PMAC 2023

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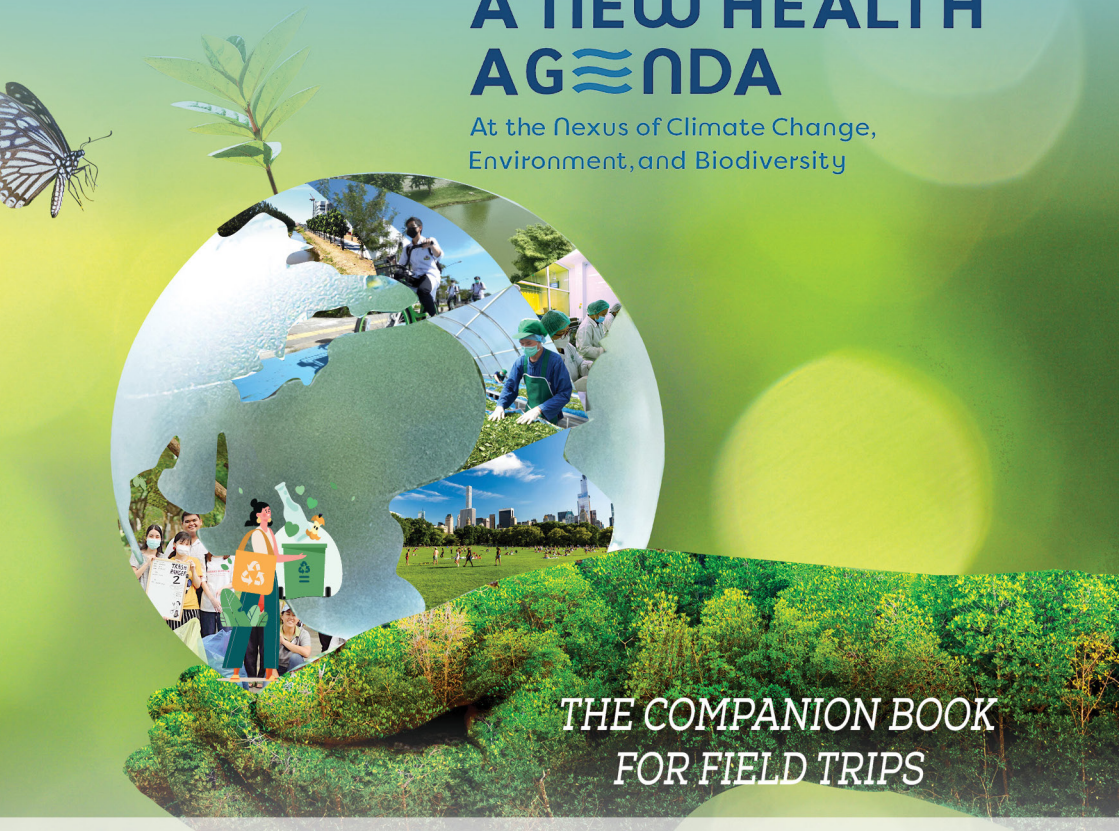
SETTING A NEW HEALTH AGENDA

At the Nexus of Climate Change, Environment, and Biodiversity



THE COMPANION BOOK FOR FIELD TRIPS

PRINCE MAHIDOL AWARD CONFERENCE 2023

PMAC 2023 | **SETTING A NEW HEALTH AGENDA**
At the Nexus of Climate Change, Environment, and Biodiversity

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PMAC 2023

Setting a New Health Agenda:
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PMAC 2023 | Setting a New Health Agenda: At the Nexus of Climate Change, Environment, and Biodiversity

The companion book for field trips in PMAC 2023

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Preface

The nexus of climate change, environment, biodiversity, and health

The National Health Security Office

Our health is closely linked to the environment we live in. However, our climate is changing, with significant consequences for our health, well-being and safety.

What is the Climate Change?

The United Nations gave a definition of climate change as it a long-term shift in temperatures and weather patterns. It was driven by nature but since 1800's. It has been human activities that became a main driven of the changes [1].

The climate change has been discussed broadly at national and international level. It is significantly consequence and related to human health, well-being, and life safety. Without interventions, the changing climate will have far-reaching and catastrophic consequences for our state, the country, and the rest of the world.

Many climate change solutions can deliver economic benefits while improving our lives and protecting the environment. It also have global frameworks and agreements to guide progress,

such as the Sustainable Development Goals, the UN Framework Convention on Climate Change and the Paris Agreement. It is an essential and urgent issue with implications at the global, national, community and personal level.

The field trip will show how the experiences and the connections between climate change and human health, the opportunity of soltions to improve and protect climate change in every level.

Site 1 : Nan Sandbox Project: Forest Rehabilitation with Medicinal Plants

Nan Sandbox Project was launched with the ultimate goal of preserving and reforesting Nan pristine headwater forest. Nan River is the longest of the four rivers contributing to Chao Phraya River, the vein of Thailand. This pristine headwater forest originates over 40 percent of the water in Chao Phraya River.

Thus, the impact of those floods and droughts in the past decade, facing by people in the region, could have been lessen with a well-preserved headwater forest. On this account, conservation and rehabilitation of Nan forest is of paramount importance to all of us. Recognizing this, a representative of Thailand's private sector, KASIKORNBANK foundation has been working to come up with a sustainable solution to tackle this problem.

Under the Nan Sandbox Project, a unique partnership between the Thai government, villagers, local leaders, and private sector were formed to work together towards the shared ultimate goal. The project promotes such a long-term development plan which will sustainably build a community that human and forest harmoniously cohabitate together, along with ensuring the

standard of living of people in the Sandbox. In doing so, the project is working on the integration of "Plants to Medicines" knowledge to create a new end-to-end value chain with high enough value to be shared back to Nan villagers. With a sustainable income, Nan villagers will wholeheartedly turn into a major force of Nan pristine headwater forest's guardian.

Site 2: Chulalongkorn University toward Sustainable Society and Green University: Chula Zero Waste Project

The Chula Zero Waste initiative, led by Chulalongkorn University's Environmental Research Institute and the Physical Resources Management Office, is a commitment of the University in being a sustainable university that focuses on tackling the environmental issues and cultivating eco-conscious lifestyles for all members of the university, especially the students.

The program employs a multi-sectoral approach to develop an effective waste management system within the campus and the surrounding communities for all types of waste, both hazardous and non-hazardous, generated in the academic activities, day-to-day operation, and recreation. Putting the Zero-Waste-to-Landfill concept and the 3R golden rules (Reduce-Reuse-Recycle) into action during the first 5-year phase (2017-2021) of the program, a reduction of approximately 40% of waste was resulted, exceeding its original target of 30%. More importantly, the program shows the effectiveness of organizational policy in driving the change of mindset and behavior of the stakeholders in the communities.

Implementation strategies and lessons learned from the Chula Zero Waste initiative will be shared and demonstrated, including the recent 'Partnership program for a more sustainable future'. This partnership model of university, community and private sector for waste segregation, collection and processing provides win-win benefits to the operators and the society, and also contributes to the reduction of environmental impact.

At present, similar activities are being carried out by more than 36 members of the Sustainable University Network of Thailand (SUN Thailand) which was founded in 2016 for learning exchange and policy development in alignment with the United Nations Sustainable Development Goals.

Site 3 : CNMI goes Green :
Chakri Naruebodindra Medical Institute saves not only patients but also the planet, Phli district, Samut Prakarn

Chakri Naruebodindra Medical Institute (CNMI), is a part of Faculty of Medicine Ramathibodi Hospital. Established in 2017, the institute adopted the 4Es concept: Education Reform, Environmentally Friendly, Energy Saving, and Excellent Living and Learning Condition. CNMI is composed mainly of a hospital, a medical school, and a residential area that must cater to thousands of people a day and requires substantial amount of natural resources. To achieve a better and more sustainable operation, an action plan called 'CNMI goes Green' has been initiated.

CNMI goes Green comprises of 6 actions i.e., Increasing and improving green areas; energy saving and utilizing alternative energy sources; recycling wastewater; managing waste; promoting eco-friendly transportation; and empowering staffs and students. Having been initiated since 2019, a number of projects have given fruitful results. CNMI solar rooftop produces approximately 3 MWh electricity since its first month. Institution-wide energy saving and waste management campaigns have reduced approximately 464 tons CO_2 equivalent in 2022. CNMI x Anywheel, proposed to increase bicycle use in the institute. More than 200 bicycles were provided for all staffs and students. The scheme is expected to augment zero-carbon internal transportation and also health promotion for all CNMI personnel. An upcoming project which will be launched in early 2023 is to recycling wastewater by filtration and ozonation to use in cooling towers. The project is expected to be a novel prototype for water resource conservation.

Apart from these strategic projects, many policies, e.g., single-use plastic prohibition and energy saving are also applied to create a sense of responsibility. Moreover, activities from the CNMI personnel are collaterally encouraged. Aiming to cultivate the green perspectives, campaigns such as You sort-We serve (plastic sorting) or World Environment Day exhibition are willingly supported by the executives.

This site visit will present the accomplishment of CNMI to operate in an environmentally safe and sustainable way. Green projects will be demonstrated. The participants will also gain and understanding of the importance of green policy as well as the importance of collaboration from the personnel to promote a green environment.

References

1. United Nations. “What Is Climate Change?” United Nations, United Nations, 2020, www.un.org/en/climatechange/what-is-climate-change

1

Nan Sandbox Project: Forest Rehabilitation with Medicinal Plants

Nan Sandbox Project: Forest Rehabilitation with Medicinal Plants

Sukjai Charoensuk
Yupawan Thongtanunam
Panarut Wisawatapnimit

Nan a land of river source

Introduction

Nan is one of nine provinces in the northern part of Thailand. The area of the province consists mainly of mountains and highlands. About 85% of the land area in Nan is conserved forest divided into seven national parks and 17 national reserved forests.[1] Because of the rich forests, eight river tributaries originate in the area and eventually join to form the Nan River. The Nan River is the longest

and largest headwater of the Chao Phraya River. The Nan River has a length of 740 kilometers and contains over 45% of the water flowing into the Chao Phraya River which is the main water artery of Thailand. This agricultural fertility system of the Nan and Chao Phraya Rivers has been a vital heritage asset of Thailand for centuries. However, everything is in flux. For example, the abundance of forests in Nan has been significantly reduced by the logging activities of the local people in their quest to earn a living. The people in Nan are not large in number, but they are varied in background. The population is approximately 478,227 in number and of many different ethnicities. Most of Nan's population are farmers. Although most people in Nan earn their living mainly from agriculture, the income from agriculture accounts for only about 14% of the total income of the province.[1] This low income is caused by the cultivation of low cash value crops, such as stock-feed corns and upland rice. Most local people, especially the hill tribes, do not actually own the land they cultivate on. They live in an area of reserved forests, and invade the forests for growing their crops. This is their traditional way of life and it has been passed on from generation to generation. "We do cut down the trees in order to prepare the land for growing our crops, and then we need to burn them…it is our way of life", said Supada Jaiping, a public health personnel who is an ethnic Lahu.

This burning of the trees is a critical and controversial issue in the process of building a community whereby humans and forest can cohabitate harmoniously.

Bald mountains due to deforestation in Nan

Supada Jaiping, a public health personnel of Ban Nam Chun health center whose ethnicity is Lahu

Life of Highland Villagers

Nan province has an area of more than 7 million rai, of which about 6 million rai has historically been reserved for forests. In the year 2022, however it was found that the forest reserve area had decreased dramatically to only 6.43 million rai, a reduction of about 1.87 million rai. This 1.87 million rai is the area that has been invaded by the villagers and used for agriculture.[2] Nan's villagers are predominantly highlanders including Tai Lue, Tai Puan, Tai Yuan, Hmong, Mien, Khmu, Mlabri, and Lahu.[1] Each tribe upholds its own traditions, wears a distinctive style of dress, and speaks their own language. Supada Jaiping, a public health personnel of Ban Nam Chun health center, whose ethnicity is Lahu, mentioned that these villagers mainly cultivate rice and vegetables for their own consumption rather than for market. Their planting season starts every year in April and nowadays there is no further forest encroachment. It is now a reserve area for the villagers to grow rice for home consumption which the government has set aside for villager's use when the area was declared a reserved forest. Neighbors know who has rights to cultivate which areas, there is no quarreling, and individuals can temporarily borrow existing land for farming.

Elderly tribe villagers

Farming by Nan's tribes

Most of the farmers are elderly. The younger villagers, who tend to not become farmers, enter the workforce as industrial workers, and tend to move to big cities where large companies are more numerous. There is currently no industry in Nan province that can utilize the skills of the new educated generation. Hence, Nan's older villagers still have to do farming within the reserved forest area.

The overlap of reservations and local traditions has become a problem that now requires our immediate attention because the conflicts between government officials and villagers can no longer be ignored. The governor of Nan, Mr. Viboon Waewbundit, recalled to our attention that "the villagers have lived in these areas for millennia, long before the declaration of reserved forest and that these people do have legitimate claims and grievances. He suggested that "the best way to deal with this problem is to communicate with the villagers to create an awareness of the importance of forest rehabilitation and to encourage them to create sustainable forest use in general."

Mr. Viboon Waewbundit, Governor of Nan

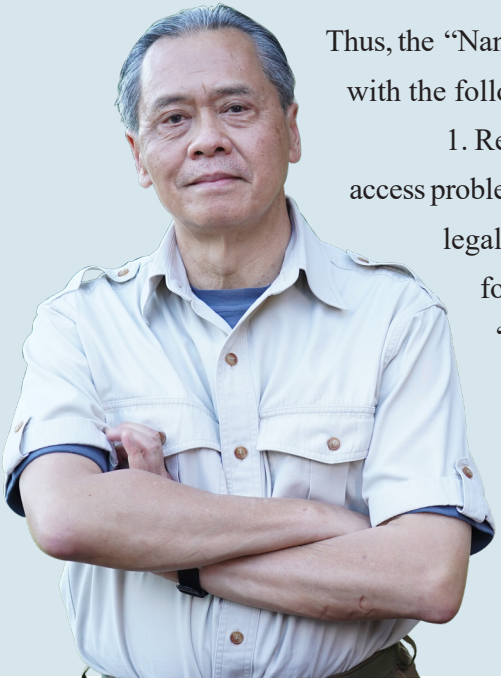
Nan Sandbox Project: Initiative for Forest Rehabilitation

In fact, a movement of laypeople in the area, such as monks and villagers, have come together to share experiences and do forest preservation activities since 1990 called the Hug - Muang Nan Foundation (Love Nan Foundation). They applied the belief of local people as their strategy to stop cutting the trees by making a symbol of inhibition to cut the trees called "ordained trees" or "Boad Pa" in Thai.[3] The villagers all knows that the trees encircled with the yellow robe ribbon cannot be cut. Later, the Rak Pa Nan (Care for Nan Forest) Project that was officially started in 2014 with the ultimate goal of preserving and restoring the forest resources of Nan province by getting all sectors in the area to realize the importance of forest preservation and cooperate in the preservation of watershed forests especially the Nan River. The project has had some success in reducing encroachment in forest reserves. However, the economies of these areas still need to be addressed for the sustainability of forest preservation.

"Ordained trees" or "Boad Pa" in Thai

Nan Sandbox is a project in which the Nan people, government and private sectors work together to find solutions for deforestation and climate change problems in Nan province. These solutions will focus on creating long term agricultural careers that can coexist with the forest for sustainable household income of the locals.

Mr. Banthoon Lamsam, Chairman Emeritus of KASIKORN-BANK PCL has been granted unprecedented permission from the Thai government to tackle the issues as a private citizen stated that "as a part of private sector, I believe that it is possible to create a sustainable agricultural industry that coexist with the forest rehabilitation."



Thus, the "Nan Sandbox" project is proposed with the following three objectives:

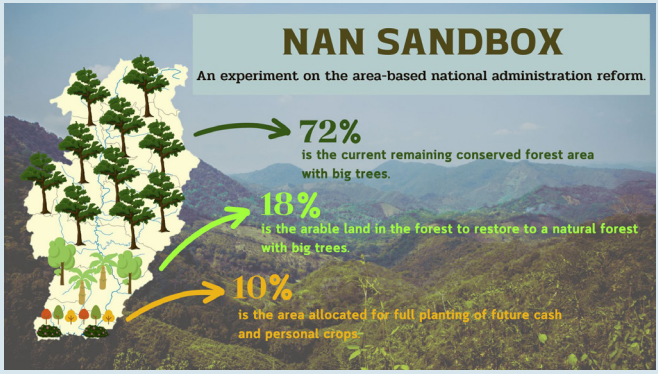
1. Resolve the existing land-forest access problems so that Nan people can live legally coexist within the reserved forest areas and return current "denuded" land areas to a natural forest state.

Mr. Banthoon Lamsam, Chairman Emeritus of KASIKORNBANK PCL

2. Raise and provide funding to support the “adjustment” of existing agricultural production systems and to support personal/ family livelihoods during the transition period.

3. Change the current monoculture system of production so that it is more environmentally friendly, produces enough income to elevate the quality of life sufficiency to encourage conservation of Thai forests and raises the awareness of the importance of the Chao Phraya River’s watershed and its value to Nan province in particular and Thailand in general.

4. Restore forest by engagement from all related sectors. The formula used to develop the area in Nan province is 72-18-10, 72% are the remaining original forest that need to maintain. Eighteen percent will be reforested with trees with government support. Under these trees, locals can grow new crops for earned income. Ten percent will be fully dedicated to new strategic crops that are economically and environmentally viable to the area (but still within a legally reserved forest).[2]



Nan Sandbox Formula

The “Nan Sandbox” will focus on encouraging locals to find new ways to alter their current monoculture with the goal of the cultivation of valuable alternative cash crops that can coexist with watershed forests to generate higher household income. This model takes up less space, is more environmentally friendly and can sustainably improve wealth and the environment. The “Nan Sandbox” project will encourage villagers to grow medicinal plants. In addition, there are many medicinal plants grown and used by the Nan villagers that can be grown and used as raw material for new “home” industries.

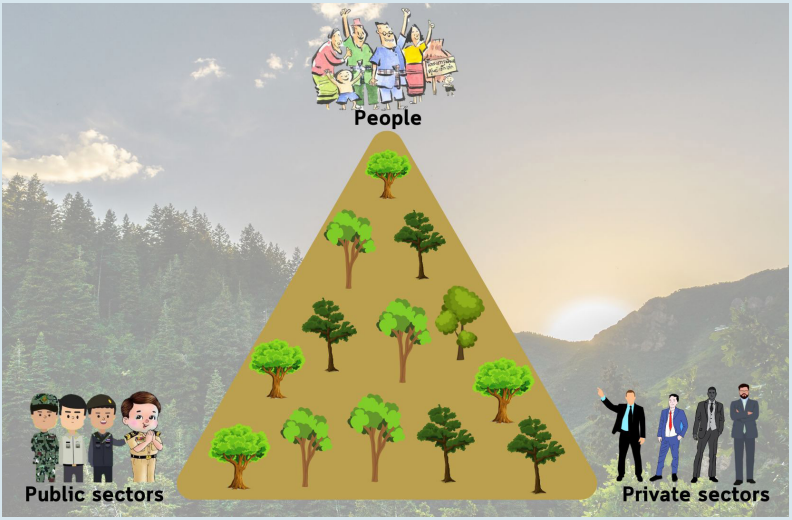
This initiative will help minimize the use of land and forests exploitation while maximizing the incomes for the locals, benefiting not only farmers but also consumers. They will enjoy high-quality organic medicinal plants without worrying about chemical contamination. This ‘medicinal plant local wisdom’ has also created a large ‘library’ of traditional medical knowledge that the current ‘tribal doctors’ have inherited from their ancestors. Today, the role of these medicinal plants and their “pharmacology” used in the primary health care of the villagers is being promoted and investigated. The advantages of this approach are available locally, inexpensive, safe and in almost limitless quantities.

In addition, the Nan Sandbox project has continually launched campaigns to raise public awareness about climate change, especially

positive changes that accrue immediate benefits to the public such as not burning down the forest. The traditional approach of the public sector, criminal prosecution of those who disobey the laws cannot stop deforestation.[4] Thus, new approaches that the government can use to deal with the encroachment problem has been recommended by Mr. Banthoon Lamsam as following : (1) the public sector needs to thoroughly study and understand the current situation and the principal causes of the conflict; (2) the public sector has to change its' way of operating because the conventional bureaucratic approach no longer works; and (3) the learning capacity of all relevant parties needs to be enhanced to increase productivity and maximize production in the limited land areas available without encroaching in more reserved forest areas.

Under the Nan Sandbox Project, a unique partnership was formed between the Thai government, villagers, local leaders, and the private sector to work together towards the shared ultimate goal. The project promotes such a long-term development plan which will sustainably build a community that human and forest harmoniously cohabitate, along with ensuring the standard of living of people in the Sandbox. In doing so, the project is working on the integration of "Plants to Medicines" knowledge to create a new

end-to-end value chain with high enough value to be shared back to Nan villagers. With a sustainable income, Nan villagers will wholeheartedly turn into a major force of Nan pristine headwater forest's guardian.



A Unique partnership of 3Ps

K Agro-innovate Institute (KAI) under the Kasikornthai Foundation is a main private partner of the Nan sandbox project. K Agro-innovate Institute (KAI) has supported Nan Sandbox in, (1) drawing relevant agencies from both the public and private sectors to study the problem and find solutions in a win-win cooperation, that is, all parties will benefit from each other,

(2) gathering knowledge from all sciences to improve the current farming methods for higher NAPI (Natural Active Pharmaceuticals Ingredient) yield and lower the cost.

In addition, the Kasikornthai Foundation has an MOU of academic cooperation with Rajamangala University of Technology Lanna in establishing a Pharma-Agroforestry District (PAD) located in Rajamangala University of Technology Lanna, Nan Province which will be a center of excellence upstream and midstream of a new value chain for medicinal plants to transfer knowledge and good practices to communities and students. Although the public and private sectors are cooperating and dedicated to the end goal to improve forest preservation, this goal cannot be accomplished without the cooperation of the local people.

Establishing a Pharma-Agro-forestry District (PAD) at Rajamangala University of Technology Lanna, Nan Province

Ban Nam Kian: A Bio-Lifestyle Community

Ban Nam Kian is a small sub-district, consisting of five villages located in Phupaeng district, Nan province. The geographical area is highland and close to reserved forests. People in Ban Nam

Kian mainly grow ‘field crops’ for cash. “The villagers are poor farmers who grow monoculture and have very little income after harvesting their crop”, said by Mr. Chusin Sanratana, President of Ban Nam Kian Community Enterprise.

Led by Mr. Chusin Sanrattana, chief executive of Ban Nam Kian sub-district administrative organization, 79 villagers worked together to set up Ban Nam Kian Community Enterprise in 2006. The main goal of this community enterprise is to “increase income, increase living standards and reduce expenses”. The first project was to produce a multi-purpose cleaning liquid from local herbs using their collective knowledge about these locally grown plants.

Mr. Chusin Sanratana, President of Ban Nam Kian Community Enterprise

Ginger, bergamot, butterfly pea flower, and Bai-Mee are common locally grown herbs in the community. Since these plants are native and wild, their cost is virtually zero. With a tank and a spatula, participants in this community enterprise have used their local knowledge to produce commercial products such as shampoo and hair conditioner. Fortunately, the community has been supported by the government to develop their products under the OTOP (One Tambon One Product; Tambon is a sub-district.) project in 2010 so they are able to use modern technologies to produce high quality products. They are able to extract the essential oils of their local herbs, such as "Bai-Mee or *Litsea glutinosa* (Lour.) C.B.Robinson" which are necessary for the production of their signature shampoos and hair conditioners. These shampoos and conditioners received a national award from the Department of Thai Traditional and Alternative Medicine, the Ministry of Public Health in 2020. From OTOP to a small factory, the Ban Nam Kian Community Enterprise is growing in term of quantity and quality.

Bai-Mee or Litsea glutinosa (LOUR,) C.B.Robinson. tree

The number of members of the community enterprise has increased from 79 (2006) to 753 (2022), and the capital requirements have risen from sixty thousand baht at the beginning to several millions today. In terms of quality, the products of Ban Nam Kian Community Enterprise are all natural based and the process of production is certified by ASEAN Cosmetic Good Manufacturing Practice (GMP) standard. The community enterprise has received many awards at the national level, such as the Thailand Top SME Awards 2019 and the Best SME Tourism 2017.

The process of production that certified by ASEAN cosmetic GMP standard

The success of the Ban Nam Kian Community Enterprise comes from the degree of commitment and engagement of the community and the leadership and transparency of management. "The business" of Ban Nam Kian Community Enterprise does not belong to any one person, it belongs to the community, statement of Ms.Sirinan Sanmonthee, Manager of Ban Nam Kian Community Enterprise.

Ms. Sirinan Sanmonthee, Manager of Ban Nam Kian Community Enterprise

Any person in Ban Nam Kian community can apply to be a member of the enterprise. An application fee is charged ranging from one hundred baht (about 3 US$) to five thousand baht (about 143 US$). The members will gain a benefit from dividends, paid

from profits. They can also buy the community enterprise products at a special discount price. The people who do not apply to be members also accrue benefit by growing local herbs and selling them to the community enterprise. The profit from running the business will be divided into three parts, which are (1) 50 percent of the profit will be set aside as capital for expanding the business, (2) a return to the members as dividends per share, and (3) return to the community development at large as investments in various projects, such as school donations and health promoting hospital development projects.

Thai traditional medicine service of Nam Kian Sub-District Health Promoting Hospital

The success of the Ban Nam Kian Community Enterprise is an example of people living in harmony with the forest. “About 40-50 years ago, people lived in the forest and knew nothing about “conservation”…they earned their living by being a farmer or a lumberman…they were poor and only knew their traditional way of life…when the government sector changed its strategy from arresting people to teaching them the importance of the forest… when we established the community enterprises so that people now have extra income so they can reduce their dependence on growing field crops…deforestation was also reduced”, stated Mr. Chusin Sanratana, President of Ban Nam Kian Community Enterprise. People in Nam Kian sub-district received information and support from several sectors both public and private which enables them to be able to rely on themselves in a sustainable bio-lifestyle.

Challenges and Way Forward

A major ongoing goal of the Nan Sandbox project is to apply knowledge from all sciences to change the way farmers grow food. Even though there are alternative crops that can generate income and are in demand in the food and processing industries, (such as coffee, cocoa, or mushrooms etc.), the key is to study all of the environmental factors that determine which crops are best suited for cultivation in the local community. Some of these strategies are (1) introducing modern agricultural technology to

local agriculture conditions, (2) developing strategic planning such as “how to create a brand”, “who to sell to” and “how much to sell”, (3) creating an information bank on how to maintain and restore a modern forest, and (4) creating an educational program on “how to grow in a reserve forest”, etc.

The sustainable deforestation deterrent trends of the future will require the development of agriculture techniques which include promoting the development of agriculture paradigms that are friendly to the environment, have high crop yields and high economic returns. The use of modern technologies will be promoted in production, processing, and online marketing. These technologies will also focus on the most current agricultural processes relative to organic and safe high-value crops, agricultural products for health, medicinal plants, crops native to Thailand and tourism agriculture. However, the harmonious coexistence of humans and forests is not only required in Nan province, but also in many other countries around the world.

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5. Mr. Chusin Sanratana, President of Ban Nam Kian Community Enterprise
6. Ms. Sirinan Sanmonthee, Manager of Ban Nam Kian Community Enterprise
7. Ms. Supada Jaiping, a Public Health Personnel of Ban Nam-Chun Health Center
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References

1. Nan Province Office [Internet]. Nan: Office; 2564 [cited 2022 Dec 1]. Available from http://www.nan.go.th/about-detail/1418/.
2. Rakpanan [Internet]. Bangkok; Rakpanan; 2022. The 5th Academic Seminar "Rakpanan" 2022; [cited 2022 Dec 1]. Available from https://www.rakpanan.org/seminar/Pages/seminar-2565.aspx
3. Rakpanan [Internet]. Bangkok; Rakpanan; 2022.Hug Muang Nan Foundation; [cited 2022 Dec 1]. Available from https://www.rakpanan.org/Initiative/organization/Pages/Page1.aspx
4. Agarwal, S. Sairorkham, B. Sakitram, P. & Lambin, EF. (2022) Effectiveness of community forests for forest conservation in Nan province, Thailand, Journal of Land Use Science [Internet. 2022 Dec 10]; 17:1, 307-323. Available from: https://www.tandfonline.com/doi/full/10.1080/1747423X.2022.2078438.

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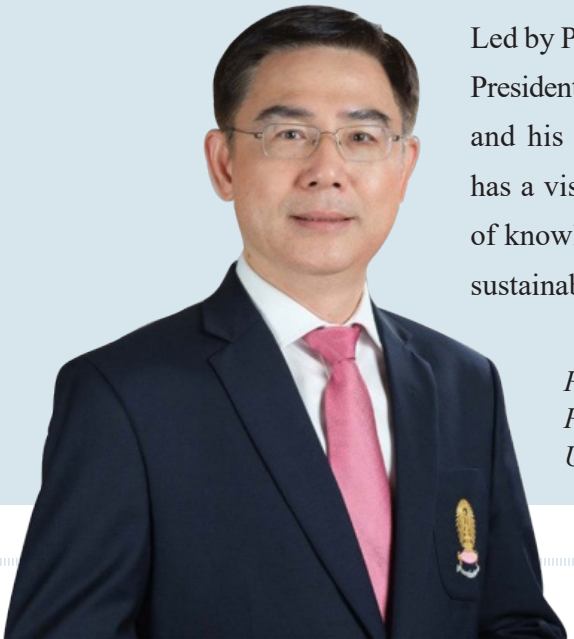
Chulalongkorn University toward Sustainable Society and Green University: Chula Zero Waste Project

Chulalongkorn University toward Sustainable Society and Green University: Chula Zero Waste Project

Panarut Wisawatapnimit
Yupaporn Tirapaiwong

Chulalongkorn University at a glance

Chulalongkorn University, known as Chula for short, is a leading university in Thailand located in central Bangkok. It has been established for 105 years and has continuously developed as the philosophy of the university is to be the academic and social development pillars of Thailand. There are 20 faculties, 23 colleges and research institutes, 8,138 faculty members, and about 37,626 students in all degree programs.[1]



Led by Prof. Dr. Bundhit Eua-arporn, President of Chulalongkorn University, and his administrative team, Chula has a vision to be "a leading creator of knowledge and innovation for the sustainable development of society".[1]

Prof. Dr. Bundhit Eua-arporn, President of Chulalongkorn University

Chula strategies focus on preparing future leaders, developing impactful research and innovation, and advocating social sustainability. Prof. Dr. Narin Hiransuthikul, Vice President for Strategic Monitoring and Assessment, Planning, Budgeting and Well-being, Chulalongkorn University stated that *"Chula vision and strategies focus on sustainability. Chula has an awareness of how to use and preserve valuable resources for the new generation and pay close attention to the environment, so we ensure to produce Chula graduates who have competencies as a nation and global citizens"*.

Prof. Dr. Narin Hiransuthikul, Vice President of Chulalongkorn University

Because the vision of sustainability of Chula is in line with the United Nation's Sustainable Development Goals (SDGs), Chula has incorporated SDGs in the university policies. Chula Zero Waste is one of the strategic projects of Green University policies that are relevant to SDG goals. It proves that Chula has an action

plan to cultivate the personnel and students to "think globally, act locally". With the strategies to move forward social accountability and sustainability of Chula's personnel and students in the Global Agenda, Chula is recognized by the Times Higher Education (THE) Impact Rankings as the number one university in Thailand for three consecutive years and the World Top 16 with the greatest global impact for society on 27 April 2022.[1]

Chula Zero Waste project: A turning point toward zero waste

"In 2017, I watched the news of a sea turtle being injured because .a plastic straw was lodged in his nasal cavity. When rescuers pulled out the plastic straw, a stream of blood ran from the turtle's nostril. This incident frightened me how much a straw could injure turtles. I started thinking about the impact I imposed on the environment and ways to reduce it. At that time, I had heard about Dr. Sujitra Vassanadumrongdee's research on improving the waste

Ms. Pawitra Chamnanrot,
Environmental Program
Coordinator of Chula
Zero Waste

management system in Thailand and her great endeavor to implement waste reduction and segregation policy in the university to set an example for the society. She gave me insightful information to work on my senior project 'Mission Bin Possible' exhibition, an experimental fun interactive space for youth to learn about waste management. It truly was the starting point of my determination to tackle waste pollution and contribute to environmental education in Thailand. To continue my passion, after graduation, I applied for a position to work with the Chula Zero Waste team and have worked with them for three years now."
Ms. Pawitra Chamnanrot, Environmental Program Coordinator of Chula Zero Waste, informed how she was inspired by the project since she was in her fourth year of studying exhibition design at the Faculty of Fine and Applied Arts, Chula. She is an example of students and staff who have been cultivated to take account in preserving the environment and social accountability through the Chula Zero Waste project as part of Green University policy.

Waste and waste management: Challenges of big city and metropolitan

Waste and waste management have been a major problem in Thailand and other capitals around the world, including Bangkok. Waste pollution has affected the environment and health of people as well as the economy of the country. Based on data from the Pollution Control Department, Ministry of Natural Resources

and Environment, the amount of solid waste generated is 24.98 million tons in 2021.[2] Although the total amount of solid waste in Thailand from 2017 to 2021 tends to decrease,[2] as shown in Figure 1, those in 2020 – 2021 may be affected by COVID-19 situation that has limited activities of people. The trend of the amount of solid waste according to COVID-19 should be taken into account. However, there are still improper disposal of waste, such as piling waste on the land, using incinerators without air pollution treatment system, and burning waste outdoors, which need proper management.

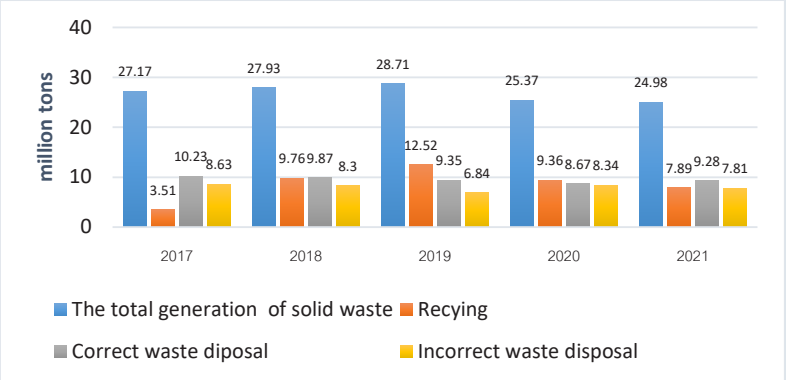


Figure 1 The trend of the amount of solid waste and waste management between 2017 – 2021 in Thailand[2]

Bangkok metropolitan is the city with the largest waste generation in Thailand, generating 20% of the total waste in the country. People in Bangkok generate more than 10,000 tons of waste daily,[2] as shown in Figure 2. Currently, Bangkok is faced with overflowing

waste and inadequate waste disposal management. Most of the waste in Bangkok is disposed of in landfills. Although Bangkok aims to build more than four waste incinerators, they can only dispose of waste by only 4,000 tons per day. The main challenge is the residual waste which is difficult to collect, transport, sort, and dispose of all wastes in landfills. Therefore, the effective strategies of Bangkok should focus on collaboration with all sectors to solve this issue, and on waste reduction.

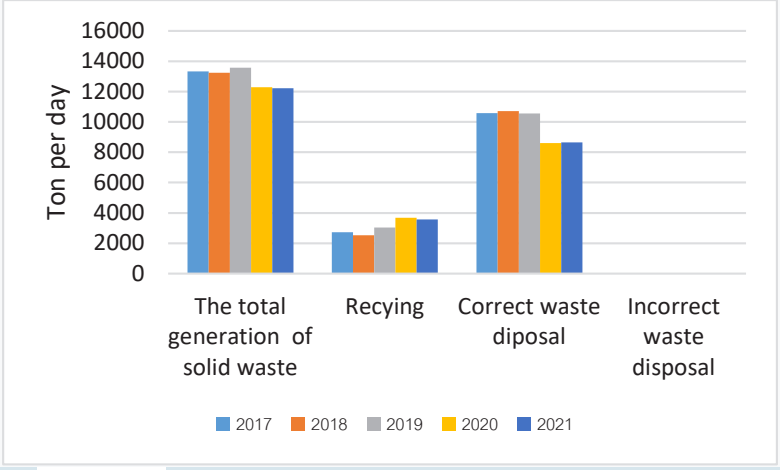


Figure 2 The trend of the amount of solid waste and waste management between 2017 – 2021 in Bangkok[2]

The Chula Zero Waste initiative: Social innovation for social sustainability

To address waste management issues, Thailand endorsed the 1st National Solid Waste Management Master Plan 2016 – 2021. Bangkok has also formulated a 20-year strategic plan (2013-2032) in which Bangkok proposed a vision of "the safe and pollution-free city". A concept of zero waste management using a comprehensive model and management of solid waste is developed to tackle waste in urban areas. In 2016 - 2017, although waste management was placed on a national agenda, the implementation was still limited and there was still no university dedicated to manage waste.[3]

Dr. Sujitra Vassanadumrongdee, a researcher at the Environmental Research Institute, Chula, and an initiator of Chula Zero Waste project stated *"It has been stuck in my mind for a long time why our country cannot manage waste. We need to change behaviors through waste separation as a social norm for Thai people"*.

Dr. Sujitra Vassanadumrongdee, Researcher at the Environmental Research Institute, Chulalongkorn University

In 2017, the Environmental Development Committee of Chula had planned to propose an electronic and hazardous waste management plan to the university. Because of the news of the fire at the waste landfill at Phrae krasa in Samut Prakan province and the unsuccessful national achievement of waste segregation and recycling target at 30 percent. Awareness of Chula is one of the major sources of waste in Bangkok because Chula has about 45,000 employees and students. The 5-year Sustainable Solid Waste and Hazardous Waste Management Plan (2017-2021)[3] or Chula Zero Waste was endorsed by the Chula President. This action plan has been in line with the sustainability vision of the university and the university's roles and responsibilities determined in the national agenda on waste management.

Chula Zero Waste initiative project, aiming to reduce the amount of waste on campus to zero to landfills, has been organized with collaboration between the Environmental Research Institute and Physical Resources Management Office, Chula. The main purposes of the project are to develop a system model for solid and hazardous waste management in urban areas, create values of "Zero Waste", raise awareness of Chula community (faculties, staff, and students) in waste reduction, segregate, and become a model in waste management for community and society.[3]

Comprehensive waste management of Chula Zero Waste: Matching Chula mission and urban lifestyle of the new generation

"For Chula Zero Waste, we had systematic planning. It means that we need not only reduce waste but also change the behaviors of people in Chula sustainably", Dr. Sujitra Vassanadumrongdee explained. The Chula Zero Waste project has applied waste hierarchy and 3Rs concepts for waste management, including reduce, reuse, and recycle.[4] These strategies are actively implemented in all waste streams in Chula from upstream (its source) to midstream (waste journey) and downstream (final disposal), as shown in Figure 3.

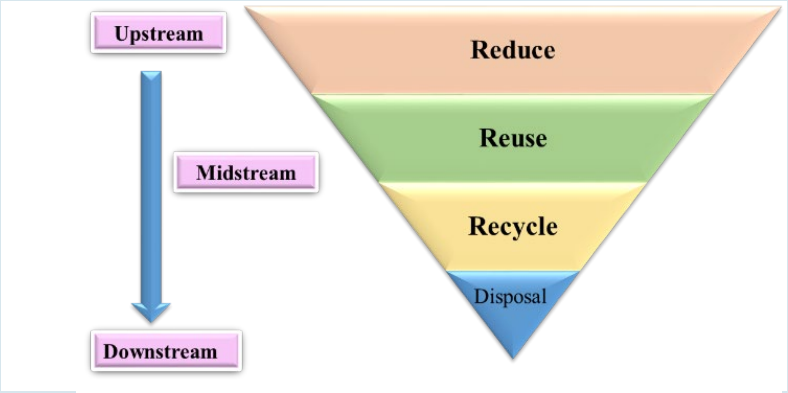


Figure 3 Waste hierarchy and 3Rs concept

This project has six work plans: 1) working mechanism, policy, and baseline data, 2) waste prevention at source, 3) waste segregation at source, 4) waste collection on the campus, 5) organic waste treatment, and 6) education and curriculum on sustainable waste management.[3]

Work plan 1: Working mechanism, policy, and baseline data.

Chula set regulations and policies and enforcement to support Chula Zero Waste. Since 2018, a reduction measure policy for single-use plastic waste has been applied.[5] The free plastic bags in all canteens and stores in the campus have been replaced with an economic scheme in order to reduce the urge for new plastic bags every time we buy stuff. Ms. Pawitra Chamnanrot, stated *"Buyers need to pay two baht for a reusable bag. This strategy is quite a success because people do not want to pay for plastic bags. We found that the number of cloth bag users has also increased."* The single-use plastic cup has also been banned and replaced with a bioplastic coated paper cup. Customers who use their own reusable cup will get a discount from the sellers in Chula's canteens and stores.

"Pay three baht for Chula Zero Waste cup, you can be sure that it does not damage the environment. However, the best way is to bring you mugs or cups because you do not have to pay for a new cup and do not generate more waste," stated Mr. Korb Limsuwan, Head of the Environmental Management Workgroup, Chulalongkorn University.

Mr. Korb Limsuwan, Head of the Environmental Management Workgroup, Chulalongkorn University

The Chula Zero Waste cup

To promote this measure, Chula Zero Waste project team has developed Chula Zero Waste cups and collaborated with the Center of Excellence on Petrochemical and Materials Technology (PETROMAT), Thailand. This initiative cup is a degradable paper cup within six months.

All foam containers and oxo-degradable plastic that could degrade into microplastic debris contaminating the environment are also banned in the Chula canteens. Single-use plastic spoons, folks, and straws are also given to customers when they request only.[5]

Since 2022, new waste and hazardous waste management policies have been formulated and enforced. There are five categories of waste: Food waste, Recyclables, Non recyclable or R+ or burnable Waste, Hazardous waste, and General wastes.

The campaign to cultivate the mindset of the Chula community to build an organizational culture for effective and eco-friendly waste management is recommended. The integration of all involved units, including research, innovation, and academic units to promote waste management is suggested. Sustainability is the main target of this policy and needs to monitor, evaluate, and report to the university.

Work plan 2: Waste prevention at source.

Waste management at the source includes how to prevent waste generation in the first place. Waste reduction is an effective strategy for waste prevention. “My Bag Project” “My Cup Project”, and “My Bottle Project” were developed, aiming to promote Chula’s personnel and students for using their own reusable bags, such as cloth bags, cups, and bottles to reduce plastic material. The

“Your Cup, We Treat” activity, is a monthly event that aims to motivate students to use their personal cups or containers by receiving special drinks for free. This idea is popular among students and they applied the activities of this project to their events. To promote the “My bottle” project, water dispensers are installed throughout the campus to support the use of personal bottles for filling drinking water for free.

My Bottle Project

My Bag Project

My Cup Project

Work plan 3: Waste Segregation at the source.

Waste segregation is promoted in Chula canteens, footpaths, and offices. *"When we encourage people to reduce waste and separate waste properly, we need to change the waste system so that it is the same throughout the university and at the same be suitable for each place. Some areas have too many garbage bins, so it may be very confusing. The number of garbage bins should therefore be organized according to users in each location, for example, a canteen must have all kinds of garbage. In contrast, the library may need only two kinds of bins."* stated Mr. Korb Limsuwan.

Standardizing trash cans with the different types of waste and labeling them with photos prepares people to dispose of their waste properly. The number of garbage bins must be in appropriate locations and easy to access.

A set of five garbage bins

For example, the canteen next to Chamchuri 4 building has a set of five bins for

1. Zero-waste cups to be shredded and composted with yard waste or to be used as nursery plant pots;
2. High-value recyclable, such as PET plastic bottles, aluminum cans, glass jars and bottles to be recycled properly;
3. Non-recyclable materials or known as “Recycle Plus or R+” such as plastic film and wrap, plastic scraps and foam products and the like to be treated as energy recovery;
4. Food scrap for farm animal feeds given to livestock;
5. General trash that is the least desirable way as it will be sent to landfills.

To ensure that all people put their waste in the right bins, the canteen’s staff has been trained about the type of waste and the sorting process. The staff will inspect and manage the materials before transporting them to the destination of each type of waste. When there is an event, the waste sorting bins are installed and the project staff called “Green Mentors” will instruct the people how to discard the waste properly. Effective wastese gregation can prolong the material lifespan. To make it easier to find the bins, Chula Zero Waste team also creates electronic maps for waste bins in the campus and advertises on the Chula’s website.

Work plan 4: Waste collection on the campus.

The waste collection stations, collecting routing, and garbage trucks are improved. The solid waste collection points are hygienic and safe.

Work plan 5: Organic waste treatment.

Based on the Chula's policy in 2022,[6] organic or food waste is divided into two types: vegetable and food scraps. The vegetable scraps will be collected and treated in a bio-digester machine. Turning green leaves and vegetable stems into compost. The product will be used to improve soil's physical, chemical and biological properties across the campus's green area. For food scraps in the canteens, farmers will take them to feed livestock and fishes. Also, Chula is open for anyone to utilize waste disposal in the university. These strategies help minimize waste disposal in Bangkok's landfills.

The Bio Digester Center

Work Plan 6: Education and curriculum on sustainable waste management.

Effective waste management at the source system relies on the change in attitude and behavioral patterns. To persuade and educate most students who are in generation Z, attractive strategies are developed. Mass and attractive communication methods, including website, Youtube, Facebook, and campaigns to increase knowledge about waste management and inspire them to be more engaged. Content and learning material on sustainable waste management are developed for children in primary, secondary, and higher education. The “Guidebook for zero waste school: Creating youth to protect the environment” is developed and used in Chulalongkorn University Demonstration Secondary School and other schools. Chula becomes a studying place in waste management for other institutes to learn and share experiences.

Attractive communication methods for waste management

Sustainability outcomes of Chula Zero Waste

The target goals of the Chula Zero Waste projects for the first five years are waste reduction by 30 percent and cultural awareness of the Chula community on waste management. *"These two goals are very challenging for the project. We have evaluated the project results by weighing the waste that Bangkok collects from Chula and the self-behavior survey of the Chula community compared with baseline data before starting the project. After three years, there is a good trend because we can reduce waste by about 20 percent."* stated Dr. Sujitra Vassanadumrongdee.

After five years of continuous and serious implementation since 2017, 81 buildings participate in the Green office project, accounting for 37 percent. There are 102 water dispensers installed in the campus; however, the "My Cup" project stopped its operation after the COVID-19 outbreak. The "My Bag" project can reduce the use of 4,800,000 plastic bags. The overall results for five years of operation found that the amount of waste has reduced by about 593 tons from the waste reduction plan of about 279.2 tons and the waste segregation plan of 304.8 tons. [6] Although the quantitative outputs of the Chula Zero Waste project are still not achieved the sustainable goals; however, the cultural awareness for "Green behaviors" are increasing. This indicates Chula personnel and students' behaviors in carrying personal bags, cups, and bottles, and properly sorting waste. However, the Chula Zero Waste

project is still needed to continue maintaining the behaviors and further developing to engage more people to be able to achieve “a sustainable society”.

Key success factors:

There are three main key success factors for implementing the Chula Zero Waste project: University policy and administrative leadership, collaboration and partnership, and communication strategies.

University policy and leadership of the President and his administrative team is the key success factor because operations of the Chula Zero Waste requires the great vision and budget from the university and enforcement of the policies.

Collaboration and partnership with all involved sectors both inside and outside the Chula community are also crucially important. The sustainable waste management behaviors of Chula personnel and students emerged from the transformation of those people. If the Chula community or sellers do not collaborate, the project cannot operate and the results can not be achieved. Chula does not manage all waste disposal. Collaboration with other sectors is needed. The remaining waste is still sent to be disposed of by Bangkok metropolitan.

The trash ranger event in the campus and neighborhood

Communication strategies and attractive campaigns are also influenced by people's changing behaviors. Therefore, the project's outreach efforts must create a variety of events, exhibits, and electronic media to ensure that all audiences have access to project information and activities.

Challenges

The biggest challenge is to continue to raise people's environmental awareness. It is quite difficult to cultivate "green behaviors" as Chula organizational culture and to transform students to continue these behaviors in their daily lives or to serve as role models for sustainable waste management in society after graduation.

However, the project needs to be continued and developed so that the Chula community takes responsibility for social responsibility and the environment.

The COVID-19 situation had paused many activities of the project and changed people's behaviors to use more single-use plastic and foam containers. Currently, the Chula Zero Waste project team has boosted up the waste management campaign.

Future plan and way forward

The Chula Zero Waste project plans to extend the implementation of waste management in three counties of Bangkok collaborating with the Bangkok governor led by Dr. Sujitra Vassanadumrongdee.

Bangkok governor and the collaborative organizations for waste management

With the strong vision of Chula for a sustainable society, and the production of global citizens and future leaders. Prof. Dr. Narin Hiransuthikul stated, *"Chula will spearhead and advocate the global agenda, including waste management or Chula Zero Waste, climate changes, and carbon neutrality for building a good society and well-being of the new generation."* However, this agenda cannot be implemented by anyone alone. "*Together we can*" stated Ms. Pawitra Chamnanrot and the motto of Chula Zero Waste project will lead to future success.

Acknowledgment

We would like to express our sincere gratitude to Chulalongkorn University, and Chula Zero Waste Project team, especially:

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2. Prof. Dr. Narin Hiransuthikul, Vice President for Strategic Monitoring and Assessment, Planning, Budgeting and Well-being, Chulalongkorn University;
3. Dr. Sujitra Vassanadumrongdee, Researcher at the Environmental Research Institute of Chulalongkorn University;
4. Mr. Korb Limsuwan, Head of Environmental Management Workgroup, Chulalongkorn University;
5. Ms. Navapan Assavasuntakul, Environmental Program Coordinator of Chula Zero Waste Project, Chulalongkorn University;
6. Ms. Pawitra Chamnanrot, Environmental Program Coordinator of Chula Zero Waste Project, Chulalongkorn University.

References

1. Chulalongkorn University. (2023). *Chulalongkorn University*. https://www.chula.ac.th/en/
2. Pollution Control Department, Ministry of Natural Resources and Environment. (2023). *Information on the solid waste situation of the country.* https://thaimsw.pcd.go.th/report1.php?year=2564
3. Environmental Research Institute and Physical Resources Management Office, Chulalongkorn University. (2017). *Report on a model project on solid waste management and hazardous waste in urban areas (Chula Zero Waste)*. https://drive.google.com/file/d/16qchch_aEnFtwuP5e0dsNIIsSQX8OHha/view
4. Chulalongkorn University. (2017). *Chulalongkorn University Announcement on solid and hazardous waste management policy B.E. 2565*. http://www.chulazerowaste.chula.ac.th/wp-content/uploads/2022/12/Chula-waste-policy-2565-1-2.pdf
5. Chulalongkorn University. (2018). *Chulalongkorn University Announcement on reduction measure policy for single-use plastic waste B.E. 2561*. http://www.chulazerowaste.chula.ac.th/wp-content/uploads/2020/01/ประกาศฯ-มาตรการลดขยะพลาสติก

แบบครั้งเดียวทิ้ง-2561-1-2.pdf http://www.chulazerowaste.chula.ac.th/wp-content/uploads/2022/12/Chula-waste-policy-2565-1-2.pdf

6. Environmental Research Institute and Physical Resources Management Office, Chulalongkorn University. (2021). *Report on a model project development on solid waste management and hazardous waste in urban areas: Chula Zero Waste Year 5 (October 2020 – September 2021)*. https://drive.google.com/file/d/14qDKqGH6p5us3nQReQEFJWMzX9vmBFYM/view

3

CNMI Goes Green: Chakri Naruebodindra Medical Institute saves not only patients but also the planet

CNMI Goes Green: Chakri Naruebodindra Medical Institute saves not only patients but also the planet

Dhanesh Pitidhammabhorn
Kamolrat Turner
Wilaiporn Khamwong
Matanee Radabutr
Wiwath Sirimahattano
Nalinee Lohacharoen

CNMI at a glance

Chakri Naruebodindra Medical Institute (CNMI) is part of the Faculty of Medicine Ramathibodi Hospital, Mahidol University. It dates back to a royal address by His Majesty King Bhumibol Adulyadej the Great to establish a large public medical facility to provide comprehensive medical services and education in the Samut Prakan area. In addition, most hospitals in Samut Prakan province are in the private sector, which is unaffordable for low-income people. Therefore, the CNMI was built on 319 rai or 126 acres under the "Ramathibodi Toward Leading Medical School in Asia Project" commemorating King Bhumibol Adulyadej's 7th cycle (84th) birthday anniversary and was opened by Princess Maha Chakri Sirindhorn on December 25, 2017.

Chakri Naruebodindra Medical Institute, Faculty of Medicine
Ramathibodi Hospital, Mahidol University
at Bang Phli District, Samut Prakarn

It is composed of Ramadhibodi Chakri Naruebodindra Hospital, Ramathibodi Medical School, and a residential area of 98.8 acres. The main purpose of establishing Ramadhibodi Chakri Naruebodindra Hospital was to increase the outreach of medical services to the general public, with a potential of 3,000 outpatients a day and 400 inpatient beds for residents, as most of the citizens from the area work in the secondary sector in factories and industrial plants in Samut Prakan and neighboring provinces in the eastern region as well as to increase opportunities for medical students to engage in primary and secondary care. Medical education was first operated at this site in the academic year 2021. Aiming to be a role model and cultivate “change agents,” the institute

has introduced the 4Es concepts, including *Education Reform, Environmental Friendliness, Energy Conservation,* and *Excellent Living and Working Conditions* to create a "campus life" for all healthcare personnel, students, and clients. In the hope that the CNMI personnel and graduates will ultimately develop a green spirit and sustainable perspective to "save not only patients but also the planet."

From concerns to the CNMI Goes Green policy

"We are a part of nature and are also affected by global issues like new diseases, depletion of resources, climate change, etc. It is the responsibility of all people to protect the environment for ourselves and future generations. We need to be a sustainable and environmentally friendly healthcare institute to cultivate change agents and be a role model for our students. Therefore, creating a campus life is essential for promoting the quality of life and improving the well-being of healthcare personnel, students and patients", said Professor Piyamitr Sritara, M.D., Dean of Faculty of Medicine Ramathibodi Hospital, Mahidol University. He then set the CNMI Goes Green as a flagship policy to turn the CNMI land of Gourami fish ponds with very little green space into green land. Healthcare workers and students have been motivated to be more conscious of resources and the environment.

Professor Piyamitr Sritara, M.D., Dean of the Faculty of Medicine Ramathibodi Hospital

CNMI Goes Green – the main operation, initially focused on 3 domains, including Infrastructure and Green Areas, Energy Saving and Climate Change, and Waste Management. Schemes and campaigns were developed and implemented in the three areas mentioned above. During the COVID-19 crisis, many activities were temporarily slowed down. Waste Management, especially the ban on single-use plastic and food waste for fish farming, was put on hold due to concerns about contagion from COVID -19, while increased tree planting was not much affected. Nowadays, after the crisis, all project campaigns are almost back on track. Environmental problems affect everyone. Now is time to pay more attention to what we have done to our planet. Human activities inevitably have significant consequences for the world.

Infrastructure and Green Area

Energy Saving and Climate Change

Waste Management

In early 2022, the committee decided to adopt the UI green metric as a measure of project performance. Three additional categories have been executed using such standards: Water Management, Green Transportation, and Education. The CNMI's new approach is to protect the environment through sustainability management. CNMI Goes Green is the initiative that fulfills the strategy. It is composed of six scopes, including 1) Infrastructure and Green Areas,

2) Energy Saving and Climate Change, 3) Water Management, 4) Waste Management, 5) Transportation, and 6) Education and empowerment. For the past 3 years, some projects have been successful, while others are still in the early stages. Leadership and collaboration among all staff are important in creating an environment that cultivates sustainability perspectives and a green heart for all people in the CNMI.

Goes Green with Six CNMI Projects

To create campus life, six CNMI Goes Green projects were launched as follows:

1. Infrastructure and Green Area

Plants are known to be the best reservoir of carbon dioxide. Increasing the number of trees is one of the most effective measures to reduce greenhouse gases. The CNMI's green area comprises more than 2,100 trees; 900 trees are taller than 15 meters, while the remaining 1,200 trees are 5-10 meters tall. Approximately 1.6 acres are covered with shrubs. It is estimated that trees and shrubs in the CNMI can pull more than 30 tons of CO_2 from the environment annually. The number of trees is increasing due to the policy of creating more green spaces. Since the CNMI is located on a piece of land with marine clay and mangrove soils that are difficult for growing trees. Therefore, native trees are selected for reforestation. Not only the environmental concern, but the green environment also promotes health and provides a healing environment for both personnel and patients. The goal

of CNMI is to have 0.0025 acres of green area per person, which is one of the main requirements for the master plan of the institute.

The green land can attract many native and migratory birds to live in the institute and its surroundings. Currently, more than 50 species can be found. Now the CNMI Bird-Watching Club is collecting all the data and planning to set conservative measures. More green areas will help sustain these lives.

Increasing the number of trees

Many native and migratory birds live in the institute.

2. Energy Saving and Climate Change

In 2017, when the CNMI first opened and offered medical services to the public, the electricity bill was very high, averaging 10 million baht per month.(US$ 304,739) *"When we analyzed the related factors, we found that about 70-80 percent of our total energy costs were related to the hospital's continuous operating hours,"* said Pairoj Boonkongchuen, M.D., director of Ramadhibodi Chakri Naruebodindra Hospital. As a result, measures have been taken to reduce costs.

Dr.Pairoj Boonkongchuen, Director of Ramadhibodi Chakri Naruebodindra Hospital

Institute-wide energy conservation and waste management campaigns saved approximately 464 metric tons of CO_2 equivalents by 2022 (assessed by the Thailand Greenhouse Gas Management Organization; TGO). Broken fluorescent lamps

have been continuously replaced with LED lamps. The water temperature and pump pressure in the air cooler have been actively adjusted to reduce electricity consumption. The results have been successful in conjunction with the institute-wide electricity savings campaign. Ramadhibodi Chakri Naruebodindra Hospital received the Metropolitan Electricity Authority's 6th MEA Energy Award in 2021. After the award, the campaign is still ongoing. Electricity consumption will be continuously reduced. The rooftop solar system on the CNMI provides about 2.56 MW of electricity (nearly 3 MWp). This helps reduce the 5,475 metric tons of CO_2 -equivalent required for power generation. The second phase of the solar roof will be funded by the Energy Regulatory Commission of the Ministry of Energy of Thailand at a cost of 28 million baht (US$853,000). It is expected to generate 0.9 MW of electricity and save 785 tons of CO_2 equivalent per year.

Rooftop solar system for Energy Saving and Climate Change

Electricity produced from solar roof

3. Water Management

The CNMI has a complete wastewater treatment system. Wastewater is treated using the Rotating Biological Contactor (RBC) system. Approximately 500 – 600 m^3 of effluent is discharged into the ditch daily. All the outflow parameters are monitored. Therefore, the treated wastewater discharged into the institute is guaranteed to be environmentally safe. The treated water is mainly used for watering plants. There is a novel pilot project dealing with the treatment of wastewater for use in cooling towers. The system is supported by the National Science and Technology Development Agency (NSTDA), King Mongkut's University of Technology North Bangkok (KMUTNB) and Active Science Co. Ltd. By using ozone technology and adsorption filtration processes, the quality of the reclaimed water is good and almost all impurities are eliminated. The expected results are replacement of tap water and reduction of chemical water treatment (antiscalant and water softener).

The new project to process wastewater to use in cooling towers

4. Waste management

CNMI Goes Green has initiated a number of waste management projects. Categorized by task, there are sorting, reducing, reusing, and recycling. The ultimate goal is to leave zero waste in landfill.

Sorting: In 2020, recycled waste was accounted for only 7% of total waste generated in the CNMI, as much of the recyclable waste ended up in the landfill. The goal is to help CNMI members properly sort recycled waste from general waste. The results have been impressive: in 2021, the recycled waste increased to 9.1% and revenue from the sale of recycled materials was nearly 90,000 baht (US$2,742). The campaign was able to save 20 tons of CO_2Eq. The recycling campaign will continue. By the end of 2022, recycled waste has increased to about 15%.

Ramadhibodi Chakri Naruebodindra Hospital provides food to patients and staff. The hospital kitchen generates about 5-6 tons of food waste every month. Previously, the waste was not sorted and ended up in a landfill. However, in 2021, food waste from the hospital kitchen and some hospital departments began to be collected and given to fish farms in the surrounding communities. This project helps the environment and strengthens the relationship between the organization and the neighborhood. Not only are the aforementioned tasks beneficial, but other activities to tackle waste problems are also effective, such as the

disposal of e-waste, plastic food packaging, hazardous waste, and used needles.

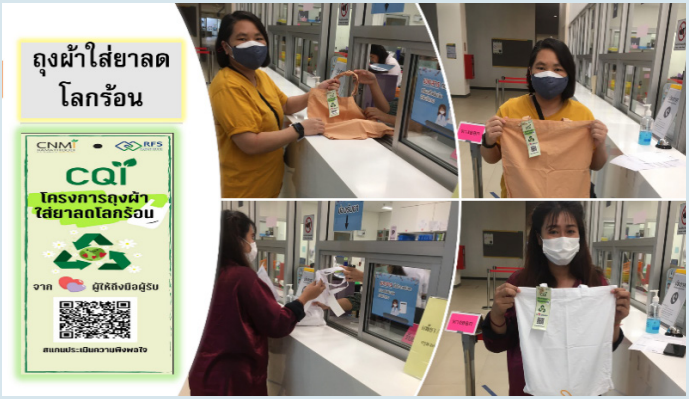
Reducing: Disposable plastic containers are one of the main problems. They may be convenient, easy to get, and effortless to dispose of, but they cause a huge environmental problem. To reduce plastic waste, the executive board enforces a policy to ban single-use plastic in mid-2022. All vendors at the institute must use environmentally safe containers. The ban policy and movements to create positive rewards also run in parallel. Those who bring reusable containers, tumblers, and bags benefit from discounts at the stores in the CNMI.

Reusing: The Ramadhibodi Chakri Naruebodindra Hospital laundry reuses discarded textiles to make products for hospital use, such as cloth bags, hand pads, cloth cuffs, etc**.** The project has saved approximately 3,750,000 baht **(**US$114,277**)** annually on the purchase of new fabrics**.** It also reduced waste disposal costs by about 576,000 baht **(**US$16,670**)** and 33.7 tons of CO_2 equivalent per year**.** This project was awarded a prize by the Mahidol Quality Fair 2022.

Recycling: In 2021, the CNMI joined the 'Upcycling-Upstyling Campaign' with PTT Global Chemical PCL (PTTGC). The project consists of recycling plastic containers of dialysis fluid to build a bus shelter at the institute. Unfortunately, the materials were unsuitable for building such a strong and durable structure. However, the CNMI also participates in the YOU turn project of

the PTTGC, Kao, and Kanebo groups to recycle PET bottles and turn them into reusable coverall PPE suits. The handover was held in March 2021 at the PTT head offices.

More works are still ongoing in collaboration with the private sectors, namely, upcycled boots from plastic film with PTTGC, recycling stretchable and hard plastics with PTIC (PTTEP Technology and Innovation Center), and e-waste management with AIS.



Products from linen unit, crafted from discarded cloths

5. Transportation

CNMI x Anywheel, has been proposed to escalate the use of bicycles at the institute. More than 220 bicycles are provided to all staff and students. The scheme is expected to augment zero-carbon internal transportation and health promotion for all CNMI employees. Launched in August 2022, 5,000-6,000 km have been biked or 0.6-0.7 tons of CO_2 equivalent emitted per month. Unfortunately, the project was launched during the rainy season,

and the bicycle usage is predicted to increase in other seasons. Moreover, electric car charging stations are planned to increase the use electric cars for CNMI employees and customers.

CNMI x Anywheel allocates bicycles for students and personnel.

6. Education and empowerment

A medical school is an important part of the institute that plays an important role in protecting the planet. With the full support of Assistant Professor Suthida Sumrithe, M.D., Director of Ramathibodi Medical School, many medical students can participate with the staff in several sustainable activities, for instance, Environment Clubs, Waste Sorting Campaigns, Research, etc.

There are research projects involved in making our earth better. A CNMI faculty member, Associate Professor Phisit Khemawoot, Ph.D., and his colleagues have conducted an experiment regarding PM2.5 characteristics and toxicity profiles in zebrafish and rats. Preliminary results show higher toxicity of PM2.5 and PM10 from the CNMI compared to standard PM dust. The study indicates the negative impact of pollution on our health, highlighting the urgency to protect our environment. More research projects addressing the relationship between the environment and health or diseases are underway.

Assistant Professor Suthida Sumrithe, the present director of Ramathibodi Medical School

Key Success Factors

1. Strong leadership and management: effective leaders are critical to setting and achieving goals, making strategic decisions, and inspiring and motivating team members. Professor Piyamitr Sritara, M.D., dean and administrative team of the Faculty of Medicine Ramathibodi Hospital, Mahidol University, have established the CNMI goes green policy and brought it to implementation at all levels of staff and students.

Associate Professor Wicharn Chokthanasiri, M.D., Director of CNMI (Associate)

2. Clear policy and support: the CNMI goes green policy has been cascaded through good collaboration and support from the dean and all administrators at all levels.

3. Teamwork: teamwork is a critical factor in the success of projects. Collaboration between staff, students, and all stakeholders helps drive the sustainability of a green university.

4. Networking: The CNMI goes green project has received support from nonprofits to support efficient operations and reduce the risk of financial instability. Some networks support investment in infrastructure or technologies in developing environments to reduce energy consumption.

Professor Artit Ungkanont, M.D., the former director of Ramathibodi Medical School (2018)

Sustainability Challenges Overcome

It is challenging to make the CNMI goes green with six projects sustainable because they need sound strategies, monitoring, support, and motivation. Lifestyle habits, especially during the contagion of emerging diseases such as COVID -19, can be major obstacles to implementation and success. A strong commitment is needed from all administrative staff and stakeholders. The "CNMI goes green" activities must be enthusiastically supported by organizational leaders.

The university may consider investing in renewable energy sources, such as expanding solar panels or wind turbines, to generate electricity and reduce dependence on fossil fuels. However, the CNMI is increasingly focusing on sustainability and environmental responsibility as part of its "CNMI Goes Green" initiative. Some possible steps a university could take to further develop its green initiatives include developing and implementing a comprehensive sustainability plan that outlines goals and strategies to reduce the institution's environmental impact, including: 1. Investing in renewable energy sources, such as expanding solar rooftops to 100% on campus or wind power, to meet the institution's energy needs and reduce energy consumption.

2. Promoting alternative transportation and bicycling to reduce the carbon footprint of commuting students, faculty, and staff.

3. Increasing the use of recycled and environmentally friendly materials such as paper and cleaning supplies to reduce the institution's waste generation.

4. Partnering or networking with other organizations and non-profits to support and promote sustainability initiatives in the surrounding communities.

5. Engaging students, faculty, and staff in sustainability through initiatives such as recycling programs, wastewater, and waste recycling.

6. Encouraging collaborative research with other universities or businesses.

The following quotes are evidence of strong and committed leaders in the CNMI who can help overcome any challenges and lead to success.

Assistant Professor Suthida Sumrithe said, "Conducting research in collaboration with external expertise in developing environments will improve a wider environmental field of research. Although our strengths and expertise are in science and health areas, we join with other agencies and cooperation in environmental research. The result will be better. We have to wait and see.

Associate Professor Wicharn Chokthanasiri said, "As can be seen, success will happen when everyone works together to solve climate change. This model for environmental protection will be a role model for students after graduation in other places where they will work, as well as a primary hospital or secondary

hospital, a community, or an educational institute that still needs to complete these things. Therefore, everyone must preserve the environment because our world is forever and for future generations to have resources that can be used efficiently."

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"True Success is not in the learning, but in its application to the benefit of mankind."

HRH PRINCE MAHIDOL OF SONGKLA

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