usage of chemicals for cleaning toilets.

E (Energy): Energy saving such as electricity and fuel conservation, alternative energy usage from biomass, biogas, food scraps and organic waste.

E (Environment): Environmental management and a healthy environment by improving the environment in health services based on **"Cleanliness, Safety, Good Environment and Liveliness"** concept. The adjustments of landscapes, such as growing plants that help absorb toxic substances and produce oxygen for the atmosphere.

N (Nutrition): Campaign on organic foods and local vegetables by planting for domestic consumption, forming communities or groups in order to grow seasonal vegetables, reducing chemical fertilizer and pesticides to help limit Nitrous gas emission and consuming foods from domestic sources to lower energy used during transportation.



CLEAN Strategies

CLEAN is the strategy of participating and implementing on GREEN activities to be successful. It depends on collaboration among all sectors to implement as below.

C (Communication): Public communication must be collaborated from the personnel, patients and health networks to build awareness and understanding in reducing greenhouse gas emission.

L (Leader): Play the key role in implementing and mobilizing a good model for the GREEN Hospital project. The role model should be the executives, chief or group head and they should implement practice all over the organization.

E (Effectiveness): Effectiveness of implementation by practicing GREEN activities and evaluating reduction of greenhouse gas emission.

A (Activities): Conducting activities in order to build awareness and participation. This is based on sustainable sanitation and eco-friendly concepts under GREEN activities, such as experience sharing that may lead to new methods or innovations.

N (Network): Participation from networks, community and locality by sharing knowledge and experiences on reducing greenhouse gas emission, as well as implementation in health and other agencies in the future.

The previous achievements

The result of GREEN and CLEAN Hospital project showed that the project receives good feedback as many healthcare facilities, including hospitals and Tambon Health Promoting Hospitals have joined the project. At the present, there are 4,176 healthcare facilities of the overall target that have joined the project (812 hospitals and 3,364 Tambol Health Promotion Hospitals) and 171 of those healthcare facitities are success as **"GREEN and CLEAN Hospital Models"**

Table 1: Overall result of GREEN and CLEAN Hospital project in 2012-2014.

Health Service Segment	Total	Participant (Information at the date of Nov 18, 2013)	GREEN and CLEAN Hospital Model*		
			2012	2013	2014
Regional Hospital	28	28	3	1	1
General Hospital	68	68	19	3	0
Community Hospital	778	716	49	27	11
Tambon Health Promoting Hospital	9,768	3,364	32	8	17
Total	10,642	4,176	103	39	29

*Qualification of Hospital model described in Appendix

In 2011, the Department of Health created a GREEN and CLEAN Hospital website to be a channel to communicate with the target groups and networks **(http://envh.anamai.moph.go.th/green).** Moreover, the Carbon footprint calculated program was also created, in order to estimate greenhouse gas emission and evaluate the success of the global warming activities in GREEN project for each health center.

However, the more valuable result than the amount of carbon footprint data and greenhouse gases reduction is the attitude of people that change the aspect of health sectors to not only focus on providing healthcare facilities. GREEN and CLEAN activities of each participant are good models for other agencies and a good learning center. The activities are the beginning of sustainable success because they help change personnel's behavior, build awareness and allow them to understand the benefits of greenhouse gas reduction activities. For example, energy saving not only helps to reduce climate change's impact but also electricity bills. These activities are new alternatives used by health agencies in reducing global warming which is also an indirect health service by preventing health problems. Finally, they show that **climate change is not one's responsibility but everyone's.**

Table 2: The amounts of Greenhouse Gases emitted by the different activities from 2012 – 2014.

Activities	Carbon Footprint (ton CO_2e/Year*)		
	2012	2013	2014
Electricity	236,529	246,167	250,427
Commercial Aircraft	1,370	1,338	1,073
Water Supply	30,798	33,763	31,717
Fuel	76,264	74,128	71,130
Cooking Gas	14,427	14,822	12,878
Fertilizer	265	262	254
Medical Wastes	149,476	150,888	156,592
Sewage	703	711	735
Waste	24,908	24,798	25,435
Wastewater Treatment System	6,430	6,296	6,706
Total	541,169	553,173	556,947

* Fiscal Year

Numbers of 103 GREEN and CLEAN Hospital Model in 2012

North :
11 Healthcare facilities
1 Regional Hospital
2 General Hospitals
7 Community Hospitals
1 Tambon Health Promoting Hospital

Northeast :
32 Healthcare facilities
3 General Hospitals
18 Community Hospitals
11 Tambon Health Promoting Hospitals

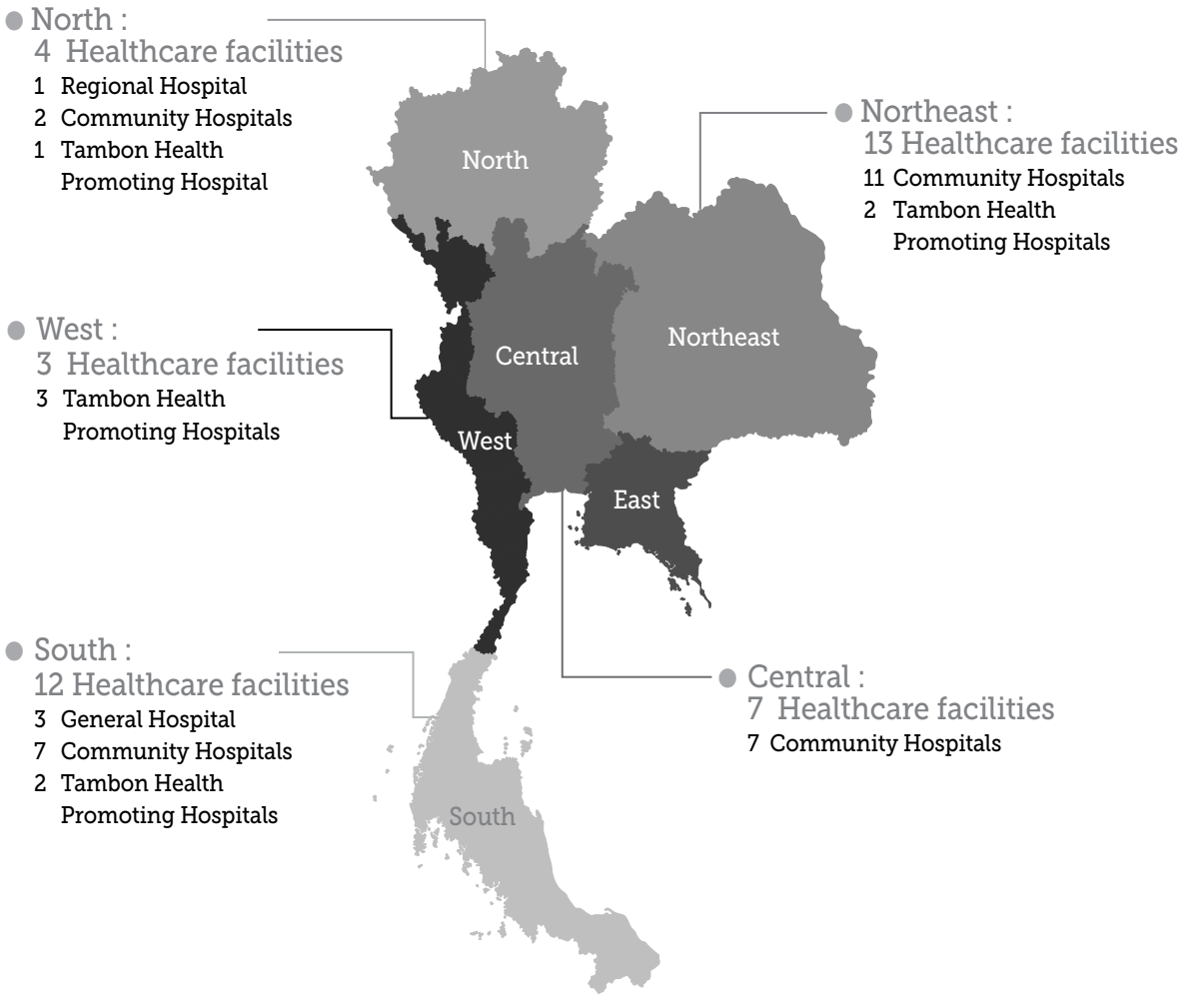
West :
7 Healthcare facilities
1 Community Hospital
4 General Hospitals
2 Tambon Health Promoting Hospitals

East :
6 Healthcare facilities
1 Regional Hospital
1 Community Hospital
4 Tambon Health Promoting Hospitals

South :
19 Healthcare facilities
1 General Hospital
11 Community Hospitals
7 Tambon Health Promoting Hospitals

Central :
28 Healthcare facilities
1 Regional Hospital
9 General Hospitals
11 Community Hospitals
7 Tambon Health Promoting Hospitals

Numbers of 39 GREEN and CLEAN Hospital Model in 2013



Numbers of 29 GREEN and CLEAN Hospital Model in 2014

Northeast :
12 Healthcare facilities
1 Regional Hospital
5 Community Hospitals
6 Tambon Health Promoting Hospitals

South :
13 Healthcare facilities
5 Community Hospitals
8 Tambon Health Promoting Hospitals

Central :
4 Healthcare facilities
1 Community Hospital
3 Tambon Health Promoting Hospitals

Out of the total 4,176 healthcare facilities in Thailand, there are 171 that are qualified to be GREEN and CLEAN hospital models since the project has been implemented from 2011-2014, as they have practiced all GREEN activities, followed CLEAN strategies and recorded Carbon Footprints continuously for efficient future greenhouse gases reduction plans.

This report presents the selected 20 healthcare facilities as a good example and good source of knowledge for other agencies and nearby communities.Furthermore, the result of the project can act as motivation for other agencies to participate in GREEN and CLEAN project.

CHAPTER II
Examples of GREEN and CLEAN Hospital model

Hospital

The 17th Somdet Phra Sangkharat

Address: Song Phi Nong District, Suphan Buri 72110, Thailand
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Fax: (+66)3 553 1189

The 17th Somdet Phra Sangkharat Hospital is 250 bed-hospital that service 1,000 patients/day. Because of the awareness of the climate change crisis, the hospital has conducted GREEN and CLEAN Hospital project which follows sustainable and ecological sanitation concepts. The implementation focuses on waste generation and waste recycling. The results of the implementation are not only greenhouse gases reduction but also a model and motivation for nearby communities.

Strategy/Practice

The starting point: The success of the meet HAS standard (Happy Toilet Standard) led to the 17th Somdet Phra Sangkharat Hospital involved in GREEN and CLEAN hospital project. The hospital clarified the details of the project and requested to collaborate with related agencies.


The project launched: The project officially launched on July 23, 2010 when the director of the hospital signed MOU on the globe with staffs as a symbol of the collaboration to reduce greenhouse gases in their hospital. The other activities on that day were signing for collaboration on greenhouse gases reduction, planting and adding EM to the ponds in the park to maintain quality of the water after wastewater treatment.

Promotional strategies: Meetings, providing information through billboards, bulletin boards, wire broadcasting, flyers and hospital websites are setup to promote the project and to gain attention continuously.

Implementation Process

The hospital has strictly practiced GREEN and CLEAN activities by following CLEAN strategies including:

C: Communication: Public communication to family, relatives and neighbors in order to raise awareness and responsibility for the actions that cause global warming.

L: Leader: Playing the key role in practicing global warming and greenhouse gases reduction.

E: Effectiveness: Strictly and continuously implementing in order to gain effective results and be a good model affirmed by the Carbon Footprint.

A: Activity: Strictly and continuously practicing so everyone can be a part of changing the world.

N: Networking: Collaborating and participating with networks to reduce global warming.

The Hospital focuses on development to be a learning center and building networks by

- Providing information about GREEN and CLEAN to networks such as healthy market, government sectors, schools and Tambon Health Promoting Hospitals in the area and nearby.
- Instruction and exhibition about effective microorganisms (EM) application and sanitary improvement for the sectors.
- Successfully developing to be a learning center which is consistently visited from other organizations
- Expanding **"Buddy Hospitals Project"** to other hospitals in Suphan Buri Province, which are Si Prachan Hospital, Dan Chang Hospital, Bang Pla Ma Hospital and U Tong Hospital by introducing EM and then leading to GREEN and CLEAN activities. As a result, Sri Prachan Hospital became a model for GREEN Hospital in 2011, and continued to expand the network to 7 schools in Song Phi Nong Municipality, which then became GREEN Schools, as well as further expansion to other schools in Song Phi Nong District.

GREEN is a principle to reduce global temperatures by the efficient use of resources as following,

Lung Exercise

G: Garbage: The waste management follows 4 Rs which are:

R1 (Reuse): Reusing the water bottle used in hospital by

- Using them as EM bottles to hand out to other agencies.
- Modifying them into lung exercise equipment for patients.

R2 (Reduce): Reducing waste by using canvas bags instead of plastic bags in diabetics clinics and using banana leaves or other natural containers instead of plastic. As a result, the hospital can reduce the use of plastic and pollutants from waste disposal activities.

R3 (Recycle): Collecting recycled garbage and selling to the factory in order to gain extra income. The hospital sets up an auction for private sectors to annually buy the garbage. This income is divided into 2 parts: 70% is returned to the responsible departments and 30% goes to the staff welfare fund. As the results, the hospital gains 30,000-40,000 baht per month on average.

R4 (Repair): Repairing and modifying equipment instead of new purchases. For example, modifying foot pump sinks to be bicycles, and using water from wastewater treatment to water plants in 20 acres of the hospital land as well as in the toilet flushing system for staff housing. **These activities help save 40,000 baht per month on average.**

R: Restroom

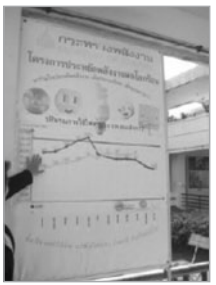
Managing hospital sanitary system and improving toilets to meet HAS standard, using EM instead of chemical products to clean the toilet. Hence the hospital has won **"The Best of Happy Toilet"** of 2009. This activity not only helps save 6,450 baht a month on average but also decreases chemical usage around 1,290 liters per month.



E: Energy

Implementing **"Energy Saving Project"** for reducing energy use from activities including air conditioning, light and heat and compression. Moreover, each department has their own practical policy which does not affect work enjoyment.





The result of the implement shows that the hospital saved 4,736,361 baht. Because of the efficient implementation, the hospital has won **"Thai Energy Award"** and **"Asian Energy Award"** in 2010 for small/ medium control unit from Ministry of Energy.

E: Environment

Managing environment both inside and outside the workplace. The implementation follows **"Healthy Workplaces"** plan by improving landscape and planting ground cover plants to reduce heat absorption. In terms of the interior, growing various houseplants to reduce indoor air pollutants which started in Anatomical Pathology Clinic. The implementation is certified as **"the excellent healthy workplace"** of 2008, **"the excellent hospital in safety engineering and environment"** 3 years in a row (2008-2010), and **"the safety hospital in Regional health promotion center."** of 2010.



N: Nutrition

Promoting safety, local and organic food by following **"Food Sanitation Standard"**. The hospital and the staff restaurant purchase food and ingredients from chemical-free stores. Furthermore, the hospital has created a project to encourage their staff to grow organic vegetables for the hospital kitchen.

Carbon Footprint Measurement

Carbon Footprint is a total amount of greenhouse gases, which are carbon dioxide, methane, nitrous oxide and chlorofluorocarbons, released by the hospital activities. From 2010 and 2011, the measurement shows that The 17th Somdet Phra Sangkharat Hospital released 1,805.87 tonnes CO_2e/year of greenhouse gases and the hospital managed to decrease this to 1,553.74 tons CO_2e/year in 2011.

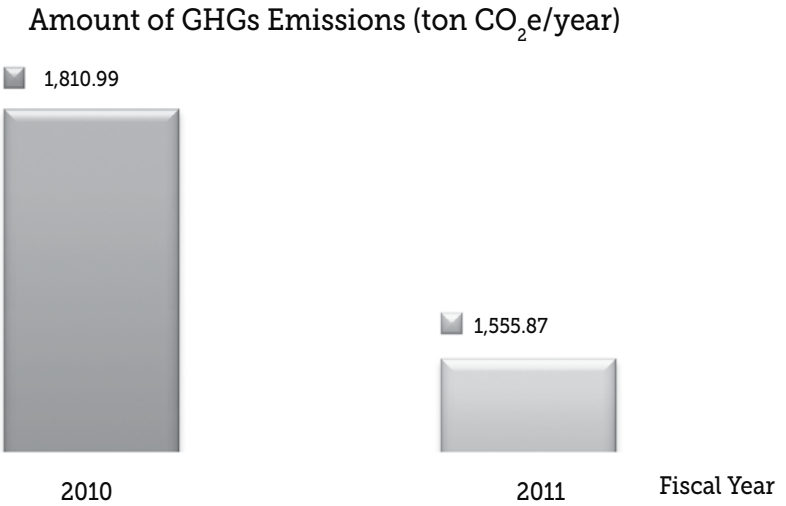


Chart 1: Amount of greenhouse gas emissions from The 17th Somdet Phra Sangkharat Hospital's activities in 2010 and 2011.

The table shows that the highest amount of greenhouse gases emission is from energy consumption. However, the GREEN activities helped in reducing greenhouse gases by 254.92 tons CO_2e/years and the use of medical chemicals was also decreased as shown in Table 3.

Table 3: Amount of greenhouse gas emissions by each GREEN activities of The 17th Somdet Phra Sangkharat Hospital in 2010 and 2011.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2010	2011
Garbage	154.42	150.26
Restroom	0	0
Energy	1,588.85	1,333.93
Environment	0	0
Nutrition	1.80	1.80
Service	65.92	69.88

Results of the Implementation

Public Health Personnel: The staffs have learned about the importance and the impact of global warming on environment and health, as well as greenhouse gases reduction methods.

Organization: The hospital could save some money and spend it on hospital improvement. Moreover, the hospital is rewarded from GREEN activities in local, national and ASEAN levels.

Community: Raising awareness and participation in environment conservation, as well as living in a healthy environment.

Next Steps

1. Announcing Carbon Footprint reduction data from implementing the project, along with awarding successful departments and setting a new greenhouse gases reduction goal.
2. Expanding the project to other agencies and communities such as schools, fresh markets and restaurants to promote greenhouse gases reduction.

Hospital

Si Prachan

Address: Wang Nam Sap Sub-district, Si Prachan District, Suphan Buri 72140, Thailand
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Fax: (+66)3 558 1204

The implementation related to energy saving and environment conservation of the hospital was initiated in 2006 from the idea of the Director of the hospital (Dr. Suthon Yuwasirinan). This idea aimed to reduce the cost of energy consumption with everyone's collaboration and to encourage teamwork. Moreover, the hospital was aware of global warming as an urgent agenda; thus, it joined GREEN and CLEAN project in 2011.



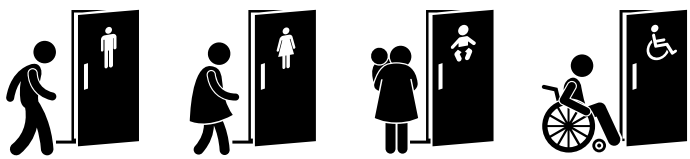
Strategy/Practice

The strategy and the concept of the project follow the philosophy of sufficient economy, formulated by His Majesty King Bhumibol Adulyadej, along with raising awareness by participating and networking both in and outside the province.

Implementation Process

Due to the energy and equipment consumption trend in the hospital rising every year, Si Prachan Hospital in collaboration with the Department of Alternative Energy Development and Efficiency has started energy saving project.

The 4th Regional Health Promotion Center Ratchaburi held GREEN and CLEAN conference in April 27-29, 2010 which was the beginning of the idea of greenhouse gases reduction. In the conference, The 17th Somdet Phra Sangkharat Hospital exchanged the information about EM. After the demonstration, the results showed that the toilets were clean and deodorized, so the hospital invited experts from the hospital (Somdet Phra Sangkharat) to instruct the proper use of EM. The board of the hospital and related parties were invited to promote EM and then officially stop using chemicals to clean toilets on June 16, 2010.





On July 16, 2010, Bureau of Environmental Health, Department of Health visited the hospital to support GREEN and CLEAN project. The result of the visit gave a clear path of the project implementation. Therefore, EM was developed in other forms such as liquid biofertilizer from food scraps, compost from grasses, leaves and organic vegetables, and also demonstrated a biogas producing method from food scraps. After using the products, the hospital could reduce its chemical cleaning cost from 9,387 to 540 baht a month in 2010, and to 401 per month in 2011. Moreover, in 2011, the hospital also implemented an energy conservation cooperative which focused on personal participation. Thus the hospital could reduce energy consumption by 6,000 units per month on average.



In terms of organic vegetables, the hospital was guided by Mr.Moh Jamjang, a local wisdom, and grew organic vegetables in the hospital from his instruction.


However, the director of the hospital realized that everyone can practice environmental preservation activities not only in the hospital. Therefore, the hospital promoted the project to schools and local communities, in order to gather more participants and have a more effective outcome. Thus, the hospital expanded the network to school, local communities, Tambon Administrative Organization, private sectors, local shops and nearby hospitals in Suphan Buri Province.

The implementation began with training 5 students from primary school in Si Prachan District about environmental preservation, educating village health volunteers, conducting environmental activities in collaboration with local administration organizations, distributing EM to restaurants and private sectors, demonstrating EM production and sharing cleaning techniques with community hospitals in the province, in order to promote GREEN and CLEAN activities in Suphan Buri Province.



Carbon Footprint Measurement

The hospital has collected and analyzed the data in the carbon footprint measurement program from the activities. The results show that the hospital released greenhouse gases at around 558.89 tons CO_2e/year in 2010 and decreased to 529.20 tons CO_2e/year in 2011, and the trend went up in 2012-2014 as shown in the chart 2.

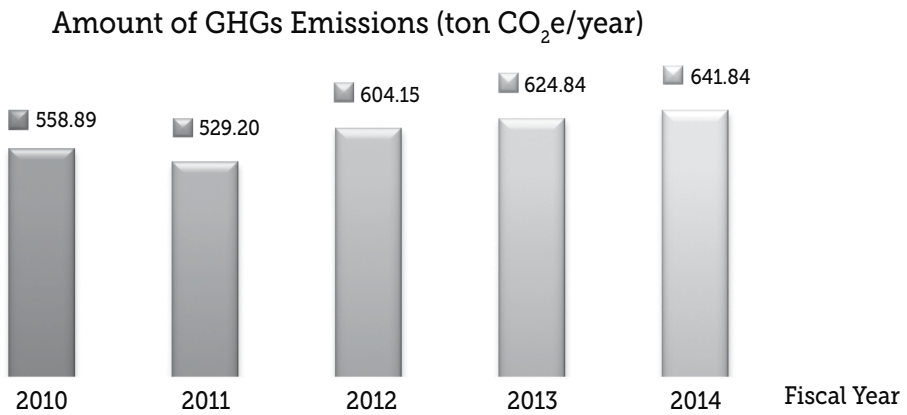


Chart 2 : Amount of greenhouse gas emissions from Sri Prachan Hospital's activities in 2010-2014.

According to the greenhouse gases emission data of the hospital, the most of greenhouse gases released were from energy related activity. In 2010, the amount of greenhouse gases emission was 535.06 tons CO_2e/year and it was decreased to 507.07 tons CO_2e/year, as a result of the energy conservation cooperative that helped reducing energy consumption to the satisfied greenhouse gases reduction level.
The data also shows that healthcare activity such as medical chemicals, released greenhouse gases of around 0.12 tons CO_2e/year in 2010 and 1.68 tons CO_2e/year in 2011. Thus, the hospital needed an implement in order to decrease greenhouse gases emission. Other activities such as environmental activity released 1.82 tons CO_2e/year in 2010 and 2.70 tons CO_2e/year in 2011. Therefore, the hospital continuously grows more plants both inside and outside the hospital in order to reduce greenhouse gases by photosynthesize.

Table 4: The amount of greenhouse gases emission from GREEN activities of Si Prachan Hospital in 2010-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)				
	2010	2011	2012	2013	2014
Garbage	21.77	17.63	26.02	35.41	34.48
Restroom	0	0	0	0	0
Energy	535.06	507.07	567.21	571.26	585.98
Environment	0.12	0.12	0.12	0.12	0.12
Nutrition	1.82	2.70	2.76	2.76	2.76
Service	0.12	1.68	8.04	15.29	18.5

Advantages

Due to the implementation, personnel are proud to be a part of greenhouse gases reduction. The visitors and the patients are satisfied with the great environment and clean toilets, as well as the neighbors being satisfied with no disturbance. The most important thing is that the hospital has developed and accomplished a lot to become a climate change model of The 4th Regional Health Promotion Center. Moreover, the hospital is recognized and visited from many organizations in the area and nearby in order to share experiences and good practices.

The pride of the hospital is to collaborate in creating environmental preservation activities with government sectors and private sectors in Suphan Buri Province and nearby, in order to drive GREEN and CLEAN project together following the main purpose in building networks.

Further Implementation

The hospital has set up the main strategy to develop in order to be a sustainable environmentally friendly organization. The goal is to have one Green model school, one Green model community and environmental sustainability learning center in the hospital.

Factors of Success

From the previous achievement, there are 3 factors of success as follows;

1. The executive announcements a clear policy along with follow ups and supports the project.
2. Selecting the members of the board from various organizations, along with continuously arranging meetings and organizing activities. Evaluation and overall operation reports are required afterward.
3. Encouraging participation and expansion of networks in all sectors.

Hospital

Prasat

Address: Kang-an Sub-district, Prasat District, Surin 33140, Thailand
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Fax: (+66)4 455 1295 ext. 1003

Prasat Hospital is a community hospital with 150 beds and 404 staff set on 14.8 acres of land. In 2005, the hospital faced a waste management problem especially with recycling waste. Therefore, the hospital formed a **"Recycling Waste Bank"** and received good participation from the personnel. The money from selling the recycling waste was spent on gold jewelry for lucky draws on New Year Parties, which later earned it the name **"Golden Waste"**

In 2007, the hospital utility cost report showed that the cost of water and the electricity trend had increased. Moreover, the public health personnel behavior due to the lack of energy awareness, as well as the global warming crisis had concerned the director of the hospital, Dr. Chumnum Wittayanan. Thus, he aimed to raise awareness by conducting GREEN Hospital Project following the Sufficient Economy, formulated by His Majesty King Bhumibol Adulyadej.

Strategies

1. The leader is the most important factor to drive the project and instruct the personnel
2. Announcing declaration for greenhouse gases reduction to personnel
3. Selecting committees and implementing the project following the roadmap
4. Releasing a policy due to the leak survey in the hospital
5. Evaluating the project and reporting energy consumption to the director every month
6. Promoting the campaign every quarter
7. Creating motivation by rewarding Mr. & Miss GREEN of the month

Implementation Process

1. Waste Management

Waste management has started since 2003. The first step was focusing on waste sorting by separating infectious waste from other wastes, then the **"Recycling Waste Bank"** was formed. In 2006, the implementation was focusing on personnel participation and promoting the campaign continuously. As a result, the income from selling the recycling waste increased from 98,000 baht in 2009, to 85,994 baht and 132,606 baht in 2010 and 2011, respectively Moreover, the hospital has become an exchanged learning center for other organizations in town including schools and hospitals.

While waste management was implemented, the natural management was also conducting the following **1A3R concepts** which are

Avoid

- Avoid using toilet spray and replace with kaffir lime
- Avoid making a requisition for house supplies such as stationary and tissue napkins
- Avoid using foam container

Reduce

- Reduce infectious waste by flushing drain water down the toilets
- Set minimums and maximums on requisition of house and kitchen supplies as well as office equipment
- Using cloth bags for patients with chronic illness
- Maintain equipment and machines

Reuse

- Reuse wrapped fabric as rags
- Use both sides of A4 paper
- Practice 5S for healthy workplace
- Place a used stocking donation box for prosthetic leg process
- Save usable parts of broken equipment for extra spares

Recycle

- Form **"Recycling Waste Bank"** since 2005 to present
- Sort food scraps for biogas conversion
- Sort waste vegetables and fruit peels for bio extract
- Produce biofertilizer from grasses and leaves
- Use stain from waste water treatment system as plant fertilizer
- Water plants with water from water treatment
- Start an aluminium can tab donation box

2. Sanitary development

The hospital realized that clean restrooms are a great impression for visitors and patients. Therefore, in 2006, the hospital joined Thai Public Toilet Standards (HAS) and succeeded in cleanliness, safety and chemical reduction. As a result, the hospital has won the **"The Best of Happy Toilet"** (government hospital). The hospital also expands networks by giving instruction to other hospitals, restaurants and tourist attractions in Surin Province, as well as being a learning center for other organizations.

3. Environmental development

In terms of environmental development, the hospital aims to be a place that not only provides health services but also a clean, safe and well environmental place. Thus, from 2006-2010, the hospital improved the indoor and outdoor environment by adjusting landscape and adding green area. Thus, the hospital was awarded in healthy workplace and other rewards.

4. Energy preservation

In the fiscal year 2009, the GREEN Hospital policy was created. The main focus was on greenhouse gases reduction by concentrating on intensive implementation and participation in environmental preservation as follows.

1) GREEN and CLEAN Hospital project: The hospital invited Asst. Prof. Dr. Jirapol Sintunava, lecturer from Mahidol University, to give lectures on greenhouse gases reduction method to hospital staff.

2) Observing and creating global warming project: This project is participated by the head of departments and relevant personnel of the hospital, the other 5 network hospitals and Ruamtawan hospital in Kanchanaburi Province, In order to instruct them on ecology, power generation and a greenhouse gases reduction plan.

3) Energy Observation project: The activity is divided to 6 teams which are

- Electricity team
- Water supply team
- Fuel team
- House supply team
- Waste management team
- Organic food team

4) Climate change declaration project:

After health personnel signed the declaration, they received a green T-shirt and a canvas bag with the slogan **"Wearing GREEN Shirt on Wednesday to Avoid Plastic Bags and Foam Containers"** In addition, they planted trees to add more green area and reduce CO_2 in the hospital and strived to continue the action. Hence, 404 trees were then added in the hospital.

Carbon Footprint Measurement

In 2010, the hospital joined GREEN and CLEAN project and implemented GREEN activities divided into 4 phases as follows

Phase 1: Promoting greenhouse gases reduction activities every quarter focusing on viral campaigns

Phase 2: Running Mr. & Miss GREEN award of the month contest

Phase 3: Designating a learning center for the community

Phase 4: Observing leaks every quarter

Carbon Footprint shows that greenhouse gasses were released at 970.70 tons CO_2e/year in 2010 and 975.55 tons CO_2e/year in 2011 which means there was an increase of 4.85 tons CO_2/year. The increase resulted from more patients coming to receive the services in 2011 because the hospital became the District Public Health Division in the time of the Thai-Cambodian border dispute, so the hospital consumed more cooking gas, heating and disinfection.

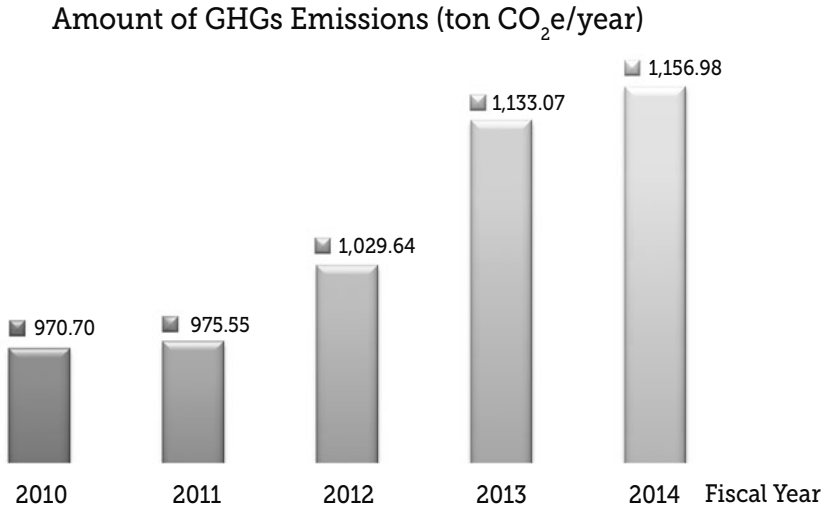


Chart 3: Amount of greenhouse gas emissions from Prasat Hospital' activities from 2010-2014.

Table 5: Amount of greenhouse gas emissions from each GREEN activity of Prasat Hospital's activities from 2010-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)				
	2010	2011	2012	2013	2014
Garbage	0.12	1.02	4.16	5.40	3.47
Restroom	0	0	0	0	0
Energy	880.11	882.72	932.36	1,042.84	1,100.48
Environment	1.91	3.25	3.35	1.69	1.94
Nutrition	0.12	0.12	1.33	4.46	3.92
Service	88.44	88.44	88.44	78.68	47.17

The hospital has succeeded in following GREEN and CLEAN Hospital Project by The Department of Health, the Ministry of Public Health and was awarded **"GREEN and CLEAN Learning Center in Healthcare Facility"** in 2010. The learning center is still running in order to share and exchange knowledge and best practice to government and private sectors. Therefore, the learning center opens for visiting every 3rd Wednesday and Thursday of the month. The total visitors include 267 organizations or around 1,000 people and leads to sustainable GREEN and CLEAN project.

Outstanding Activities

The hospital has been implementing successful and practical projects such as forming **"Recycling Waste Bank"** which is sorting waste, producing EM, producing biofertilizer from food scraps, planting trees, releasing 5 energy reduction which are saving electricity, saving fuel, saving water supply, waste management and house supply management.

Results of Implementation

The implementation received good participation from personnel as well as awareness of energy saving and greenhouse gas reduction.

Factors of Success

- The executives value the project
- Teamwork
- Follow up on progress
- Raising awareness
- Promoting and campaigning


Problems/Obstacles

The energy consumption of the hospital still rises because the hospital has served more services as well as there being an increase in buildings and personnel.

Hospital

Nong Muang Khai

Address: Nam Rat Sub-district, Nong Muang Khai District, Phrae 54170, Thailand
Tel.: (+66)5 464 7458
Fax: (+66)5 464 7194

Nong Muang Khai Hospital is a community hospital with 30 beds. In the past, the hospital had environmental problems caused by using sanitizing chemical that affected water treatment system and caused odors, and interrupted patients and neighbors. The other problems were people had health issues and the land deteriorated because of chemical usage in agriculture.

Therefore the hospital has implemented a global warming project to reduce greenhouse gases since 2005 by following an organic agriculture concept, but the project was not very successful. In 2008, the Director of the hospital started to follow Sufficient Economy and extend to Biothai, which allowed it to become a sufficient economy hospital.

Later on, the hospital joined GREEN and CLEAN Hospital on March 29, 2010 which meant following GREEN activities and CLEAN concept.

Implementation Process

The implementation started with environmental management by using EM, EM5 and Bokashi, as well as raising awareness and guiding the community.



Environment

- Using EM for environment management in the hospital
- Spraying EM into the water treatment system to deodorize
- Producing EM5 for insect repellent
- Using multi purpose solution to clean equipment
- Using EM multi purpose formula to clean dishes


- Creating registered herb gardens and preserving plant varieties to be a learning center for students. The hospital is able to register 180 plant varieties
- Expanding green area by continuously planting more plants in the hospital. In fiscal year 2010, the hospital had 895 medium-large trees with 50 varieties and 4,990 square metres



Nutrition:

From the philosophy of sufficient economy, formulated by His Majesty King Bhumibol Adulyadej, the **"Grow what you eat...eat what you grow"** project implemented by planting seasonal organic vegetables in the hospital.

- Growing organic vegetables in the hospital: growing seasonal organic vegetables of more than 15 varieties for patients and personnel. The hospital grew organic vegetable by using bio fertilizer instead of chemical fertilizer. In 2011, the project was expanded to meet the increased demand and for being a learning center.

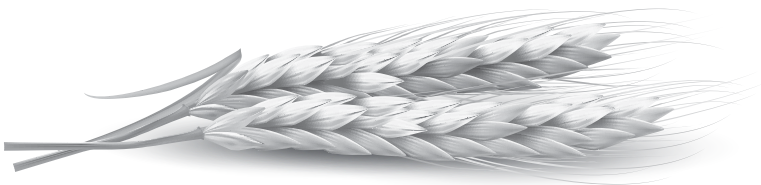
"Bok choy"

"Papaya"

- Organic farming: the hospital breeds animals such as chicken, ducks, geese, fish, frogs, pigs, cows in pasture and feeds them food mixed with EM. The eggs were also incubated in order to increase the size of the animal.
- Organic rice cultivation

"Organic rice"

"Organic farming"



- Fishery: changing soil ponds to concrete ponds and rotating fish

Garbage

In 2011, the hospital released a policy in order to reduce 20-30% of plastic usage in the hospital. The policy includes dividing waste into 5 categories which are general waste, infectious waste, hazardous waste, recycling waste and organic waste.

Waste management

Recycling waste: Selling used paper, boxes and plastic bottles. The total amount of recycling waste is 2 tons/year. The hospital also collects recycling waste from networking healthcare facilities as well as signing a MOU contract between the province and organic farming.

Organic waste (such as food scraps):

- Breeding earthworms which act as a decomposer for producing biofertilizer and vermicast is also fertilizer

"Earth warms"

- Using a biogas ingredient to replace cooking gas

Energy

Carpool activity helps to reduce energy for staff when traveling from home to the hospital. This activity helps reduce the number of cars by 10 and saves 1,500 baht/person/month or 15,000/month in total. Moreover the result of the activity shows that average gas consumption is 4 liters/person/day. Hence, the personnel who participated the activity saved 40 liters/day or 10,000 liters/year.

Carbon Footprint Measurement

The carbon footprint shows that the amount of greenhouse gas emissions in 2010 was 199.60 tons CO_2e/year and then decreased to 189.46 tons CO_2e/year in 2011. The trend was falling in 2012 and rising in 2013-2014 as shown in chart 4.

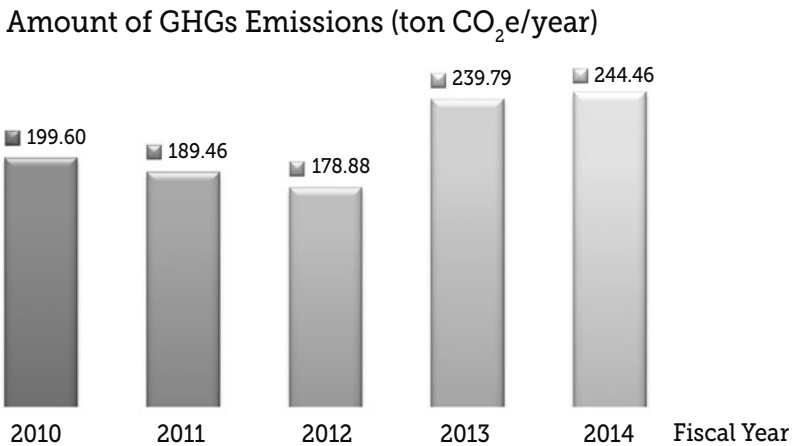


Chart 4: Amount of greenhouse gas emissions of Nong Muang Khai Hospital' activities from 2010-2014.

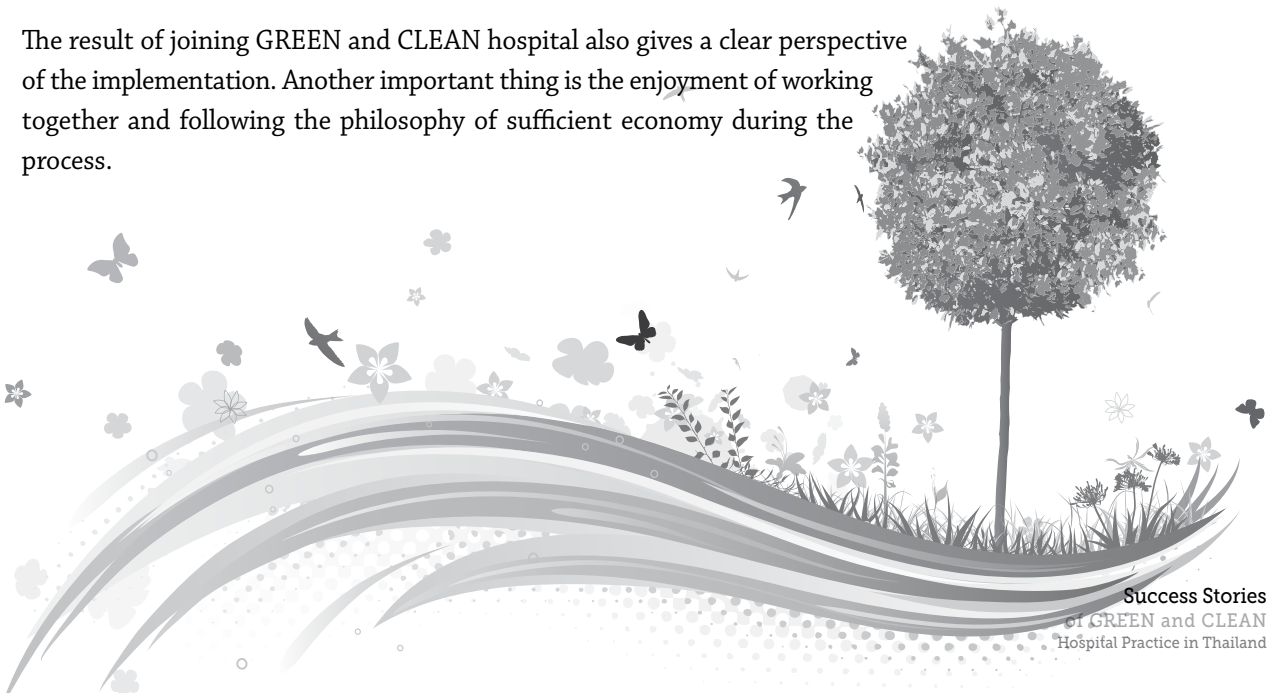
Table 6: Amount of greenhouse gas emissions from each GREEN activity of Nong Muang Khai Hospital in 2010-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)				
	2010	2011	2012	2013	2014
Garbage	5.91	5.69	4.68	6.67	6.61
Restroom	0	0	0	0	0
Energy	192.49	182.57	173.00	231.83	236.65
Environment	1.08	1.08	1.08	1.08	1.08
Nutrition	0.12	0.12	0.12	0.12	0.12
Service	0	0	0	0	0

Results of implementation

The results reflect the significant change in terms of environment in the hospital, such as a nice and beautiful atmosphere. The implementation is also a good learning practice of hospital expenditure reduction. Moreover, the personnel can reduce their house expenses due to the implementation.

The result of joining GREEN and CLEAN hospital also gives a clear perspective of the implementation. Another important thing is the enjoyment of working together and following the philosophy of sufficient economy during the process.



Hospital

Matong Tambon Health Promoting

Address: Matong Sub-district, Phrom Phiram District, Phitsanulok 65150, Thailand

Tel.: (+66)5 522 2333

Matong Tambon Health Promoting Hospital is set on one acre and responsible for 7 villages. Before 2008, recycling waste in the hospital was disposed with general waste and hazardous waste by incineration. The hospital environment management was poor and sometimes used lawn herbicide. Moreover, people in the area lack knowledge on environmental crisis awareness. For example; using plastic bags and burning recycling waste with general waste on the street, in their houses and in the hospital. Therefore, the hospital realized that the health problems due to climate change, which are caused by the hospital and people in the responsible area needed to be solved together.

The intention led to continuous improvement in the hospital until it was able to be a happy workplace for 4 years in a row as well as win the best public toilet of 2010 due to the Happy Toilet Project. Later on the hospital released a policy of being a leader in raising awareness and being **a learning and demonstration center, with community collaboration** under GREEN and CLEAN project in 2011-2013.

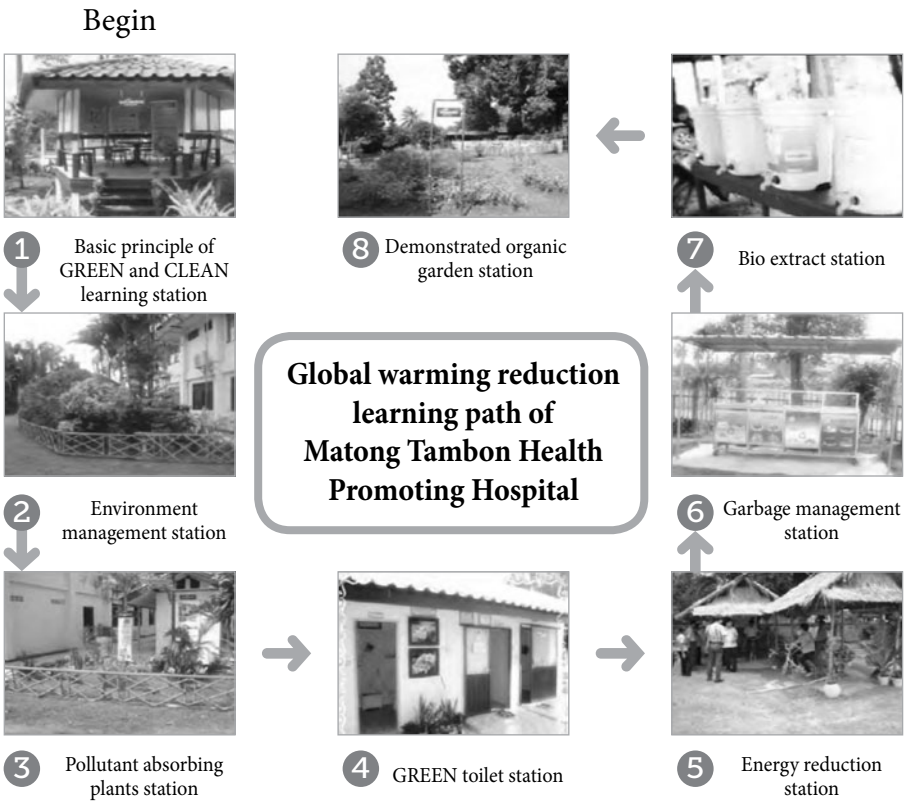
Strategies

1. Problem based-learning
2. Encouraging participation by setting up the informal meetings to create policies and share information from leaders to community
3. Funding and assigning project to leaders and all partners
4. Following up on the results and continuously improving with participation from all stakeholders

The hospital has achieved the objective and become a GREEN and CLEAN hospital model as well as a GREEN and CLEAN learning center. The achievement was the result of good executive support, personnel participation and strong networking which continuously drove the project.

"Learning Center"

While implementing **"Learning by Doing"** project, the hospital and partners were participating and sharing knowledge which created a learning center as seen from the chart.



Carbon Footprint Measurement

The amount of greenhouse gas emissions measured by the online Carbon Footprint program of the Department of Health, shows that in 2010 the hospital emitted greenhouse gasses at 6.57 tons CO_2e/year and the activity that caused the highest emission was energy consumption, which was 6.45 tons CO_2e/year. The data was changed in order to discuss about an energy reduction policy. The policy includes **"Meetings under the Trees in 2011 project"** due to the high amount of greenhouse gases that the hospital caused from setting up meetings in AC rooms 4-5 times a month. The average energy consumption per month of the hospital in 2009 increased 5.4% from 2008. As a result of the implementation, the amount of greenhouse gas emissions of the hospital decreased to 0.30 tons CO_2e/year in 2011.

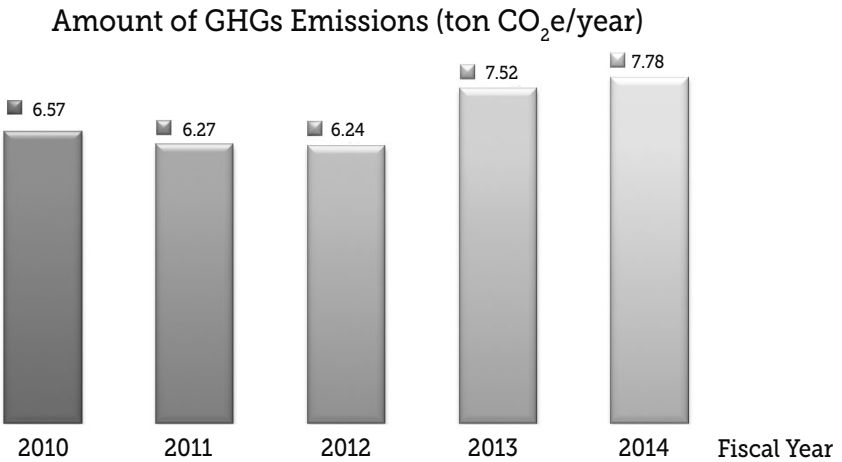


Chart 5: Amount of greenhouse gas emissions from Matong Tambon Health Promoting Hospital's activities in 2010-2014.

Table 7: Amount of greenhouse gas emissions from Matong Tambon Health Promoting Hospital's activities in 2010-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)				
	2010	2011	2012	2013	2014
Garbage	0.12	0.12	0.12	0.12	0.12
Restroom	0	0	0	0	0
Energy	6.45	6.15	6.15	7.40	7.66
Environment	0	0	0	0	0
Nutrition	0	0	0	0	0
Service	0	0	0	0	0

Recommendations

The hospital has been successful and become a GREEN and CLEAN hospital model, and share best practice to temples, schools, local organizations and communities.

Factors of Success are 4C which are

1. **C-Change agent:** Community leaders which are determined to improve and be leaders for people in community.
2. **C-Champion:** Specialists share and exchange knowledge and skills.
3. **C-Community:** Community leaders and people participate in raising funds, as well as assigning and implementing the project.
4. **C-Continuity:** Continuously participating, following up on the progress, and finding solutions.




However, the hospital still needs to continue working on the improvement project in order to be a leader in greenhouse gases reduction of the community. Therefore, the hospital has the further implementation plan as follows;

1. **Short term improvement**
   - Using urine as a catalyst for biofertilizer
   - Breeding earthworms to decompose wet waste and biofertilizer waste.

2. **Midterm improvement**
   Evaluating the progress and improving learning centers and demonstrating GREEN and CLEAN activities to schools.

3. **Long term improvement**
   Expanding GREEN and CLEAN activities to households, villages, temples and local organizations.

"Herbal garden"

"Green toilet"

Hospital

Phato

Address: Phato Sub-district, Phato District, Chumphon 86180, Thailand
Tel.: (+66)7 753 9044



Phato Hospital is a 30-bed hospital set on 3.3 acres of land. In 2005, the hospital was concerned with unorganized waste disposal, especially recycling waste. Therefore, the hospital has formed a waste bank and called it **"Valuable Waste"** which is the beginning of waste reduction activity. In 2007, Former Director of the hospital, Dr. Phanchet Boonchuay, had an idea about raising personnel awareness, and later on it became **"GREEN Hospital"** which followed the philosophy of sufficiency economy. In 2010, Dr. Malai Promchan carried on and developed the project by joining the GREEN and CLEAN Hospital project.

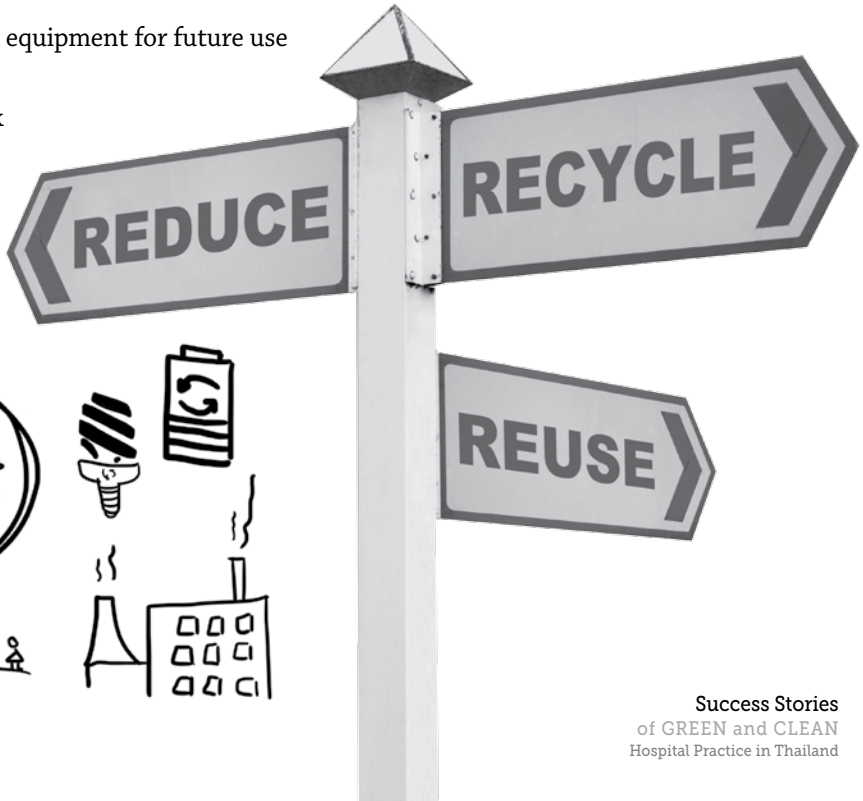
Strategy

In present, the hospital is following the Sustainable and Ecological Sanitation principle, has practiced all 5 GREEN activities and strictly followed CLEAN concept. The project has been promoted to community. Carbon footprint program is used as a greenhouse gases measurement of hospital activities.

Implementation Process

G: Garbage using 1A-3R which are

- **Avoid:** avoid using sprays and foam containers
- **Reduce:**
  - Reducing infectious waste water by distinguishing wastewater treatment system. This method helps in reducing waste weight before sending to the private sector to dispose
  - Using lunch box and cloth bags to reduce plastic bags
- **Reuse:**
  - Using torn clothes as hand towels instead of paper tissue
  - Running a monthly paper reuse award
  - Making paper bags from 2 sided used paper to pack cotton and bandages
  - Saving usable parts of broken equipment for future use
- **Recycle**
  - Forming recycling waste bank
  - Placing aluminum tab donation box for prosthesis
  - Using water from washing rice to produce EM and multi-purpose formula



R: Restroom: Toilet management

"How to clean the toilets properly and get rid of the smell?" is the most common question from patients and visitors. This question was the important motivation for the hospital leader to improve toilets to meet HAS standard until able to win the **"National Happy Toilets"** in 2010. The hospital also reduced chemical use by using bio extracts, a multi-purpose formula to clean the toilets and using lime leaves, citronella grass as a replacement for chemical spray.

E: Energy

The hospital has created a saving energy policy following **"Reduce energy with remaining quality and safety"** concept, which the hospital was determined to achieve. Thus, the hospital has assigned staff to check and save the energy usage everyday.

E: Environment

The hospital has implemented healthy environment project by making small gardens and growing plants that help absorb toxic substances in the buildings. The hospital also conducts **"Big Cleaning Day"** twice a year, as well as Healthy Workplace Program (HWP) and won the HWP award in 2005 which the projects are still carried on.

N: Nutrition



The hospital has campaigned on organic food and local food by starting an organic vegetable club that grows vegetables from bio extract and biofertilizer produced from food scraps. There is also a Clean Food Good taste restaurant which provides healthy menus, such as chili paste with vegetable and herbal drinks.

Carbon Footprint Measurement

The hospital has collected data from practicing GREEN activities and calculated greenhouse gas emissions by carbon footprint program. The data shows that the trend in 2010-2012 had decreased then increased in 2003-2004 as seen in the following chart 6,

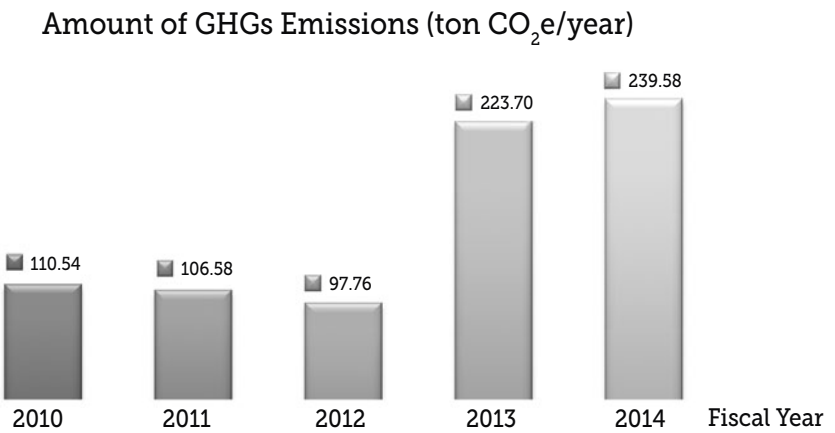


Chart 6: Amount of greenhouse gas emissions from Phato Hospital's activities from 2010-2014.

Table 8 shows that the highest amount of greenhouse gas emissions is from energy consumption, as well as garbage and toilet activities, respectively. The data shows that GREEN activities helped in reducing greenhouse gases which the hospital will carry on with the implementation.

Table 8: Amount of greenhouse gas emissions from each GREEN activity of Phato Hospital in 2010-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)				
	2010	2011	2012	2013	2014
Garbage	32.28	30.45	31.08	2.73	0.24
Restroom	0.36	0.37	0.33	0.34	0.34
Energy	77.58	75.52	66.11	220.36	238.55
Environment	0.32	0.24	0.24	0.27	0.45
Nutrition	0	0	0	0	0
Service	0	0	0	0	0

Community Networking

The previous implementation was able to connect with community, passing on awareness, encouraging and supporting GREEN activities. For example, using pig manure as fertilizer, producing EM to use in households to reduce chemical use, producing bio extract and biofertilizer from food scraps, growing organic vegetable with bio extract, producing charcoal with cut off branches, and using pyro ligneous acid for insect repellent.

Factors of Success

The implementation has been successful because of collaboration from all parties. The achievement also brought compliments and admiration from patients and visitors. Moreover, it changed garbage into valuable things as well as helping save money and reduce greenhouse gases emission.

Hospital

Pathum Thani

Address: Bang Prok Sub-district, Mueang Pathumthani District, Pathumthani 12000, Thailand
Tel.: (+66)2 598 8888
Fax: (+66)2 581 5733

Pathum Thani Hospital is a general hospital with 227 beds hospital, 4,000 inpatients per day, 12,500 outpatients per day and 1,014 staffs.

Motivation

In 2009, Pathumthani Province conducted a clean energy project which Pathum Thani Hospital was selected to be a project model due to its size and numerous energy consumption. The implementation followed green hospital concept. Later the Director of the hospital improved the concept to be 7 green principles which were adjusted to meet the environment and safety qualifications framework, including green business, green technology, green energy, green art, green living and green nutrition. In the beginning, the hospital implemented 3 green principles, which were green energy, green environment and green nutrition by creating the first green market in Thailand along with an improvement strategy in model hospital. In 2010, the hospital has started to implement GREEN and CLEAN Hospital activities as tools to improve and develop the previous project. Other than that, the hospital has followed food safety policy by Ministry of Public Health. The hospital continuously produces organic food to serve food for safety service for patients and visitors.

Implementation Process

Garbage:

The hospital has followed 3R principle which are **Reduce, Reuse and Recycle.** The implementation was prepared by dividing waste into 4 categories and setting up a sorting, collecting, gathering and disposing process. In 2010, a recycle waste bank was formed which opens every Wednesday. The activities include training new staff and retraining old staff, encouraging waste sort and deposit to the waste bank, producing bio extract from food scraps for cleaning purpose, and being a model for community nearby healthcare facility in waste management.

Restroom:

The hospital improved the toilets to meet HAS standard by focusing on cleanliness and convenience for disable person and elders such as install emergency button. Besides, using bio extract to clean the toilets to substitute chemical products.



Energy:

Setting up energy saving board and appoint project representative of each department. The energy saving activities are,

- **Electricity saving:**

  Setting up energy saving committees, setting an energy saving roadmap, training representative of every department, changing light bulbs to energy saving light bulbs, setting on and off times, unplugging, adjusting steam system, setting AC temperature at 25°C setting automatic control system in VIP patient building and maintaining electrical appliances.

- **Fuel saving**

Driving limit of 90 km/hr, reviewing routes, loading as necessary, turning off engine while waiting, carpooling and maintaining the engine

- **Cooking gas saving**

Turning off when it is not used, checking gas leak

- **Water saving**

Turn off the water after the use, checking and maintaining the equipment

Environment:

Conducting 5S in every department, adding green area, growing plants that help absorb toxic substances, adjusting gardens to be floating gardens, improving landscape, gardening, evaluating environmental quality by medical engineering division, evaluating healthy workplace results

Nutrition:

The green market for organic food was started on March 3, 2010, and it was the beginning of building awareness and participation between producer and consumer. The green market is the important channel to raise awareness of producer, merchant and consumer in order to live a healthy lifestyle and preserve environment. Furthermore, it is a model of healthy, disease prevention and greenhouse gases emission reduction project.

Outsanding Projects

Green Market

The green market provides one stop food safety products from a non chemical environment, friendly production and procession, as well as organic vegetables and healthy menus.

Hightlight: **The GREEN Market** is a learning center and a model of healthy and safe food with a completed food chain. It also builds a connection between producers and consumers from the beginning of production. It provides an opportunity to visit organic farms, builds organic farming knowledge and nutrition knowledge through a nutritionist, as well as healthy menus which are low-fat, low-sodium, and low-sugar. **The GREEN Dialogue,** a meeting for producers, dealers, scholars, nutritionists and consumers to exchange knowledge, is held weekly and monthly. There are booths to display and demonstrate the products. The healthy products in the market are marked with different shades of green to sell every Wednesday. Besides, the hospital has a **"GREEN Kitchen"** which provides macrobiotics food for personnel.

Carbon Footprint Measurement

The data shows that the amount of greenhouse gases emission has decreased from 2010-2012. The activity that caused the highest greenhouse gases emission was energy consumption.

Greenhouse gases emission amount of Pathum Thani Hospital from 2010-2012 is shown in chart 7.

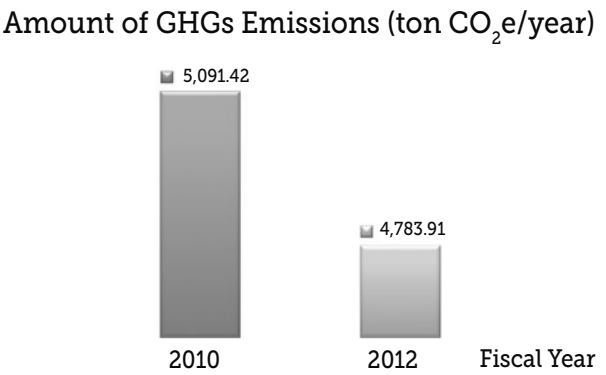


Chart 7: Amount of greenhouse gases emissions from Pathum Thani Hospital's activities from 2010-2012.

Table 9: Amount of greenhouse gas emissions from each GREEN activity of Pathum Thani Hospital from 2011-2012.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2010	2012
Garbage	11.99	19.53
Restroom	0	0
Energy	4,221.54	4,124.73
Environment	0	0
Nutrition	0	0
Service	857.89	639.65

Results of the implementation

Personnel: Able to learn about greenhouse gases reduction implementation and practice, as well as green activity in their department and in their family. The green market provides healthy and safe food at low prices for personnel.

Hospital: Able to reduce expenses, build a good reputation, and create a healthy environment in the workplace for personnel and people.

Community: Able to adjust the implementation in their households and have a place to sell their organic products. The green market provides healthy and safe food at a low price for people.



Factors of Success

1. Have a clear goal, motivation and efficient practices
2. The executive values, the importance of improving health and environment, and also having practical plans and policies
3. The personnel realize the importance in being a part of the implementation
4. Have a practical implementation and give rewards and praise
5. Collaboration of all parties including government sectors, people in the community and networks

Problems and Obstacles

1. A lot of responsibility being put on each individual.
2. The implementation requires teamwork and coordination
3. Limited budgets

Next Steps

The hospital aims to be a GREEN and CLEAN hospital model and an Energy Management model for both government and private sectors. Moreover, the hospital also tries to find alternative energy sources such as using bio extract to substitute chemicals, preserving energy, providing healthy and safe food, creating a great environment workplace and participating in a greenhouse gases reduction project.

Hospital

Sangkha

Address: Sangkha Sub-district, Sangkha District, Surin 12000, Thailand
Tel.: (+66)4 457 1028, (+66)4 457 1478

Sangkha Hospital is a community hospital with 150 beds, 317 personnel and responsible for 200,000 people of Sangkha District and Si Narong District.

Motivation

Global warming has a significant impact on humans and environment. The environment preservation subcommittees of the hospital were aware of the crisis; thus, GREEN and CLEAN project was implemented in 2010.

Implementation Process

Sangkha Hospital held an event for announcing the project in January, 2011. In the event there were many activities which allowed every department of the hospital and Tombon Health Promoting Hospital networks to enjoy, to learn and to participate, such as Miss GREEN and CLEAN contest, green market and global warming awareness campaign.

Moreover, energy reduction plans and campaigns are conducted as following.

Energy saving policy: Setting AC, light timer and setting the temperature at 25°C, using natural light and planting trees around the hospital to reduce heat.

Water saving policy: Using sprinklers to water the gardens instead of hoses

Waste management policy: Sorting waste, breeding earthworms to produce fertilizer

Outstanding Activities

The environment preservation subcommittee of the hospital has started to implement GREEN and CLEAN project following CLEAN strategy to achieve the goal.

"Earth worm composting"

Garbage: The hospital manages waste by sorting into organic waste, hazardous waste, general waste and recyclable waste. The hazardous waste and infectious waste are properly disposed by private sector. The others are used in the hospital, such as breeding earthworms with food scraps and using fertilizer from earthworms for plants. Moreover, the recyclable waste bank was formed to collect sorted waste from personnel in order to earn extra money.

Restroom: The hospital was proud to participate in the **"Happy Toilet Contest"** of 2009 and was able to win first place in the service sector division. The Director of the hospital paid attention to convenience of patients and visitors; thus, he created **"Natural Toilet"** concept as the toilet improvement path. Besides, the toilet management team was appointed in order to manage the toilets by following HAS activity. The team assigned each member to be responsible for each building and also encouraged **"Toilet Training"** in the children's building and **"Walking Toilet"** in elders' clinic.

Energy: The result of energy saving is not distinctive due to a rapid expansion of the hospital, the increasing amount of patients, as well as buildings and energy consumption in the past few years. Therefore, the director of the hospital has created energy saving policies such as improving patient transmission



to save fuel. The other policies are using natural light and wind, changing AC and light bulbs to energy saving ones, and setting AC timer. After conducting the policies, the data from Carbon footprint shows that the energy consumption rate has increased, but still less than the expansion rate of the hospital. As a result, the hospital has won the 1st runner-up prize of Eco-Hospital Award in the midsize hospital division.

Environment: Due to the Director's idea of improving the hospital to be like home, the green area was added to more than 80% of the land such as creating small gardens along the walkway, providing waiting area for patients' relatives, building a houseboat as a relaxing spot for patients and visitors, and creating a glasshouse to grow plants that help absorb toxic substances. Furthermore, the hospital also improved personnel houses by creating small gardens and painted them in Italian style. As a result, the hospital was evaluated as a healing environment hospital from The Healthcare Accreditation Institute and won **"Healing Enviroment Award in 2011".**

Nutrition: The hospital opens the green market every Thursday to allow personnel and people to buy and sell organic products which are quality checked. Besides, the hospital kitchen prepares food for personnel and patients from organic vegetables. Moreover, the hospital has encouraged personnel to grow their own gardens in their household.



"Green market and organic vegetable garden"

Factor of Success

The factors of success are to continuously raise awareness of greenhouse gases emission reduction and create clear implementation policies as well as participation from personnel and support from executives.

Results of the implementation

The hospital has won many awards such as **"Healing Environment Award"** of 2011 from the Healthcare Accreditation Institute, **"Eco Hospital Award"**, first runner-up of Sustainable Development from Thailand Business Council and the first place in **"National Toilet Contests"** of 2010 in community hospital division.

Carbon Footprint Measurement

The amount of greenhouse gas emissions has increased every year due to the expansion of the hospital in the past 2-3 years. The increased amount of utility consumption led to the rise in greenhouse gas emissions, which resulted from more patients and energy consumption, since the hospital expanded from 120 beds to 150 beds in 2012 as seen in the chart 8.

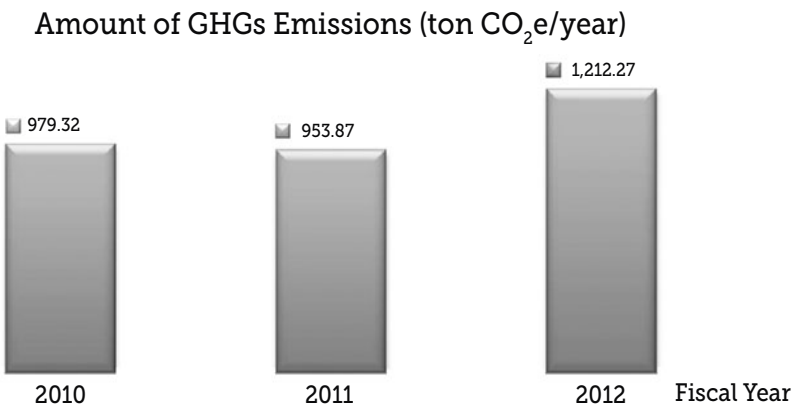


Chart 8: Amount of greenhouse gas emissions from Sangkha Hospital's activities from 2010-2012.

Table 9: Amount of greenhouse gas emissions from each GREEN activity of Sangkha Hospital from 2011-2012.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)		
	2010	2011	2012
Garbage	58.37	60.70	59.07
Restroom	1.93	2.16	2.16
Energy	914.72	885.79	776.59
Environment	0.96	0.96	0.98
Nutrition	2.26	2.73	1.99
Service	1.08	1.08	371.48

Our Pride from the implementation

Since the hospital has improved its environment, patients and visitor are satisfied when receiving the service and feel like home.

Factors of Success

1. The executive support and driving the implementation to success
2. Strong teamwork
3. Personnel are aware of greenhouse gases impacts

Next Steps

1. Expanding the implementation to Tombon Health Promoting Hospital networks and community
2. Being a learning center for other organizations
3. Decreasing the use of plastic bags and foam in the hospital.




Hospital

Nam Phong

Address: Nam Phong Sub-district, Nam Phong District, Khon Kaen 40140, Thailand
Tel.: (+66)4 344 1011, (+66)4 344 1517
Fax: (+66)4 344 1518

Nam Phong Hospital is a 60 bed hospital with 315 personnel located on the north of Khon Kaen Province and set on 14.5 acres of land. The hospital has been operating under the vision **"A quality hospital to improve health of the community."** GREEN project

Implementation Process

Nam Phong Hospital has implemented environmental activities since 2005 by forming a **recyclable waste center** and building a natural resource and environment preservation network. In 2010, the 6th Regional Health Promotion Center invited Namphong hospital to join GREEN and CLEAN project. Therefore, the hospital has joined the project following **GREEN Heart GREEN Hospital concept** to show responsibility and be a model of environment and health management as well as raising people's awareness and participation. The activities that the hospital has conducted are

"Campaign Signs"


Garbage: Nam Phong Hospital follows 5R principle which are reduce, reuse, recycle, repair and reject to encourage participation from patients and personnel. The practical projects are recyclable waste centers, using personal cups/glasses, using handkerchiefs, using lunchboxes, using canvas bags, avoiding foam containers, practicing 5S, for healthy workplace producing bio extract and fertilizer by stain from water treatment system, using e-mails for reducing paper usage and producing biogas from food scraps.


Restroom: Assigning staff to clean the toilets, checking the result, using natural product and bio extract for cleaning and deodorizing, and building special restrooms for the elders and the disabled. As a result, the hospital won the 2nd runner up of Khon Kaen's public Toilet contest in 2010.



Energy: Creating and strictly practicing energy saving policies such as providing 3 rides a day for pick up their personnel, using bells instead of electric bells, and setting a energy expense reduction goal


Environment: Planting trees every month, creating **"My First Plant Project"** by giving newborn's parents trees to plant in community and encouraging to grow plants that help absorb toxic substances

Nutrition: Encouraging personnel to grow vegetable gardens in the hospital and take home which has conducted for 2 year. Moreover, the hospital also supports organic farming networks by selling their products in the green market 2 days a week.


CLEAN strategy which are

Communication: Public communication to build understanding between personnel

Leader: Being a role model in implementing GREEN activities including the board of the hospital

Efficiency: Following up the results every month

Activity: Conducting activities to raise awareness such as 5S and planting trees

Network: Building environment network in the area to exchange knowledge and work together


Carbon Footprint Measurement

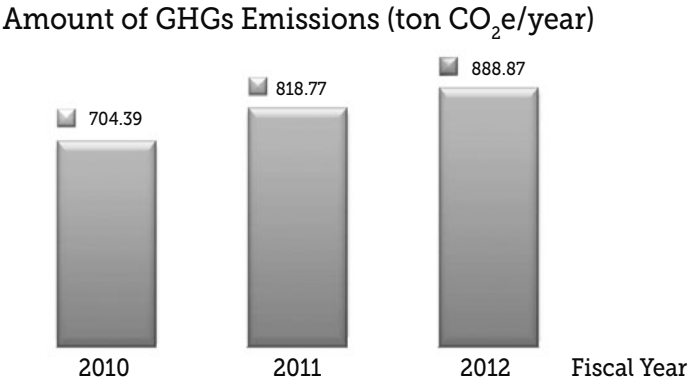


Chart 9: Amount of greenhouse gas emissions from Nam Phong Hospital's activities from 2010-2012.

The hospital chose 6 activities to evaluate greenhouse gas emission which are fuel consumption, energy consumption, water treatment system, chemical use for medical purposes, cooking gas consumption and waste management. The data shows that the amount of greenhouse gas emission is 704.39 tons CO_2e/year in 2010, then it has increased to 818.77 and 888.87 tons CO_2e/year in 2011 and 2012. The activity that caused the highest amount of greenhouse gas emissions was energy consumption.

Table 11: Amount of greenhouse gas emissions from each GREEN activity Nam Phong Hospital from 2010-2012.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)		
	2010	2011	2012
Garbage	36.87	32.04	31.00
Restroom	18.96	18.96	18.96
Energy	647.00	765.73	836.86
Environment	0.12	0.12	0.13
Nutrition	0	0	0
Service	1.44	1.92	1.92

However, waste management project could reduce the amount greenhouse gas emission due to **5R concepts.** The cooking gas consumption was also slightly decreased because the hospital hired private sectors to prepare food for some occasions. The amount of greenhouse gas emission from water treatment system and chemical use for medical purposes were stably low compared to other activities. The analysis led to energy saving policies which aimed to raise personnel awareness. The roadmap for 2013 is improving energy saving plan and finding alternative energy sources. However, a fuel saving project is difficult to achieve due to the expansion of the hospital.

Our Pride

The activity that makes the hospital proud is **"The Biggest Fan of Environment"** project. The questionnaires show that the most practical activities are sorting waste, using personal cups, avoiding plastic bags or foam containers, using canvas bags and growing organic vegetable gardens. Moreover, people have more awareness about global warming and take pride in participating to reduce greenhouse gases emission. They also give suggestions to their family members to practice the activities. The hospital is creating a paper box recycling policy in order to reduce waste in the community. Even though there were some problems in implementing, the hospital still carries on the projects by

- Creating clear policies
- Thinking outside the box, creating enjoyable situations and being flexible
- Instantly promoting the projects, exchanging knowledge and praising models
- Being simple and keeping sufficient
- Following PDSA (Plan, Do, Study, Act) principle
- Evaluating quality and quantity to monitor the results

Factors of Success

- Executive has great visions and is determined to support the implementation
- Teamworking and following up the results
- Supporting from the authority
- Unity

Next Steps

- Better following up system
- Organizing knowledge
- Exchanging knowledge with networks
- Encourage environmental innovation
- Collecting environmental activity data networks
- Creating stronger policies
- Finding alternative sources of energy

Hospital

Kohyaochaipat

Address: Koh Yao Noi Sub-district, Koh Yao District, Phangnga 82160, Thailand
Tel.: (+66)7 659 7119
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Kohyaochaipat Hospital is a community hospital with 30 beds located on an island in Andaman sea. In 2011, there were 62 personnel, and services 55 outpatients and 5 inpatients a day.

Motivation

Kohyaochaipat Hospital is located on a reserved forest; therefore, the hospital has created a policy to preserve the trees and forbid deforesting. Due to the expansion of the hospital, the amount of patients has increased which led to an increase in the amount of waste and energy consumption. Dr.Montit Poonsanguan, the director of the hospital and personnel realized that those activities would cause environmental problem and global warming; thus, the hospital has joined GREEN and CLEAN project.

Strategy and Progress

The hospital has implemented greenhouse gases emission reduction activity by following the strategies below,

1. Integrating Hospital Accreditation (HA), Health Promoting Hospital (HPH), Health Management Quality Award (HPMQA), sanitary and safety with greenhouse gas emission reduction activity
2. Adjusting existing policies by following GREEN and CLEAN project in order to rise awareness
3. Announcing the policies to the staff, checking and reporting risks
4. Public communicating in order to create understand, driving the projects, raising awareness and requiring participation
5. Exchanging knowledge between the hospital and local networks

Implementation Process

Garbage

In term of waste management, the hospital sorts them into 4 categories which are infectious waste, general waste, hazardous waste and recyclable waste. The implementations regarding waste reduction are

Reduce: Such as reducing the use of plastic bags, reducing dust from drying machine, encouraging using lunch box instead of foam or plastic containers.

Reuse: Such as using hand towel, using liquid medicine bottles as EM bottle, and using IV tubes as ropes

Recycle: Such as sorting waste and sell to local recycling shops, there were 7 kg. of recyclable waste per day in 2010 and 10 kg per day in 2011.

Waste utilization: Such as producing biogas from manure, using stain from water treatment system as fertilizer, producing bio extract to deodorize and using compost for chemical substitute.






CO2

Restroom

Managing the toilets by following HAS activity, focusing on cleanliness, sufficiency and safety, using herbs to deodorize.


Energy

The hospital creates energy saving policies which are

- Electricity saving policy: Turning off the light, unplugging appliances, constantly checking up and repairing the electrical supplies
- Water saving policy: Turning off taps, checking leak, decreasing water pressure
- Fuel saving policy: Maintaining the engines, carpooling, encouraging personnel to walk to work



Environment

Preserving the trees by forbidding deforestation, planting more trees twice a year, growing plants that help absorb air pollutants, conducting 5S for healthy workplace, setting up a big cleaning day event every 6 months and setting up a big toilet cleaning day every 2 months.



Nutrition

The hospital demonstrates organic gardens to patients and relatives to encourage organic vegetables and local food consumption. The hospital also created a family garden for pregnant women and postpartum mothers to learn how to cook nutritious meals from local herbs. Furthermore, sufficient garden was also created which grows more than 15 varieties of fruit and vegetables, such as lemon, banana, papaya and coconut.

The hospital encourages people to change risky behaviors by growing laurel clock vine to detox and consuming more fish to reduce fat.

The connection between the hospital and community is built by village health volunteers and networks to help raise awareness in global warming. Moreover, the hospital supports integrated global warming reduction projects, such as being a GREEN & CLEAN model, sorting waste, growing vegetables in households, consuming organic vegetables, breeding animals and planting more trees.

Results of the implementation

1. Personnel are aware of global warming
2. The environment in the hospital has improved and get better
3. The hospital become a learning center for other organizations such as students
4. Creating a network of clean eating in the community

Carbon Footprint Measurement

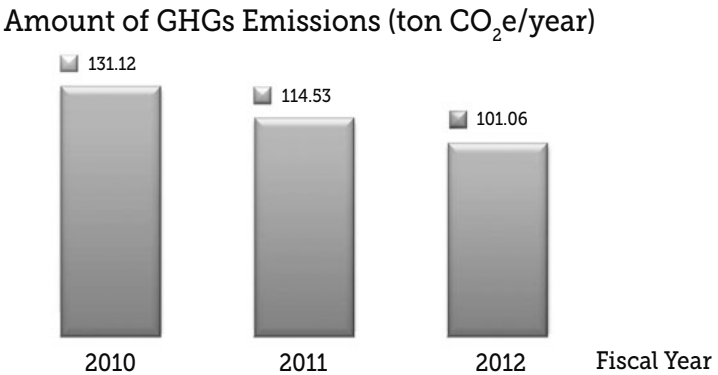


Chart 10: Amount of greenhouse gas emissions from Kohyaochaipat Hospital's activities from 2010-2012.

The data show that the amount of greenhouse gas emission in 2010 was 131.12 tons CO_2e/year and has decreased to 114.53 tons CO_2e/year and 101.66 tons CO_2e/year in 2011 and 2012, respectively, resulted from continuously implementing GREEN activities as well as clear energy saving policies.

Table 12: Amount of greenhouse gas emissions from each GREEN activity of Kohyaochaipat Hospital from 2010-2012.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)		
	2010	2011	2012
Garbage	1.42	1.38	1.84
Restroom	0	0	0
Energy	123.58	107.03	93.1
Environment	0	0	0
Nutrition	6.12	6.12	6.12
Service	0	0	0

Next Steps

1. Forming recycling oil bank
2. Produce biogas from hospital's organic waste
3. Reuse water by using water from washing for plants
4. Add value to recyclable waste such as making decorations from plastic bottles.
5. Produce EM for cleaning purpose
6. Recreate a family zone.
7. Expand the biogas from manure project to other communities
8. Encourage self-sufficient villages and global warming reduction village
9. Increase green area in the hospital

Our Pride

The hospital has a hard working team that continuously works to create sustainability and unity.

Factors of Success

1. Support from the executive
2. Personnel are aware of global warming crisis
3. Leaders act as a model
4. Integration between Hospital Accreditation (HA), Health Promoting Hospital (HPH) and Health Management Quality Award (HPMQA).
5. Strong community network
6. Prioritize the importance and risk in order to improve

Hospital

Bua Yai

Address: Bua Yai Sub-district, Bua Yai District, Nakhon Ratchasima 30120, Thailand
Tel.: (+66)4 446 1662, (+66)4 446 2729
Fax: (+66)4 446 1663

Bua Yai Hospital is a community hospital with 120 beds that services 450 patients, which come from many areas in the province such Bua Yai District, Sida District and Bua Lai District. The hospital provides specialist physicians including general practitioners, plastic surgeons, obstetricians, pediatricians and orthopedic surgeons. Moreover, the hospital is also a center of apprenticeship placement in medical field. As a result, the resource, energy and fuel consumption has risen every year and it doubles the expenses every year as well. The director of the hospital was aware of the importance of global warming reduction and energy saving; thus the hospital has followed GREEN activities which are,

Implementation Process

Garbage

Bua Yai Hospital follows the 3R principle in waste sorting by dividing waste into 5 types which are general waste, organic waste, infectious waste, hazardous waste and recyclable waste. General waste is handled by local government. Infectious waste and hazardous waste are handled by a private company. organic waste is used to produce bio-gas, and recyclable waste is sold by the hospital.

Restroom

The hospital follows HAS activity (Healthy, Accessibility, Safety) to improve the quality of restrooms, such as using herbs to deodorize.

Energy

Bua Yai Hospital follows policy in energy saving which are turning off the lights, fans, air conditioners when not in use, setting the temperature of air conditioners to 26°C and unplugging the electrical appliances when not in use. Moreover, the hospital produces its own biogas from organic waste. It also uses an Evaporation Ventilation Unit instead of air conditioners.

Environment

Bua Yai Hospital gives precedence to great working atmosphere, beautiful landscape and green area.

Nutrition

The hospital kitchen prepares food using ingredients from clean markets. The hospital also provides healthy menus for patients and personnel, and encourages growing edible gardening at home.

Results of the implementation

1. Personnel and patients are interested in the greenhouse gases emission reduction campaign.
2. The hospital kitchen is able to produce biogas to substitute 50% of cooking gas.
3. Setting air conditioner temperature to 25-28°C and use an Evaporation Ventilation Unit which requires 10 times less energy than air conditioners.
4. Planting trees and gardens around the hospital to create a relaxing atmosphere.
5. Opening a clean market every Monday-Wednesday to sell organic vegetables.

Carbon Footprint Measurement

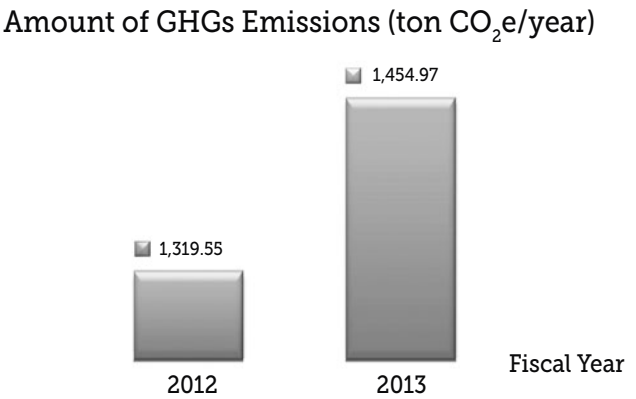


Chart 11: Amount of greenhouse gas emissions from Bua Yai Hospital's activities from 2012-2013.

The data shows that the amount of greenhouse gas emission from the hospital was 1,319.55 tons CO_2e/year in 2012 and has increased to 1,454.97 tons CO_2e/year in 2013. The increase was resulted from energy consumption which rose from 1,220.74 tons CO_2e/year to 1,322.42 tons CO_2e/year.

Table 13: Amount of greenhouse gas emissions from each GREEN activity of Bua Yai Hospital 2012-2013.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2012	2013
Garbage	41.56	64.05
Restroom	2.42	2.38
Energy	1,220.74	1,322.42
Environment	1.53	1.82
Nutrition	0	0
Service	53.3	64.3

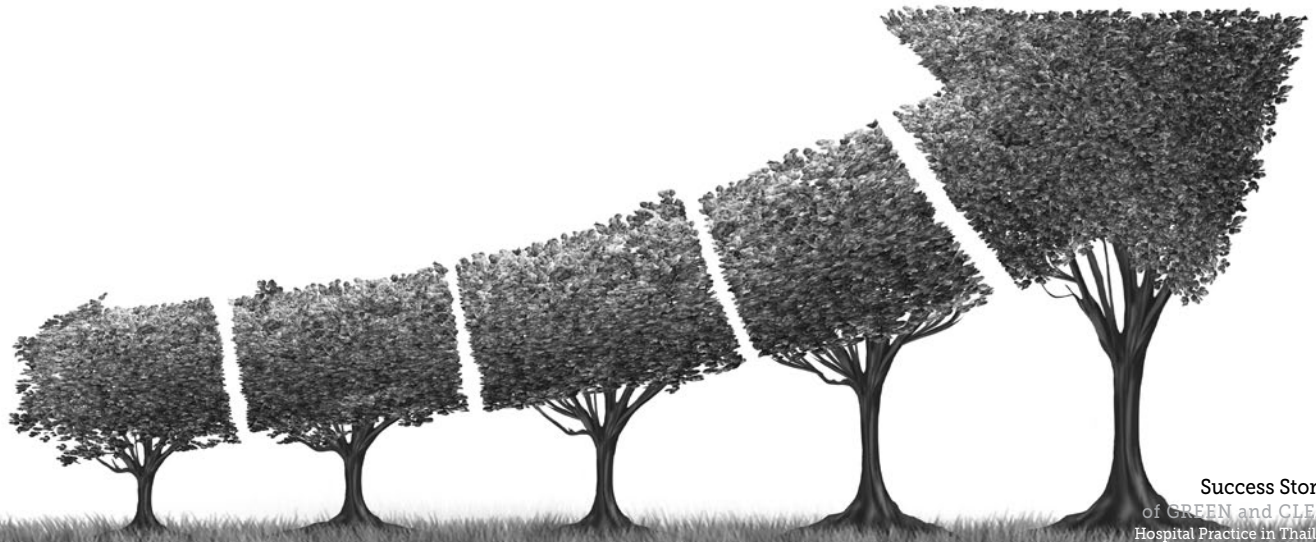
Conclusion

From waste management, the amount of waste decreased 1,200 kg, from 7,200 kg to 6,000 kg in 2011 which means the amount of greenhouse gases emitted decreased 1.37 kg. The hospital was able to reduce the amount of greenhouse gas emission from 94,135.02 kg of organic waste due to biogas use in the kitchen. **The successful of the implements are from collaboration of personnel as well as support from executives.**

Next Steps

In 2014, Bua Yai Hospital aimed to decrease the greenhouse gas emissions rate by 10% of the previous year through the following plans,

1. Grow plants that give higher amount of biogas such as napier grass
2. Install electricity meters in every department in order to measure energy consumption
3. Reduce the use of AC by improving the buildings
4. Encourage personnel to carpool
5. Plant more trees and add more gardens



Hospital

Po Dang Tambon Health Promoting

Address: Na Dee Sub-district, Yang Talat District, Kalasin 46120, Thailand
Tel.: (+66)4 360 1501

Po Dang Tambon Health Promoting Hospital is responsible for 9 villages including 1,375 households and 6,466 people in Kalasin Province. The hospital has 7 personnel and provides service to 30 patients a day on average. The hospital has joined GREEN and CLEAN project since 2013 by following waste management, toilet improvement, energy saving, green environment improvement, as well as encouraging organic food, local vegetables and local food. The Carbon Footprint is used to measure greenhouse gas emissions of the hospital.

Motivation

Po Dang Tambon Health Promoting Hospital has created a roadmap to improve the workplace in order to build hospital image and to increase work efficiency. The hospital also aims to be a great workplace as well as GREEN and CLEAN hospital model. Furthermore, the hospital intents to expand the project to community, people and networks by implementing the following activities,

1. Following 5S (Clearing Up, Organizing, Cleaning, Standardizing and Training & Discipline)
2. Improving the hospital to be a green office
3. Improving toilets to meet HAS standard (Healthy, Safety, Accessibility)
4. Improving to be a healthy workplace.

Implementation Process

The hospital has implemented environmental preservation and energy saving by following **"Po Dang Tambon Health Promoting Hospital aims to be a healthy workplace and a learning center with collaboration from networks"** vision. The hospital has conducted 5 GREEN activities as the following,

G: Garbage by sorting into 4 types which are

1. General waste disposed by sanitary landfill
2. Organic waste such as food scraps is used to produce compost and fertilizer
3. Recyclable waste such as plastic bottles and paper boxes is reused or sold
4. Hazardous waste such as light bulbs and batteries is collected to pass for Yang Talad Hospital

In term of waste sorting, the hospital follows **3R** principle which are

1. **Reduce:** reduce the use of paper napkins by using hand towels and stop using foam container.
2. **Reuse:** reuse plastic bottles as containers for EM.
3. **Recycle:** recycling recyclable waste such as modifying plastic bottles as massaging tools, using broken water jars or coconut tree trunks as flower pots, using paper boxes to store documents.

Waste utilization: producing bio extract to use in the hospital and share with people and also teaching them to produce it at home.

R: Restroom

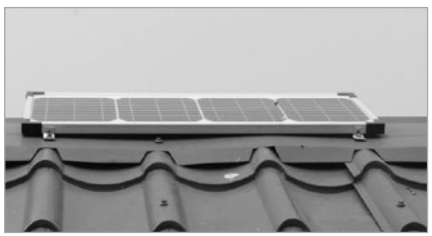
Po Dang Tambon Health Promoting Hospital has improved the restrooms by following HAS activity. In 2013, Podang Tambon Health Promoting Hospital received a donation from the community to build additional buildings and restrooms. Cleanliness, safety and inexpensiveness are the main policies for improving restrooms. The hospital uses EM produced from the hospital's organic waste to clean the toilets, and uses herbs to deodorize and planting that help absorb toxic substances around the toilets. As a result of the implementation, Po Dang Tambon Health Promoting Hospital won the happy toilet of 2014 at regional level, and was the nominee for the happy toilet contest at national level in that year as well.

E: Energy

The hospital appointed an energy reduction board and created energy reduction policies in order to reduce at least 10% of all energy consumption. The policies include using alternative energy sources, using energy saving products and sharing energy saving information in the hospital.

Energy saving activities are

- Placing water bottles inside the toilets to reduce amount of flushing water
- Putting up **"Use less toilet paper"** sign in the restrooms
- Turn off electrical appliances when not in use, set AC temperature at 26°C, unplugging electrical appliance after turning off.
- Putting up **"Turn off before leaving"** sign, turning off taps
- Biking and planting trees



E: Environment

Po Dang Tambon Health Promoting Hospital has implemented 5S and improved the hospital to a green office such as improving landscape and interior, planting plants that helps absorb toxic substances, growing organic vegetables and herb.


N: Nutrition

The hospital encourage organic vegetables and local food consumption by growing organic vegetable in the hospital, and using compost and bio extracts instead of chemicals.


"Organic vegetables"

CLEAN Principle

C: Communication

The hospital informs personnel of energy saving policies and sets up meetings to allow them to exchange knowledge.

L: Leader

Due to the Green activity implementation, the hospital won GREEN Hospital in 2014. The hospital has become a learning center with intention to expand networks and raise people's awareness.

E: Effectiveness

The hospital follows up the results of the implementations by recording the data through **http://carbonfootprint.anamai.moph.go.th**

A: Activity

The hospital has shared knowledge and be a classroom for student that instruct about environment. The hospital also invites personnel of other organizations to join the project.

N: Networking

The hospital collaborates with communities and locals in changing knowledge about greenhouse gases reduction projects. The networks are also aware of the importance of reducing of greenhouse gases; thus, **"Riding Bikes & Plant Trees"** project is conducted every year.

Carbon Footprint Measurement

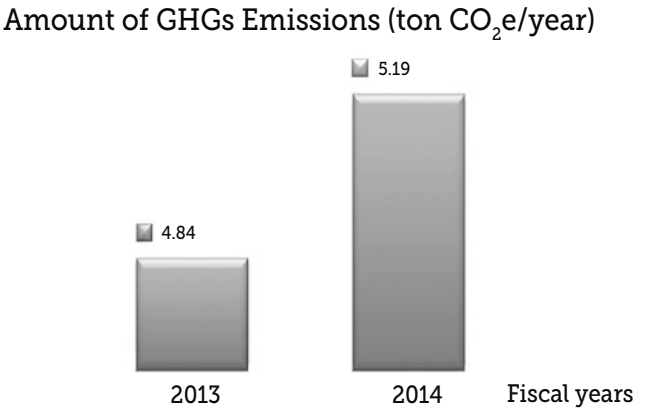


Chart 12: Amount of greenhouse gas emissions from Po Dang Tambon Health Promoting Hospital's activities from 2013-2014.

Table 14: Amount of greenhouse gas emissions from each GREEN activity of Po Dang Tambon Health Promoting Hospital from 2013-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2013	2014
Garbage	0.30	0.26
Restroom	0	0
Energy	4.54	4.93
Environment	0	0
Nutrition	0	0
Service	0	0

Next Steps

Po Dang Tambon Health Promoting Hospital and Lad Yang District Public Health Office to expand the networks by creating a roadmap to implement GREEN activity to cover all Tambon Health Promoting Hospitals in the area by 2017. The hospital aims to expand networks to government sectors in Nadee Sub-district in joining GREEN and CLEAN project. The hospital is willing to be a model and raise awareness in greenhouse gases emission reduction for people and other organizations in both government and private sectors.

Factors of Success

1. Executive support and clear policies
2. Strong network
3. Good communication and collaboration
4. Community's trust and involvement

Hospital

Sai Mun

Address: Sai Mun Sub-district, Sai Mun District, Yasothon 35170, Thailand
Tel.: (+66)4 578 7046, (+66)4 578 7023

Motivation

Sai Mun Hospital has 104 personnel, and provides service for 5 tambons including 54 villages and 30,936 people. In 2010, Dr. Pakasit Owataganon, the Director of Sai Mun Hospital created policies that showed responsibility for society. Moreover, the hospital was facing financial problems; thus the Director decided to join GREEN and CLEAN project hoping to reduce hospital expenses.

Implementation Process

Garbage

Reduce:

1. Use canvas bags instead of plastic bags
2. Use medicine paper bags instead of plastic
3. Prohibit using plastic cups in meetings
4. Use thinner plastic bags.

Reuse:

1. Use both sides of paper
2. Use used plastic bottles as plant pots
3. Forming a second hand cloth shop and donate some clothes to Suthasinee Noiin Foundation

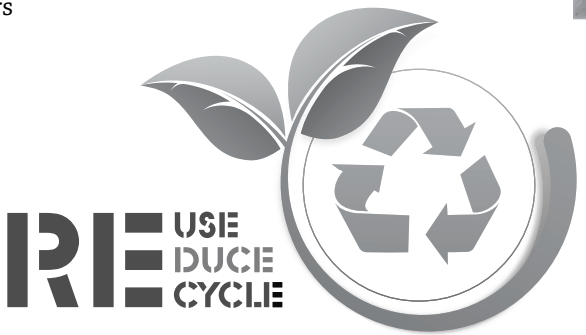
Recycle:

1. Making lung exercising tools and make exercising equipment from coconut shells
2. Sorting waste and deposit to the recycle waste bank and sell them to earn extra income

"Lung exercising"

Restroom: improving toilet quality to meet HAS standard

1. Use pandan leaves and coffee to deodorize
2. Use EM to clean the toilet floors



Energy

1. Use fluorescent tubes and reflective surfaces
2. Set AC temperature to 25°C or higher
3. Decrease number of electric kettles from 14 to 5
4. Turn off the computer when not in use and unplug
5. Limit driving speed at 90 km/h and turn off engine while waiting, instantly check the engine
6. Encourage biking to work
7. Use NPG when sterilizing medical equipment
8. Use a sprinkler to water plants



Environment

Sai Mun Hospital strictly follows green policy, such as planting trees every month, growing plants that help absorb toxic substances, gardening and making information tags on trees.

The hospital has a 51.6% green area out of the entire land. Sai Mun Hospital also produces compost from leaves and fertilizer from earthworms' excrement. The hospital plans to produce fertilizer pellets in the future.


N: Nutrition

- Growing organic vegetable in the hospital
- Encouraging personnel, patients to consume organic vegetable
- Preparing food by organic vegetable grown in the hospital

The activity later on was expanded into community and there were many organizations visit and learn about the project. Most vegetable is seasonal and normally grow in winter.



Carbon Footprint Measurement

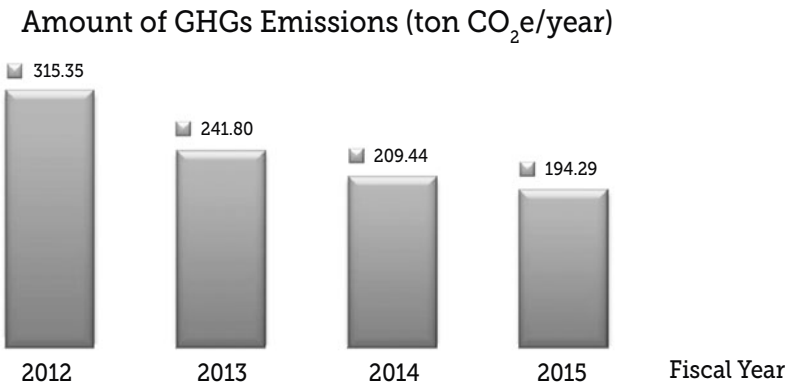


Chart 13: Amount of greenhouse gas emissions from Sai Mun Hospital's activities from 2012-2015.

The data shows that the amount of greenhouse gas emission from Saimun Hospital was 315.35 tons CO_2e/year in 2012 and had decreased to 241.80 tons CO_2e/year 209.44 and 194.29 in 2013, 2014, 2015, respectively.

Table 15: Amount of greenhouse gases emission from each GREEN activity of Sai Mun Hospital from 2012-2015.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)			
	2012	2013	2014	2015
Garbage	6.48	5.32	4.86	4.19
Restroom	0.44	0.36	0.36	0.36
Energy	307.43	235.16	203.26	188.78
Environment	0	0	0	0
Nutrition	1.00	0.96	0.96	0.96
Service	0	0	0	0

Overcome the obstacles of the project

Team management: The implementation started with easy changes, such as reducing paper usage and only turning on the air conditioner after 10 o'clock in the morning, result in smooth progress.

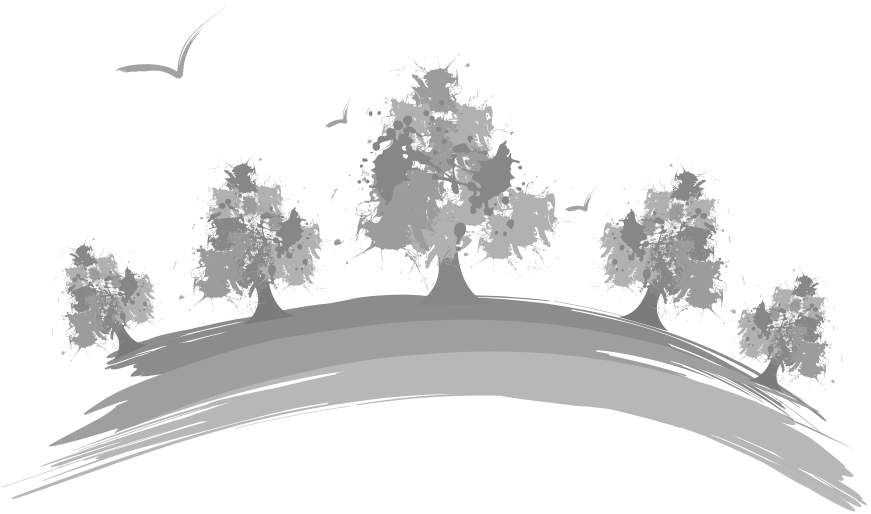
Expanding project: The Director of the hospital aims to be a model for organic gardening by selling EM, and organic vegetables. The hospital plans to collaborate with local government in creating a community organic garden.

Networking

Sai Mun Hospital has joined the committee of sanitary and environment of Yasothon Province in 2014, and had an opportunity to present the fertilizer produced from earthworms' excrement project, as well as and conducting global warming activities at schools and community halls. Moreover, gas stations in Yasothon province were interested in the EM, organics garden and fertilizer from earthworms' excrements project. Thus, the hospital instructed them until they were able to practice these activities.

Results of the implementation

1. The personnel stay healthy
2. The hospital is proud to be a part in global warming reduction
3. The hospital becomes a learning center and a model for the community
4. The hospital is financially stable
5. Creating family activities, such as gardening together



Hospital

Bannang Sata

Address: Bannang Sata Sub-district, Bannang Sata District, Yala 95130, Thailand
Tel.: (+66)7 328 9142
Fax: (+66)7 328 9142

Bannang Sata Hospital is a community hospital with 30 beds and serve 216 patients per day. Bannang Sata Hospital has implemented GREEN and CLEAN project in 2012. The objectives of the project are to raise awareness of global warming among personnel and to eliminate unnecessary use of energy.

The executive of the hospital is aware of the importance of greenhouse gases emission reduction and energy saving. Therefore, it became a motivation for the hospital.

Implementation Process

G: Garbage

Bannang Sata Hospital categories waste into 4 types which are, general waste, hazardous waste, infectious waste and recyclable waste. General waste is handled by local government while infectious waste and hazardous waste are handled by a private company. Food scraps are used to produce EM for cleaning the toilets, and recyclable waste is sold by the hospital and is returned the money to responsible departments.

The results found that

General waste

- Average amount of regular waste produced per day = 30-40 kg
- Amount of regular waste produced in 2013 = 15,630 kg
- Amount of regular waste produced in 2014 = 12,360 kg
- Amount of regular waste produced **decreased 3,270 kg (20.92%)**

Infectious waste

- Average amount of infectious waste produced per day = 13-14 kg
- Amount of regular infectious produced in 2013 = 2,040 kg
- Amount of regular infectious produced in 2014 = 1,152 kg
- Amount of regular infectious produced **decreased 888 kg (43.53%)**

Recyclable waste

- Average amount of recyclable waste produced per month = 304 kg (including paper 189 kg/month, glass bottle 24 kg/month, plastic 91 kg/month and metal 6 kg/month)

The recyclable waste bank operates by sorting waste, raising awareness of the importance of waste sorting and environment preservation in the hospital, as well as encouraging saving and earning money from selling waste.

R: Restroom

The hospital has improved the toilets to meet HAS standard by learning about HAS activity and following the standards, using herbs to deodorize and decorating the toilets. As a result the hospital won the provincial happy toilets.

EM Production

The hospital uses organic waste from the hospital's kitchen and community market to produce EM for cleaning toilets in order to reduce chemical use as well as the hospital expenses.

Making EM: The hospital uses organic waste from hospital's own kitchen and community market to make EM which is used to clean the restroom.

E: Energy

In term of energy saving, the hospital has conducted fuel saving, electricity saving, saving projects which the results are showed in table 16-18.

Table 16: Fuel usage from 2013-214.

Type	Amount (Liter)		Difference (Litter)
	2013	2014	
Diesel	12,784	7,339	-5,445
Benzene	180	26	-154
E20	220	20	-200
Gasohol 95	0	102	+102

Table: 17: Electricity usage from 2013-2014.

Year	Amount (Unit)
2013	211,978
2014	210,098
Difference	-1,880

Table 18: Water usage from 2013-2014.

Year	Amount (Unit)
2013	11,492
2014	6,686
Difference	-4,806

E: up Environment

The activities that help reduce global warming and help in managing the environment are

1. Setting up Big Cleaning Campaign
2. Planting trees and increasing green area in the hospital
3. Reducing foam container use which each department of the hospital set a foam container reduction day of the week. The activity is expanded to hospital shops.
4. Well water treatment system. The savage from the water system will be tested at the department of health's lab 3 times a year.
5. The hospital's water supply system can produce 25 cubic meters/hour. The water is quality checked at the department of health's lab twice a year.

N: Nutrition

The hospital grows organic vegetables which are used for cooking in the hospital's kitchen. The personnel also grow organic vegetables and earn extra money from selling them to the hospital and community.

Carbon Footprint Measurement

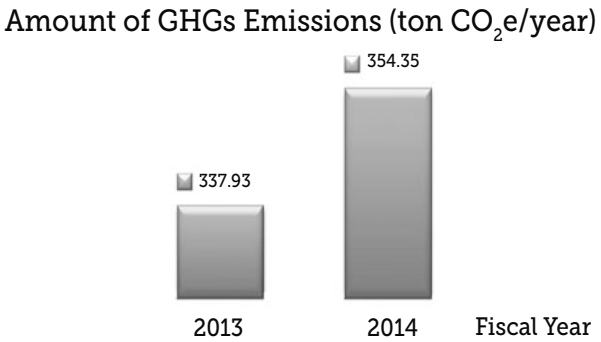


Chart 14: Amount of greenhouse gas emissions from Bannang Sata Hospital's activities from 2013-2014.

The data shows that the amount of greenhouse gas emissions of Bannang Sata Hospital was 337.93 tons CO_2e/year in 2013 and 354.35 tons CO_2e/year in 2014, which increased to 16.42 tons CO_2e/year due to more patients.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2012	2013
Garbage	12.39	12.41
Restroom	1.06	1.07
Energy	324.48	340.87
Environment	0	0
Nutrition	0	0
Service	0	0

Table 19: Amount of greenhouse gas emissions from each GREEN activity of Bannang Sata Hospital from 2013-2014.

Factors of Success

The successes of the implementation is from the support of the executive, teamwork and awareness in environmental preservation. The hospital has more green areas, good environment and a recycling bank resulting from the implementations. Moreover, the hospital and the personnel have earned extra money from selling recyclable waste.

Hospital

Prathai

Address: Prathai Sub-district, Prathai District, Nakhon Ratchasima 30180, Thailand
Tel.: (+66)4 447 9396

Motivation

Prathai Hospital is a hospital in Nakhon Ratchasima with 60 beds, set on 7.6 acres with 229 personnel. In 2014, the number of out patients was around 389 per day. As a result of increasing patients along with buildings and service expansion, the consumption of electricity, water usage and amount of waste were steadily rising. Thus, the activities affected both expenses and greenhouse gas emissions that cause global warming.

Since the GREEN and CLEAN hospital project operated by Public Health Ministry is implemented in many healthcare facilities, the Director and the boards of the hospital were aware of the global warming crisis and determined to be a part of the project. Therefore, the hospital has joined GREEN and CLEAN project in accordance with the support of Nakhon Ratchasima Provincial Public Health Office and 5th Regional Health Service Center.

Implementation Process

The hospital began to implement the project in 2011 until present. The objectives of the implementation are to raise personnel awareness and conscious energy saving. In 2010 - 2013, the personnel of the hospital had an opportunity to visit Prasat Hospital which is GREEN and CLEAN hospital model in Surin Province. The hospital also trained the personnel and had them participate in creating a project plan following GREEN activities. The goal of the project was to become a GREEN and CLEAN Hospital model in 2012-2013 by implementing the following activities,

G: Garbage following 3R concept; Reduce, Reuse, Recycle

- Forming a recycle waste bank (setting a waste fund which returns 40% to responsible departments) since 2008-present (has been operated for 6 years and 9 months)
- Producing compost from grass and leaves, and bio extract from vegetables and fruit peels
- Reusing, such as using hand towels instead of paper towels, using both sides of paper, using lunch boxes instead of foam containers
- Using a computer system instead of x-ray film procedure

R: Restroom



Restroom improvement

- Improving the toilets to meet HAS standard
- In 2013, the hospital built 2 additional public toilets at outpatient and chronic patients departments to serve patients, disabled people and elderly by focusing on cleanliness, sufficiency and safety. The hospital achieving HAS standard in 2014 resulted from the improvement.
- Getting toilets evaluated by environmental committees
- Using Thai herbs such as kaffir lime and pandanus leaves to deodorize the toilets
- Using bio extract to clean toilet floor and sanitize
- Winning the Provincial Happy Toilet of the year in 2014

E: Energy

- Encouraging personnel to carpool to save energy and reduce air pollution
- Saving energy such as switching off lights and computer screens after using and setting AC timer, turning off AC on lunch break, setting AC temperature at 25°C, sharing kettles and using energy saving appliances
- Encouraging personnel to ride a bike to work





E: Environment

The environment management began by integrating the healthy workplace standard. The management includes practicing 5S, being continuously evaluated by environment committees, adding more green areas, encouraging personnel to plant in special days such as the Hospital Anniversary in order to help absorb toxins, improving healthy atmospheres such as gardening in front of the hospital, providing visiting areas, and adjusting the landscape around the water treatment pond.

N: Nutrition

- Creating healthy policies for patients and hospital personnel, such as mixing brown rice with white rice, purchasing organic vegetables from reliable places such as healthy markets, local market, and providing healthy Menus
- Adjusting land near the kitchen to grow organic vegetables and fruits
- Encouraging personnel to grow their own vegetable gardens at home
- Selling healthy food to patients and personnel at the chronic illness department
- Promoting contaminant checks every 3 months in the hospital kitchen and every 6 months in the community

Carbon Footprint Measurement

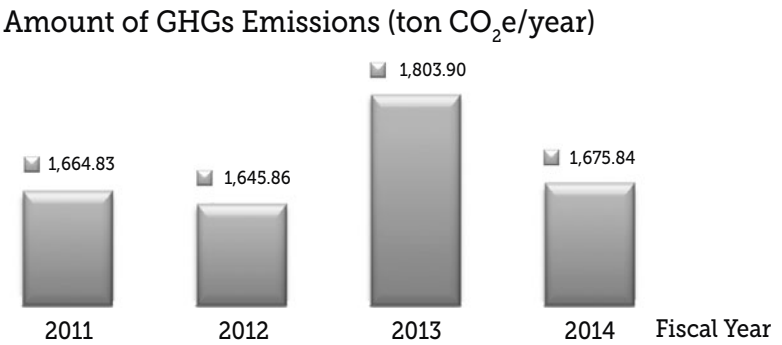


Chart 15: Amount of greenhouse gas emissions from Prathai Hospital's activities from 2011-2014.

The data shows that the amount of greenhouse gases released in 2011 was 1,664.83 tons CO_2e/year which slightly decreased to 1,645.86 tons CO_2e/year in 2012 while increasing to 1803.90 tons in 2013 due to energy consumption activity. Finally it decreased to 128.06 in 2014 which is a 7.10% decrease resulting from the greenhouse gases reduction project.

Table 20: Amount of greenhouse gas emissions from each GREEN activity of Pratai Hospital in 2011-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)			
	2011	2012	2013	2014
Garbage	19.9	16.22	8.29	17.72
Restroom	0	0	0	0
Energy	490.06	475.16	601.06	581.54
Environment	0.24	0.24	0.24	0.23
Nutrition	0.23	0.24	0.24	0.23
Service	1,154.4	1,154	1,194.07	1,076.11

Factors of success

The important factors of success in GREEN and CLEAN project of the hospital are

1. The support of the director and the hospital board, which includes sharing knowledge to promote the project
2. Team work
3. The awareness from everyone in the hospital of global warming crisis and environmental problem

Outstanding Activities

Recycling waste bank

The recyclable waste bank has operated since May 2008 until present (December 2014). The implement begins with personnel sorting recyclable waste and depositing to the bank every Monday and Thursday with the records of the amount of waste for each deposit. The hospital collects food scraps from personnel households and the hospital kitchen for the municipality to produce bio fertilizer pellets, and also to produce biofertilizer and bio extract from grass and leaves to use in the hospital.

"The recyclable waste bank"

Due to waste sorting management, the amount of waste was reduced from 19,380 Kg to 17,060 Kg in 2012 especially general waste. As a result, the hospital has gained 179,130 baht from the implementation and spent 60,000 baht from the extra income to purchase sports shirts for personnel.


O2
O2
O2
O2
O2

Toilet improvement

In the past, the number of toilets in the hospital was not enough and below standard. There was no toilets for disabled people, pregnant women and elders. So, they started to improvement their toilet which the director of the hospital approved the budget of 1.5 million to construct new toilets, one in outpatient department and one in Chronic Patient Department. In terms of the toilet standard, the hospital has assigned cleaning staff and evaluation by environmental committees. As a result of the implementation, the hospital won the provincial toilet award in 2014.

Results of the implementation

- Be able to gain benefits from waste, such as producing biofertilizer from grass and leaves, bio extract from vegetable and fruit peels, and gain extra money from selling recycling waste
- Become green hospital with a healthy environment and happy workplace while reducing global warming
- Be able to monitor greenhouse gas emissions from activities in the hospital and use the data to plan further projects
- Personnel realize the importance of the projects and also the importance of participation and energy saving
- Be a model hospital for the community and other organizations to learn from

Next Steps

- Reducing general waste and infectious waste by 5% of the previous year
- Running creative projects and innovation of energy saving contests
- Increasing the use of bio extract for cleaning toilet floors at least 50% in each department
- Expanding greenhouse gases reduction network in collaboration with Tambon Health Promoting Hospitals and schools, and by being a learning center for interested organizations

Hospital

Sawang Daen Din Crown Prince

Address: Sawang Daen Din Sub-district, Sawang Daen Din District,
Sakon Nakhon 47110, Thailand
Tel.: (+66)4 272 1111
Fax: (+66)4 272 1636

Sawang Daen Din Crown Prince Hospital is a general hospital with 120 beds. The implementation started from the policy of Sakolnakorn governor, which is GREEN Sakon Nakhon and the policy of Sakon Nakhon Public Health, which is GREEN hospital.

The assembly contains 3 elements which are government sector, local administration and citizen. Due to the expansion of the hospital and the large amount of greenhouse gas emissions, the hospital tried to find an efficient way to save energy and reduce greenhouse gases. Thus, the hospital has joined GREEN and CLEAN project.

Implementation Process

G: garbage Waste management following 3Rs,

Reduce

1. Decreasing plastic medicine bags in chronic patients
2. Using alcohol and gel bottles for hand soap bottles

Reuse

1. Using both sides of paper
2. Reusing sterile water

Recycle

1. Sorting recycle waste
2. Forming a Sawang Daen Din Crown Prince Hospital waste bank

Waste Sorting

The concept of waste sorting is to categorize waste and minimize the amount of disposal waste by reusing and recycling it. The waste is categorized into 5 categories which are

1. **Organic waste:** organic waste is waste from the canteen, hospital kitchen and organic waste.

The organic waste is disposed by

- Using it to feed earthworms and get urine and excrement following Maejo University instruction. The urine and evacuation are used as fertilizer for organic fruits and vegetable in the hospital. The hospital also shares the instruction with Tambon Health Promoting Hospital.
- Producing compost fertilizer for agriculture
- Producing multi purpose formula by preserved process which helps the hospital in reducing cleaning products such as dishes, floor and car

2. **Recyclable waste**

After visiting Panna Sub district, a waste management model, and Donkeung, the hospital has formed a recycle bank. The hospital also promoted the implementation; as a result, 26 villages in Sawang Daen Din District have operated recyclable waste banks for 2 years by following these steps;

1. Collecting and sorting waste by the committees of the villages
2. Cooperating with local junk shops to sell waste
3. Gathering money from each village, and then using it to fund the village such as cremation money for villagers, management cost in Tombon and villages.
4. Passing general waste from city municipal to landfills
5. Dumping in holes and sealing for infectious waste disposal



R: Restroom: Improving toilets to meet HAS standard

1. Using multi purpose formula produced from bio extract to clean toilets and floor
2. Using natural products to deodorize instead of chemical products


E: Energy:

Energy saving by

1. Turning off the lights when there is enough natural light in the hallway, balcony and outside
2. Setting timer for AC and lights as well as scheduling maintenance every month
3. Turning off computer screen when it is not in use
4. Selecting energy saving appliances
5. Unplugging and switching off power boards after using
6. Changing light bulbs to E5

Fuel management plan by

1. Turning the engine off while waiting for passengers
2. Checking routes before the trip
3. Instantly checking vehicle engine
4. Carpooling
5. Limiting speed to under 90 km/hour

Water saving by

1. Instantly checking water system
2. Turning off water after using
3. Planting trees with water from water treatment
4. Installing sprinkler system for planting
5. Providing hot water from sunlight

E: Environment: Greenhouse gases emission reduction and healthy environment management

The hospital tries to add more green area in 250 acres, which integrated from healthy workplace project and other projects in the hospital, including adding green area inside and outside the buildings and tree planting campaign.

The water treatment in the hospital is whirlpool system which is a natural system. The system has quality check plan 3 times a year and analysis of quality due to quality control.

N: Nutrition

1) Promoting organic food and planting vegetables in the hospital
2) Promoting personnel and people to consume organic vegetables
3) Cooking organic vegetables planted in the hospital for patients
4) Encouraging local people to plant organic vegetables and buy their goods

Carbon Footprint Measurement

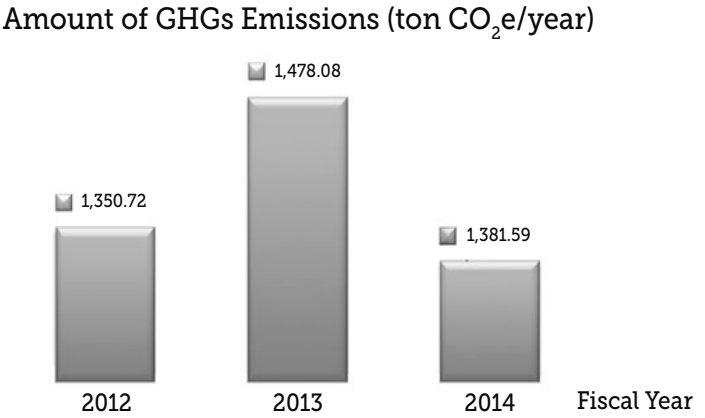


Chart 16: Amount of greenhouse gas emissions from Sawang Daen Din Crown Prince Hospital's activities in 2012-2014.

The data shows that greenhouse gas emissions in 2102 was 1,350.72 tons CO_2e/year and slightly increased to 1,478.08 in 2013. Then it decreased to 1,381.59 ton CO_2e/year, which is a 96.49 ton CO_2e/year or 6.53% reduction due to greenhouse gasses reduction projects.

Table 21: Amount of green gases emissions from each GREEN activity of Sawang Daen Din Crown Prince Hospital in 2012-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)		
	2012	2013	2014
Garbage	33.02	22.59	15.92
Restroom	0	0	0
Energy	1,294.59	1,420.71	1,351.42
Environment	0	0	0
Nutrition	0.12	0.12	0.12
Service	22.99	34.66	14.13

Problem and Obstacles

In the past, the personnel of the hospital had a negative attitude toward waste management and also lack of courage to give opinions or suggestions in meetings. However, a year after, the hospital came to the conclusion from visiting local agriculture communities and agreed that every parties had their own tasks. Therefore, the tasks had to be integrated and worked on together. As a result, the district assembly and **"Sawang Daen Din District builds happiness, good people, healthy life, good income and nice environment project"** has been created which followed Tambon and Ampher constitution as tools of implementing. The sub-district constitution was formed from 4 sub-district and became district constitution then adjusted it to be a roadmap.

Factors of success

The board of the hospital realized the importance of the implementations as well as vision, plan and practice. Hence, the practical implementations are conducted in all sectors including environment team, bio health team and family clinical practice and environment team, which led to the expansion of networking and sustainable results in the future.

Results of the implementations

In the past, people in the community had no knowledge about waste sorting. However, after conducting the project they sorted plastic bottles into soft and hard plastic, which can sell at a higher cost than mixed plastic. The waste sorting is not only a good way to earn extra money but also a way to get rid of the waste from community, help the municipality and reduce greenhouse gases emission to the atmosphere.

In terms of bio extract from fruits which is used for multi purpose formula, in the past it was used only in the hospital, but now the formula is shared with the community. Hence, local people can produce it in their households which helps them reduce their expenses.

Next Steps

1. Running innovation of energy reduction contest in the future
2. Using solar cell roof
3. Connecting relevant implementations such as using fertilizer from earthworms in guava fields and using the guava leaves to produce medicine for diarrhea
4. Encouraging personnel to grow their own vegetables by using biofertilizer
5. Starting green market, however, local people sell their products to the supermarket because of higher price offer so it is important to build more organic vegetable networks

Hospital

Si Thep

Address: Sa Kruat Sub-district, Si Thep District, Phetchabun 67170, Thailand
Tel.: (+66)5 679 9467, (+66)5 679 9498

Si Thep Hospital is a 30 bed hospital which is set on 8 acres with 197 personnel. In 2013, there were 285 outpatients a day and 4,349 in-patients a day on average.

Motivation

In 2009, the hospital environment developing team attended an energy and global warming conference, after hearing the success of the implementation from model organizations and also their results, which not only reduced energy but also expenses. Therefore, the hospital environment developing team proposed the ideas of energy saving to the board of the hospital. The existing policies that the hospital has been implementing are environment improvement, toilet cleanliness and healthy workplace; thus, energy saving and GREEN hospital project has been conducted following 7 GREEN concepts which are;

- Green business
- Green technology
- Green energy
- Green art
- Green environment
- Green living
- Green nutrition

These concepts have been created as a roadmap in quality evaluation of the hospital in the environment and safety division which has been conducted from 2012.

Implementation Process

G: garbage
The hospital has managed and gained benefits from waste by sorting waste into 3 categories as follows,

Infectious waste: Private section takes them to dispose properly and reports to relevant organizations to show responsibility to community

Hazardous waste: Private sector takes them to dispose properly

General waste: Tambol Administrative Organization of Sa Kruat collects and disposes in disposal area

Water treatment system: The water treatment system operates by activated sludge (AS) system and quantity waste water test by Department of Health labolatory. Water from water treatment system is used to water trees and lawn in the hospital and the stain is used as fertilizer for plants in the hospital and houses.

Si Thep Hospital has been implementing the project by following 3R concepts which are

Reduce: Using hand towel instead of paper towel and throwing garbage directly in trash cans without plastic trash bags.

Reuse: Using both sides of paper to reduce paper use, energy and budget

Recycle: Watering trees and plants with water from water treatment system, using stain as fertilizer for plants, using torn patient uniform for hand towels and rags.

R: Restroom

The hospital has improved toilets to meet HAS standard in order to provide clean and safety toilets with emergency alarms for disabled people, elders and personnel. Moreover, the hospital has collaborated with both government sectors and private sectors to improve the toilets to meet HAS standard.

E: Energy

The hospital set up meetings to inform personnel and relevant parties about the policy and participation in energy and global warming reduction which are,

- **Energy saving:** Setting timer for AC, using energy saving AC, maintaining the AC, changing normal ballast to electrical ballast, changing old light bulbs into energy saving light bulbs, checking brightness level by light intensive measurement and adjusting brightness to suite the use of each department
- **Fuel saving:** Limiting speed limit at 90 km/hr, turning off the engine while waiting for patients or personnel, carpooling
- **Water saving:** Turning off the faucet after using, checking and regularly maintaining piping system

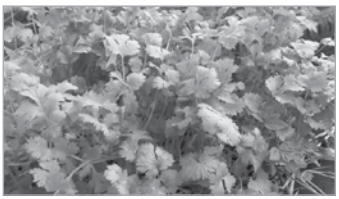
E: Environment

Environment management by conducting the following activities

- 5S: conducting a cleaning campaign in the hospital every 2nd Friday of the month
- Healthy environment
- Creating evaluation and environmental engineering improvement project to evaluate environmental risks and solving the system in the hospital by Environment Round
- Implementing occupational health. Si Thep Hospital has passed the 5th level in 2012 by being evaluated in physical environment which are brightness, sound, dust, including checking personnel health from risk in the workplace such as hearing efficiency, sight efficiency and lung efficiency

N:Nutrition

Promoting safe food by checking food for contaminants in restaurants and shops in the community, such as formalin, fungi resistance, salbutamol, pesticide, informing personnel and communicate leaders about their danger, encouraging personnel and local people to consume local and organic vegetables and to grow their own vegetables. The hospital also demonstrates an organic vegetable garden to sell and distribute to people who are interested and for cooking in the hospital kitchen.



Carbon Footprint Measurement

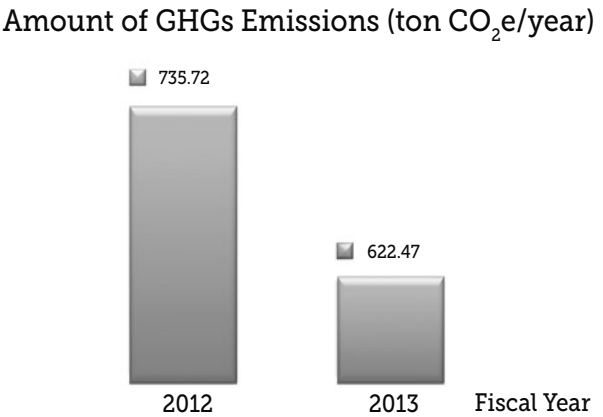


Chart 17: Amount of greenhouse gas emissions from Si Thep Hospital's activities in 2012-2013.

The data shows that the amount greenhouse gases emission from Srithep Hospital in 2012 is 735.72 tons CO_2e/year and decreased to 622.47 tons CO_2e/year which resulted from implementing GREEN activities, especially in energy saving activities.

Table 22: Amount of greenhouse gas emissions from each GREEN activity of Si Thep Hospital in 2012-2013.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2012	2013
Garbage	33.48	30.9
Restroom	0.94	0.89
Energy	641.04	326.88
Environment	60.26	263.8
Nutrition	0	0
Service	0	0

Factors of Success

- The director and the board of the hospital value in being a part to save energy
- Create a policy and an objective of energy saving
- People understand and realize about the importance of cooperation and the implementation
- The project leader has knowledge roadmaps and practical policies

Advantages of the Implementation

- Collaboration, participation and networking between personnel, patients and visitors
- Have proper tools for energy and global warming reduction project
- Reducing hospital budget and expenses

Next Steps

- Setting up Organic lifestyle project for improvement by environment friendly bio extract
- Setting up Herb garden project for medication purposes

Hospital

Yi-ngo

Address: Yi-ngo Sub-district, Yi-ngo District, Narathiwat 96180, Thailand
Tel.: (+66)7 359 1454

Yi-ngo Hospital is a community hospital with 30 beds which has opened since December 1, 2010.

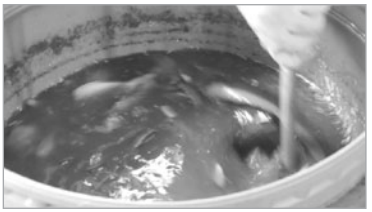
Outstanding Factors

The outstanding factor of the hospital is a good atmosphere such as airy and sunny. The hospital also had a **"Hospital Service Idea"** which is a combined hospital and hotel in order to show gratitude for people that raised funds to buy the land to build the hospital. In the past, the land was a rice field and had no trees; thus, the hospital tended to add more green area to maintain the existing ecosystem. Besides, the hospital had a small budget so saving energy is a good way to save the hospital money.

From **"The Best Community-Owned Hospital"** which is the collaboration management from people to improve hospital service as hotel service. The director of the hospital had an idea to raise personnel awareness by having board members as a model. Therefore, the **"GREEN Office for GREEN Hospital"** was conducted by following the philosophy of **"Sufficient Economy".**

Implementation process

In 2013, the hospital has joined GREEN and CLEAN and implemented all of 5 GREEN activities following CLEAN principle for clearer objective. The implementation includes instructing the community and using Carbon Footprint as a measurement tool in order to plan practical projects. Now, the hospital is able to increase the standard of 5 GREEN activities and ready to be a learning center of the 5 activities as the following;



G: Garbage-Waste management by sorting waste into 3 categories which are general waste, infectious waste and hazardous waste and properly disposal by 3Rs concepts as the following,

- **Reduce:** Using cloth medicine bags instead of plastic medicine bags
- **Reuse:** Using both sides of A4 paper and using the wraps as document envelopes for patients and personnel, using old paint cans and tires as flower pots
- **Recycle:** Providing an area for sorting recycling waste to sell, drying cloths with pandanus palm, watering trees with modified broken bicycles and producing bio extract and bio fertilizer from food scraps

R: Restroom-Toilet management

The hospital has improved the toilets to meet HAS standard and was able to win the **"Happy Toilet"** in 2013. The hospital also reduces chemical use by using bio extract and multipurpose formula for cleaning the toilets and using Thai herb to deodorize instead of toilet spray.

E: Energy-Energy saving

The energy saving policies include setting timers for all electronic appliances, setting standby mode for computer, carpooling and riding bicycles.

E: Environment-Environment management

The hospital has implemented **"GREEN Office for GREEN Hospital"** project by adding green atmosphere in workplace and plants trees on special occasion, practicing 5S, running **"Big Cleaning Day"** and also following healthy workplace concepts. As a result, the hospital has won provincial healthy workplace award in 2013 and the implementations are still carried on.

N: Nutrition

The hospital has promoted growing local vegetables and organic vegetables project by using bio extract as fertilizer instead of chemical, growing sufficient garden. The hospital has also promoted Saiyairak innovation, Rainbow Rice innovation, Halal food standard, Clean Food Good Taste (CFGT) 100% food standard, healthy menus, herbal drinks as healthy break menus. Furthermore, the hospital still carry on and develop the activity to be GREEN+2E which are,

E=Examination physical-Examination and healthy lifestyle

The hospital has conducted healthy lifestyle activity which is annual physical examination from any risks in the workplace such as insufficient brightness, sound level check and vaccine.

E: Exercise-Exercise for health

The hospital assigned personnel to join a club and schedule each day for each club activity. The director of the hospital is an exercise model for personnel.

Carbon Footprint Measurement

The data shows that the amount of greenhouse gases emitted from the hospital in 2012 is 235.11 ton CO_2e/year and increased to 253.64 tons CO_2e/year in 2013. Hence, the hospital has to find policies for energy management.

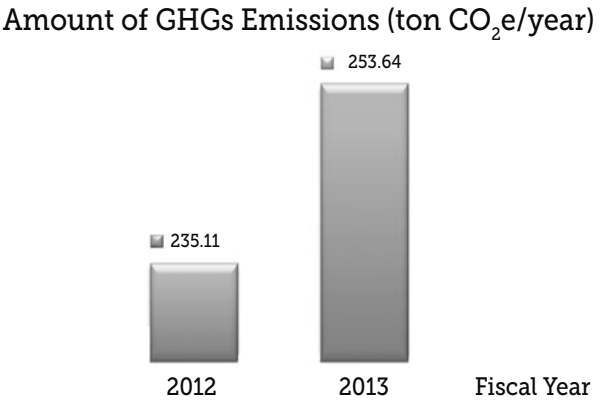


Chart 18: Amount of greenhouse gas emissions from Yi-ngo Hospital's activities l in 2012-2013.

Table 23: Amount of greenhouse gas emissions from each GREEN activity of Yi-ngo Hospital in 2012-2013.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)	
	2012	2013
Garbage	3.97	4.17
Restroom	0.17	0.76
Energy	230.43	248.71
Environment	0	0
Nutrition	0	0
Service	0	0

Factors of success

From the implementations of Yingo Hospital, the hospital is able to share and connect to community and local people in order to raise awareness in global warming situation. The implementation has been achieved because of collaboration and participation from all parties. The team is truly proud of patients and visitors praises.

Hospital

Khanu Woralaksaburi

Address: Saen To Sub-district, Khanu Woralaksaburi District, Kamphaeng Phet 62130, Thailand
Tel.: (+66)5 577 9013
Fax: (+66)5 577 9013

Motivation

Khanu Woralaksaburi Hospital is a 60 bed hospital and has realized the importance of healthy environment in the hospital due to the problems of the amount of garbage and high energy consumption. The problems became a motivation of implementing pollution reduction and environmental management projects. Thus, the hospital has joined GREEN and CLEAN project since 2010. The achievements of the hospital are passing Healthy Workplace evaluation for 5 years in a row, improving toilets and met HAS standard and also passing level 5 of health risk evaluation. These achievements are related to hospital environment policy that provide patients, visitors and personnel safe and health which are physical environment management in safety, conflagration, waste disposal, public utility system, equipment or emergency incidents. The policy is created for the hospital to be a safe, healthy and environmentally friendly place.

Implementation process

GREEN Activity

The hospital has created policies for the implementation and also set up meetings in order to share information to personnel about GREEN and CLEAN project. The implementations started with sorting waste, using bio extract produced from waste to reduce chemical products, using both sides of paper, using old clothes as hand towels, watering plants with water from water treatment system, following 5S (Clean office), setting timer for electrical appliances, using saving appliances, using natural products instead of foam containers.

Moreover, the hospital also improved landscape, planting trees in the hospital, growing plants to absorb toxic substances, encouraging personnel to grow their own vegetables and sell to the hospital in order to promote organic vegetables.


Information Board: To promote energy saving and encourage participation

Public relations through organizations and networks: (Tambon Administrative Organization, municipality, government sectors.) The hospital extent activities to community such as life improvement of labored breathing in asthma project, Khanuwittaya School waste bank, instructing restaurant owners about healthy menus, training volunteers in food contaminant testing, promoting organic vegetable cultivation in community, encouraging personnel, community leaders, students and local people to plant trees in temples.


Results of the Implementation

Due to the production of bio extract, the cost of chemical cleaning product has decreased around 35,000 baht per year. Additionally the hospital has earned 50,000-80,000 baht per year from selling recycling waste such as glass, paper, X-ray film and plastic.


Carbon Footprint Measurement

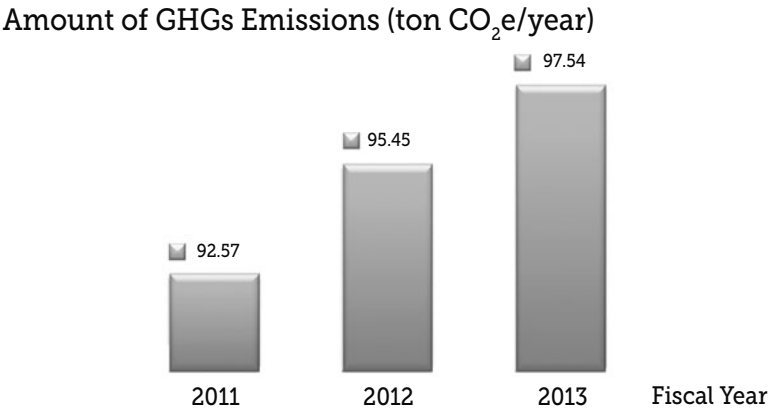


Chart 19: Amount of greenhouse gas emissions of Khanu Woralaksaburi Hospital's activities in 2011-2013.

The data shows that the amount of greenhouse gases emitted from Khanu Woralaksaburi Hospital is 92.57 tons CO_2e/year in 2011 and slightly increased to 95.45 tons CO_2e/year in 2012, and 97.54 tons CO_2e/year in 2013 which resulted from increasing energy consumption due to more patient. The comparison finds that greenhouse gas emissions in 2012 is 13.76 kg CO_2e/person and 13.62 kg CO_2e/person in 2013.

Table 24: Amount of greenhouse gas emissions from each GREEN activity of Khanu Woralaksaburi Hospital in 2011-2013.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)		
	2011	2012	2013
Garbage	2.40	1.24	1.55
Restroom	1.40	1.32	1.38
Energy	86.61	90.73	92.45
Environment	0	0	0
Nutrition	0	0	0
Service	2.16	2.16	2.16

Outstanding Innovations

- Cloth medicine bags project: Encouraging patients to bring their own personal tracked cloth medicine bags, in order to monitor their behaviors regarding medication, which also helps saving 30,000-50,000 baht per month, and to reduce waste
- Using saline bags as wire straps
- Using glass bottles to contain breast milk
- Using shred to cover baby' eyes in the incubators

Our Pride

Due to determination of continuous quality improvement, the hospital is certified from many organizations such as **"Quality and Healthy Hospital"** from the Healthcare Accreditation Institute (Public Organization), Healthy Happy Workplace from Public Health Center and GREEN and CLEAN hospital model. These awards reflect the vision of the director, ability of personnel and solidarity of everyone.

Factors of Success

The sucess was resulted from the Director of the hospital values and has clear objectives on the project as well as the cooperation and teamwork. Besides, the strength of network, organization, personnel and relevant parties in greenhouse gases reduction and energy saving helps reducing expenses and greenhouse gases emission in the future.

Hospital

Phimai

Address: Nai Mueang Sub-district, Phimai District, Nakhon Ratchasima 30110, Thailand
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Phimai Hospital is a 90 bed hospital. In 2012, there were 523 outpatients and 13,756 inpatients.

Motivation

The expansion of the hospital and the amount of personal affected hospital liquidity. The hospital expenditure got higher from the amount of electricity consumption and garbage, as well as the reduction of green area. Therefore, if the hospital did not have a management plan, it would affect expense and environment.

Green activities are

In 2010, the hospital started to implement GREEN and CLEAN project but it was not very successful. Then in 2011, after opening a 5-story outpatient building, the hospital has collected data of each activity daily, such as energy consumption, fuel and office supplies. Hence, the hospital has accurate data of each activity and is able to plan practical implementations. The implementations include personnel development, raising awareness in global warming situation, efficient using resources, visiting and learning GREEN and CLEAN hospitals model and instructing personnel. Personnel are also allowed to brainstorm to set strategies for daily duty by following GREEN activity as well as participate in setting a goal to be a GREEN and CLEAN hospital in 2012-2013.

G: Garbage following 3R concepts

- Forming a recycle waste bank and sell them monthly
- Producing compost and bio extract by weed and food scraps from the hospital kitchen
- Reusing such as using both sides of paper and using paper box to store document
- Using magnets instead of staples on information board
- Stop using X-ray film and replacing it with computer system

R: Restroom

- Examining follows HAS activity by Community and Family Medicine Team
- Joining Happy Toilet Award of 2013 and won honorable mention in community hospital sector

E: Environment


- Conducting 5S activity and get evaluated every 3 months
- Winning Healthy Workplace Award of 2012
- Adding green area for being relaxing place in empty areas
- Planting tree to block the light which helps reduce temperature in the buildings
- Planting with community

E: Energy

- Carpooling
- Encouraging bicycle riding to work by setting bicycle parking area for the convenience
- Reducing energy consumption such as turn off the lights after using and walk up and down the stairs instead of using elevator (personnel), turn off computer screens when finished using and set the AC temperature at 25°C

N: Nutrition



- Encouraging the hospital kitchen to prepare food with organic vegetables for healthy purpose of the patients and to reduce chemical use
- Growing own vegetables of each department by using their own produced fertilizer
- Operating organic market every Friday at the food court on G floor at outpatient building in order to provide organic product to personnel, patients and patient relatives

Results of the Implementation




1. Personnel and patients are interested and follow the policies such as walk up and down the stairs.
2. The hospital atmosphere is beautiful and pleasant due to the green implementation.
3. Personnel are interested in organic products so all departments have their own vegetable gardens. Thus, the hospital has operated an organic market which is not only to reduce chemical use but also good for health.
4. Planting trees with community on special days.
5. The hospital provides clean toilets which meet HAS standard.
6. All departments earn extra income from selling garbage which is the motivation of waste sorting and also to reduce disposal waste.
7. The hospital has set one day as **"Big Cleaning Day"** for personnel to participate in environmental management in order to improve the hospital to be a happy workplace.

Recommendations

1. If there is no waste management, the amount of waste will significantly increase. For example, the hospital was able to produce compost from 13 tons of organic waste. Hence, the hospital could decrease the large amount of waste and reduce greenhouse gases emission. The hospital also plans to manage other kinds of waste in the future.
2. Without energy control and policy, the energy consumption would be very high. Therefore, the new buildings were installed all saving energy equipment such as number 5 saving energy AC, low loss as well as environment management such as ventilation and using benefits from natural light.
3. Managing organic market and garden related to consumer demand for sustainable implementation.
4. Sharing information about environment and global warming problems which is caused from personnel, patients and visitors in order to raise awareness.

Carbon Footprint Measurement

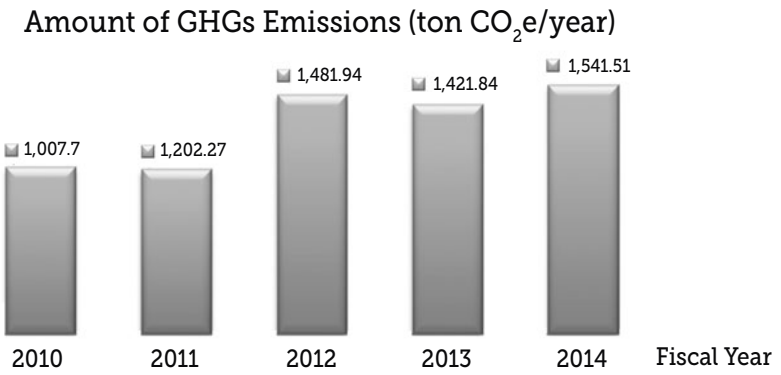
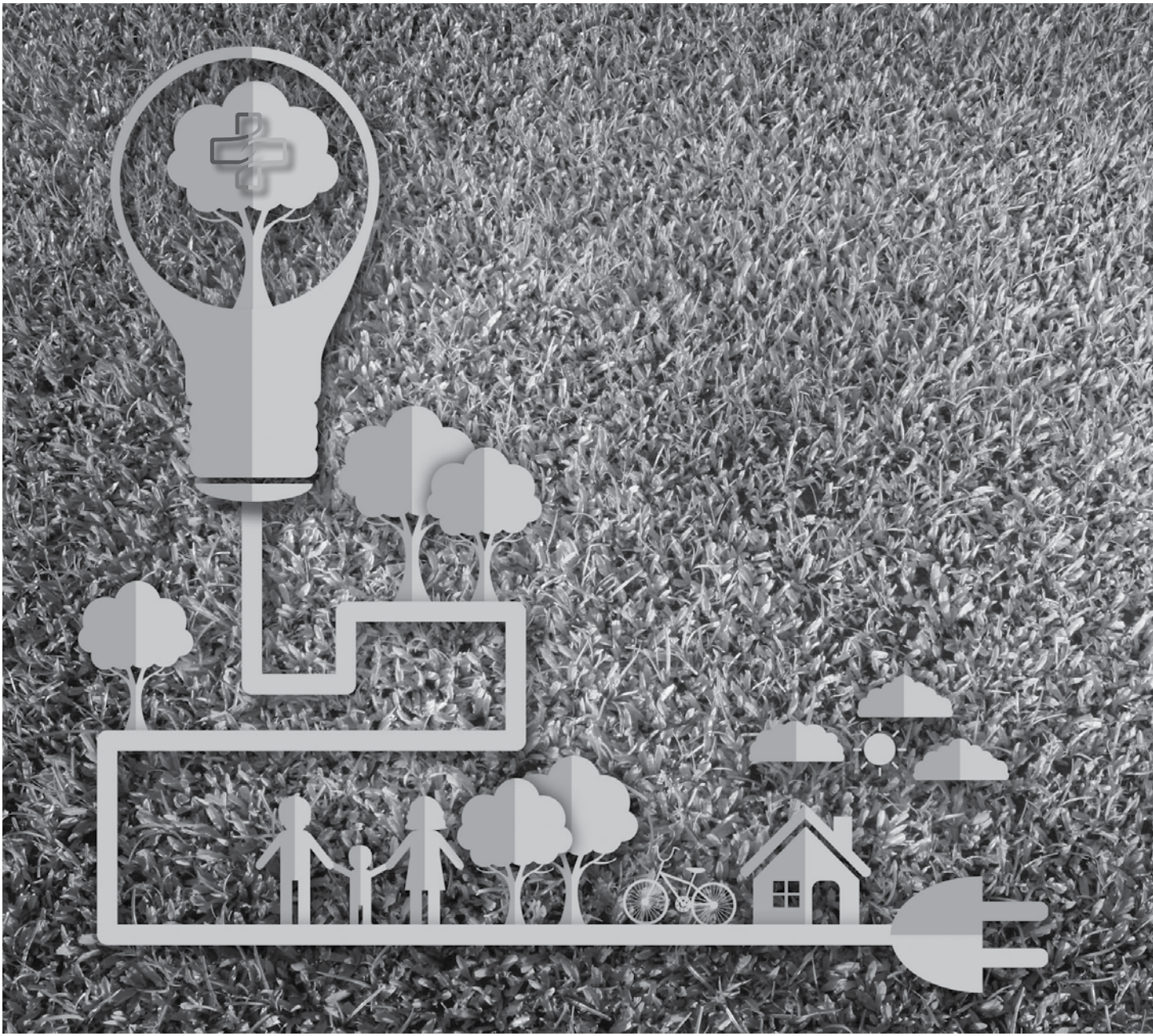


Chart 20: Amount of greenhouse gas emissions of Phimai Hospital's activities in 2010-2014.

The data shows the amount of greenhouse gases emission of Phimai Hospital is fluctuated. However, it tend to increased from 1,007.7 tons CO_2e/year in 2010 to 1,541.51 tons CO_2e/year in 2014, mostly from energy activity. The factors of the amount are various including the amount of patients, services and the expansion of the hospital. Nonetheless, the hospital will carry on GREEN activities in order to be a model for people and patients.

Table 25: Amount of greenhouse gas emissions from each GREEN activity of Phimai Hospital in 2010-2014.

Activities	Amount of Greenhouse Gas (CO_2e) Emissions (Ton/Year)				
	2010	2011	2012	2013	2014
Garbage	34.26	41.88	47.45	61.75	62.42
Restroom	0	0	0	0	0
Energy	625.50	818.42	1,086.33	1,011.89	1,130.75
Environment	0.54	0.57	0.76	0.80	0.94
Nutrition	0	0	0	0	0
Service	347.40	347.40	347.40	347.40	347.40



CHAPTER III

Summary and Next Steps of GREEN & CLEAN Hospital Project in Thailand

Summary and Next Steps of GREEN and CLEAN Hospital Project in Thailand

From the implementation of GREEN and CLEAN hospital project since 2010-2015 or 5 years, there are 4,176 participants divided into 816 hospitals and 3,364 Tambol Health Promoting Hospitals. The results of the implementation find that the important factors that drive GREEN and CLEAN model hospital to succeed are;

1. **Leader:**
Many hospitals start implementing the project and become project models because the leaders and personnel are aware of the impacts of global warming. Therefore, it leads to policy release, determination and support in global reduction.

2. **Teamwork:**
The implementation could not be success by individual. Thus, the teams that understand and value the important of the implantation could drive and expand the project to other sectors and communities.

3. **Awareness:**
Raising awareness by sharing information through information boards, wired broadcasting, meetings or being model interests personnel to join the projects, which leads to sustainable implementations.

4. **Motivation:**
Besides clear policies and roadmaps, motivational activities such as rewarding could motivate people to join the project.

5. **Integration:**

Integrating work and project activities to eliminate personnel's feeling of having extra work to do.

6. **Networking:**

By sharing information and building understand for networks and patients. Patients and visitors could learn about global warming reduction through personnel practices as well as information boards and wired broadcasting. Thus, they could practice the activities in the hospital, communities and their houses.

7. **Evaluation:**

Following up and evaluating project results help analyzing problems, finding solutions and planning improvement plans

Next steps

1. Promoting the project in health service centers especially Tambol Health Promoting Hospitals in order to expand the implementation to cover all area
2. Extending GREEN activities to be GREEN Plus by adding more activities which are chemical management, mercury disposal and other services that would help reducing greenhouse gases and friendly to environment
3. Running innovation contests. Since the project has been implemented for many years, the combination of knowledge and creativity is necessary in order to increase potential of GREEN and CLEAN implementation of the healthcare facilities. The contest has been run once in 2015.
4. Expanding to community around healthcare facilities as GREEN and CLEAN Community by encouraging community to implement GREEN activities and have healthcare facilities as a model. For example, sorting waste in community and grow local and organic vegetable.

# of GREEN and CLEAN

Hospital Practice in Thailand


REUSE
REDUCE
RECYCLE


Appendix

The qualification of **"GREEN and CLEAN Hospital"** model

1. Health service center that implements all GREEN activities and follows CLEAN principle

2. Health service center that collects carbon footprint by Carbon Footprint Program of the Department of Health (has collected at least 2 fiscal years in order to plan future implementation)

3. Healthcare facilities that is able to be a leaning place

4. Healthcare facilities that has conclusion for sharing (3-4 pages of A4 paper with pictures) with following topics
   - Name, address, phone number and e-mail
   - Motivation of implementation
   - Strategy/progress
   - Carbon Footprint data
   - Results of the implementation and make plans from the results
   - Suggestion of future implementation

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