



# The Wisdom of the Monarch

The Wisdom of the Monarch: A World Leader in Sustainable Development

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Laws Supporting Royal Initiated Projects  
of His Majesty King Bhumibol Adulyadej







**The Wisdom of the Monarch**  
A World Leader in Sustainable Development











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## Biography of His Majesty King Bhumibol Adulyadej

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His Majesty King Bhumibol Adulyadej was born in Cambridge, Massachusetts, USA, on 5 December 1927. He was the youngest son of Prince Mahidol (son of King Rama V and Queen Savang Vadhana) and Princess Srinagarindra, the Princess Mother. His elder sister and brother were Princess Galyani Vadhana and King Ananda Mahidol, Rama VIII.

His Majesty King Bhumibol Adulyadej acceded to the throne as the ninth monarch of the House of Chakri on 9 June 1946, and was crowned on 5 May 1950.

On 28 April 1950, he wed Mom Rajawongse Sirikit Kitiyakara, the daughter of Prince Nakkhatra Mangala, Prince of Chanthaburi (Mom Chao Nakkhatra Mangala Kitiyakara) and Mom Luang Bua Kitiyakara. Mom Rajawongse Sirikit was later elevated to Queen Sirikit, and eventually Queen Sirikit Regina.

Their Majesties have four children:

1. Princess Ubolratana Rajakanya
2. King Maha Vajiralongkorn Bodindradebayavarangkun
3. Her Royal Highness Princess Maha Chakri Sirindhorn
4. Her Royal Highness Princess Chulabhorn Walailak

King Bhumibol Adulyadej passed away on 13 October 2016, at 15.52 hrs, at the age of 88 years and 313 days.

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## Foreword

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The Royal Tribute Project of the National Legislative Assembly to compile laws supporting Royal Initiated Projects aims to pinpoint all legislation that has helped support the operation of all the royal initiated projects. This is the first project of its kind; no one else has attempted to compile in book form the legislation behind His Majesty King Bhumibol Adulyadej's Royal Projects. The book entitled *The Wisdom of the Monarch: A World Leader in Sustainable Development: Laws Supporting Royal Initiated Projects of King Bhumibol Adulyadej* is published for distribution among the public and private sectors, locally and overseas, as well as the general public.

Through this book, the National Legislative Assembly hopes to convey the knowledge of His Majesty's Royal Initiated Projects, as well as the laws supporting the projects, in a concrete form, that is comprehensive and easy to understand, with illustrations that are visually compelling. The book covers the Royal Initiated Projects under 13 headings: water, forests, soil, agriculture, occupation promotion, public health, social welfare, education, transportation, communication, environment and climate change, innovation, and Sufficiency Economy Philosophy. Each section will present an overview of selected royal projects, and the laws supporting them, the success of the projects, and remarks for further research and implementation, as well as the legal development that need to be made to ensure the continued success of the projects.



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## Foreword

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The committee of the Royal Tribute Project of the National Legislative Assembly to compile laws supporting the Royal Initiated Projects has published this valuable book to honour His Majesty the King's wisdom and to pronounce the seeds of his wisdom to all Thais and citizens of the world.

The Committee of the Royal Tribute Project of  
the National Legislative  
Assembly to Compile Laws Supporting  
Royal Initiated Projects  
November 2017

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### Message from Professor Pornpetch Wichitcholchai President of the National Legislative Assembly

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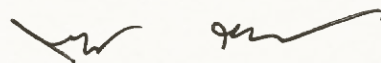
His Majesty King Bhumibol Adulyadej was a benevolent monarch, reigning over not only the nation but also the hearts of his people. He devoted himself to working laboriously for 70 years, during which time he traveled from dawn to dusk and travailed on his frequent trips to remote areas, paying no heed to the endless tasks and discomfort. No morsel in this country has never witnessed traces of his tread. It was these door-to-door visits by the King to faraway villages that created an emotional and spiritual bond between the Monarch and his people. The stories he heard first-hand from the villagers became the basis for the royal initiated projects that would help the people gain self-sufficiency, improve their livelihood and help the community build up their strength and capacity for sustainable self-development. His Majesty's hard work has helped transform arid lands into farmlands and changed the lives of most Thai people from a life of poverty to "having enough to eat and live on" and ultimately to "eating well and living well."

Chitralada Villa, Dusit Palace, is the one and only palace in the world that was a Monarch's home, his personal office as well as an experimental ground for the study and research for his numerous projects, all these projects on his own private funding. These experimental projects served as the starting point for more than 4,600 royal initiated projects and the initial phase of 6 Development Study Centres which were later located in every region of the country. These Development Study Centres have functioned as educational areas for his people. In developing the country, His Majesty never encouraged the people to aim for material wealth but holistically based well-being and richness in body and soul. On the contrary, he bestowed upon his people the Sufficiency Economy Philosophy, which provides guidelines on sustainable human and national



development, based on the principles of moderation, reasonableness, prudence and virtue. The Sufficiency Economy Philosophy is a guidance for living a life and making a career as well as principles for state administration and national development. The Sufficiency Economy Philosophy of His Majesty earlier implemented in our country is in agreement with the Sustainable Development Goals of the United Nations which focus on people as the center of development and emphasise sustainable development procedures while leaving no one behind.

His Majesty King Bhumibol Adulyadej was the Father of the Land, and Teacher of the Nation who taught through his actions and practices. The wisdom of the Monarch which subtly combined modern technology with local wisdom is invaluable intellectual heritage of the nation. *The Wisdom of the Monarch: A World Leader in Sustainable Development* is the first publication that compiles the wisdom of the Monarch together with laws supporting royally-initiated projects. This book, we hope, will help educate Thai people, particularly Thai youth, about His Majesty's diligence, perseverance and genius in the development of the country. The book will also enhance the realization of Thai people that His Majesty the King was a truly development monarch who acted in accordance with the laws, and a sage who introduced and implemented development principles and practices in harmony with nature, all of which have tremendously brought benefits to global citizens near and far.



Professor Pornpetch Wichitcholchai  
President of the National Legislative Assembly

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## Introduction

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His Majesty King Bhumibol Adulyadej was a people's king, reigning over not only the nation, but also the hearts of all his people. The people loved and respected him sincerely, without coercion or direction. They were able to see for themselves the limitless extent of His Majesty's love, concern and compassion for his people, that made him devote himself wholeheartedly to their well-being. This bond between the King and his people began the day His Majesty acceded to the throne on 9 June 1946. When His Majesty returned to Switzerland with Princess Srinagarindra, the Princess Mother, and his sister, Her Royal Highness Princess Galyani Vadhana, to resume his studies on 19 August 1946, and the royal motorcade passed Benchamabophit Temple on its way to Don Mueang Airport, His Majesty heard, amidst the cheers of the crowd, a lone voice crying out, *"My King, do not desert your people!"* It seemed no one else noticed, but in his composition, *"When I left Siam for Switzerland,"* His Majesty reflected the inner depths of his feelings with the words, *"I wanted to cry back to him, 'If the people do not desert me, then how could I desert the people?'"* This was the first promise made in the heart of this very young king. He would not desert his people, his duty. It was a promise that created a lifetime bond between the King and his people.

*The Coronation Oath, delivered  
to his people that day,  
was like a heartfelt promise.  
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first day on the throne.*

This promise led to another promise in the form of the Coronation Oath made during a Grand Audience on 5 May 1950. The Coronation Ceremony was held in the sacred halls of the Grand Palace, and His Majesty delivered his Coronation Oath: *"...I will reign with righteousness, for the benefit and happiness of the Siamese people..."* The Coronation Oath, delivered to his people that day, was like a heartfelt promise. His determination to serve his people that was evident from His Majesty's first day on the throne. These words have lingered on in the hearts of his people.

The determination in the heart of His Majesty the King grew into a feeling of love for his people, and a feeling of deep appreciation for the love and devotion that the people felt for him. His Majesty once wrote to his friends after the coronation, describing his feelings of being among his people: “...When I was a student in Europe, I never realized what my country was, and how it related to me. I didn’t realise this

*“...When I was a student in Europe, I never realized what my country was, and how it related to me. I didn’t realise this until I learned to love my people after interacting with them. It made me realise the value of love. I have never suffered from homesickness. But I have learned from my work that my place in the world is being among my people, the Thai people...”*

*until I learned to love my people after interacting with them. It made me realise the value of love. I have never suffered from homesickness. But I have learned from my work that my place in the world is being among my people, the Thai people...”* Throughout the 70 years of his reign, His Majesty King Bhumibol Adulyadej loved his people unconditionally, and was always with his people. He visited his people in every part of the country, staying overnight among his people.

From 1952, His Majesty King Bhumibol Adulyadej was determined to visit the people in every part of the country, starting with the central region, followed by the northeast, the north, the west and the south. He wished to see their ways of life and their hardship so that he could provide them with help as much as he could. Each trip combined the entire region, and he travelled sometimes by train, sometimes by car, depending on the route and transportation access in each province, as well as the convenience for his entourage which comprised several units, for instance, the royal medical unit.

Along each route His Majesty travelled, a large number of people would come out to meet him, since this was the first time in the country’s history that a monarch had come to visit his people on their doorstep, at their respective provinces, districts, and villages. He opened up opportunities for the people to have an audience up close with him, and talk to him in an informal manner, giving them great joy. Many villagers, including village elders, brought along local products to present to him. Though these things might have small monetary value, they were priceless in their symbolic gesture -- a gift coming from the hearts of the people to their king. His Majesty

the King travelled to every corner of the kingdom, even the most remote areas without any transportation access. It can be said that there was no morsel in the country where His Majesty's feet did not reach, travelling by plane, train, car -- sometimes at the wheel himself -- on elephant back, horseback, or even by walking when there were no roads, so that he could see with his own eyes the well-being of the people. These visits allowed the King to come into close contact with his people, creating an affectionate bond between the King and his subjects that was more like they belong to the same family. The people loved and revered their King like children to their father and they were truly grateful for the love and compassion that their father had for them endlessly and unconditionally.

The stories that His Majesty heard with his own ears from the people, the problems he learned from his visits to remote villagers, gleaned from close conversations with the villagers, combined to become a source of inspiration for His Majesty to find ways to help them, leading to the origin of the Royal-Initiated Development Projects. Gradually, His Majesty commissioned simple royal villas in each region of the country, which he used as his base for his development operations. His Majesty stayed at these royal villas while he was working in each region, spending more time in the provinces each year than he did in the capital.

These extended stays in the regional palaces allowed His Majesty to become aware of the problems faced by his people, most of whom were farmers. These problems included lack of farmland, water sources, public health, and urban migration. His Majesty wished to improve the well-being of his people, and studied ways to improve agricultural yield, resulting in numerous

There was no morsel in the country where His Majesty's feet did not reach, travelling by plane, train, car -- sometimes at the wheel himself -- on elephant back, horseback, or even by walking when there were no roads, so that he could see with his own eyes the well-being of the people.

Royal Projects that covered all aspects of farming: agriculture, public health, soil management, water management, forestry, occupation promotion, livelihood development and the occupation of the hill tribes, transportation, social welfare, education, the preservation of the environment and natural resources and so forth. Each project was undertaken in compliance with the differences of each locale based on the data His Majesty personally collected.



All the royal initiatives were based on His Majesty's thorough and methodical research into the problems. He compiled all the issues of a certain area, devised his own map of that area, before actually embarking on the field trip. He once said to members of his entourage, "...Do your homework first..." When he arrived, he would get more information from the people and from the local government officials, noting and recording the geo-social aspects of the area. All the information would then be analysed in order to come up with solution. After His Majesty had proposed his royal initiatives, he would constantly follow up at every step of the procedure to ensure that the royal-initiated projects truly benefited the people.

Several of the Royal initiated projects grew out of His Majesty's own experimental projects, such as the Royal Chitralada Projects conducted to test the efficiency and effectiveness of agricultural innovations. These include experimental rice fields, rice mills, rice husk grinding facilities, fish nurseries, forest plantations, dairy farms, milk powder and milk pellet factories, pasteurized milk and cheese plants, fruit juice factories, mushroom houses, dried foodstuff unit, mulberry paper plants and alternative fuel. Royal-initiated development projects are located in every region of the country, and His Majesty visited each and every one of them regularly to closely follow up on their progress.

His Majesty always carried with him his own personal work equipment which included a map, a camera, a walkie-talkie and a pencil.

During his upcountry visits, His Majesty always carried with him his own personal work equipment which included a map, a camera, a walkie-talkie and a pencil. The image of the King that his subjects are so familiar with is that of His Majesty carrying a map, with a camera hanging around

his neck. The map he used was a special large-scale map that he devised by himself. His Majesty was a skilled map-reader and used it for the greatest benefit. It was a 1:50,000 scale map with minute topographical details, particularly details on water sources and irrigation. These detailed maps allowed His Majesty to see the big picture so that he could plan his development projects more precisely and comprehensively when he went into the field. He would study the maps meticulously before visiting the villages, and cross check its accuracy against the actual location, the condition of the villages. After talking to the villagers and the local government officials, he would devise a development project. These facts were often

His Majesty studied the workings of the walkie-talkie, tested it and also repaired or fine-tuned it himself for his own use. His Majesty used it to communicate with his entourage as well as with other radio hams to keep abreast of current news, listen to problems and provide advice. It allowed him to provide timely assistance.

supplemented with aerial photographs, barometer readings and car mileage to get a clearer picture before proposing a development plan.

His Majesty had always been a keen photographer since childhood. He read books on photography and studied imaging technology that helped hone his photography skills. His cameras were regular working cameras,

not pricey exclusive models. Not only did His Majesty use his cameras to capture artistic images, he also used them as a tool for his development work, capturing images of all the places he visited that would be used to support his royal initiative projects. Each image of the people and places that he captured attested his eye for detail, showing an artistic sense of composition and perspective that reflected both geographical details and the way of life of the people with clarity and accuracy.

The walkie-talkie radio was another device that His Majesty carried with him almost all the time. His Majesty studied the workings of the walkie-talkie, tested it and also repaired or fine-tuned it himself for his own use. His Majesty used it to communicate with his entourage as well as with other radio hams to keep abreast of current news, listen to problems and provide advice. It allowed him to provide timely assistance such as during the hurricane at Suan Phueng district, Ratchaburi province. His Majesty strictly followed all the regulations covering the use of walkie-talkies, and this was a favoured mode of communication especially during times of crisis.

His Majesty always used pencils when he worked, both in his study and in the field. Each year, His Majesty would make a requisition for 12 pencils -- one for each month. He would use each one until they were stubs, and only when they could no longer be used for writing did he use a new one. Pencils were perfect for recording information, and making changes and corrections when necessary.

It had been over 50 years since His Majesty started working in the field, personally listening to the problems of his subjects. These fact-finding missions, combined with in-depth research into the related issues, made him an expert in rural development. When designing his projects, he would analyse every single detail. If the projects did not truly benefit the people, he would

discard them. If they had potential benefits, he would use his own residence, Chitralada Villa, as an experimental ground first. If they posed problems, he would get his staff to report to him. But if they were successful, then they would be implemented. The objective of all the royal initiated projects was to help the people gain economic independence, gradually and sustainably.

The Royal Development Principles, or the knowledge that His Majesty passed on through over 4,000 royal initiated development projects, as well as through the Royal Development Study Centres are the result of His Majesty's lifelong dedication to his development work.

King Bhumibol Adulyadej was well-versed in both science and arts, which he used in his work for sustainable development. His Majesty initiated six Royal Development Study Centres around the country. These centres comprised projects that were systematic and based on the different geo-social aspects of each individual community, enhanced by modern yet simple and cost-effective technology which conformed to local wisdom, while preserving the natural environment and resources for the well-being of the people. These Royal Development Study Centres were therefore the heart of the King's Development Principles.

The Royal Development Study Centres played a role in the study, research and experiment of development methodologies that would suit each individual environment and terrain. The study centres were living natural museums, and provided a development model for other surrounding locations. The study centres used a multi-disciplinary approach to create a development model for the land and occupations such as agriculture, livestock, fishery, irrigation, forestry as well as society, supplementary occupations and handicrafts. They provided a comprehensive service for visitors, who would receive knowledge and experience on every relevant aspect of development. Over the years, the outreach of the study centres were expanded to cover every region of the country, bringing about a total reversal of land degradation into bountiful farmlands. They became models for the successful restoration of soil, water and forest resources with the full cooperation of the local communities and relevant government offices. The study centres were knowledge centres of the King's Development Principles which helped villagers to have a truly sustainable livelihood.

The Royal Development Principles, or the knowledge and wisdom that His Majesty passed on through over 4,000 royal-initiated projects, as well as through the Royal Development Study Centres are the result of His Majesty's lifelong dedication to his development work. His Majesty



formulated and applied 3 sequential rules of development: 1. thinking principle -- the objectives being to improve the well-being and happiness of the people; 2. theory -- the concepts and theories that had been tried and tested by His Majesty before implementation; and 3. practice -- the development procedures that ensure the efficiency and effectiveness of the projects. His Majesty gave a simple formula for these projects: "Understand, Access, and Develop." Understand means understanding the geographical and social makeup of the location, access refers to having access to geo-social information so that the project can truly answer the needs of the people, while development means setting the guidelines to the development project based on a holistic, multi-dimensional approach incorporating all aspects of knowledge and folk wisdom, as well as the potential to further experiment and improve the procedures that are sustainable and infinitely applicable.

In his development projects, His Majesty King Bhumibol Adulyadej always held the benefit of the people as his priority. Throughout his reign, His Majesty adhered to his working principles: study the data systematically, follow the procedure, use the holistic approach, simplicity is the key, think outside the box, start small, use nature to combat nature, explosion from within (start with capacity building to prepare the community for development), cost effective but high yield, participatory approach in both ideas and operation, perseverance, nurturing an awareness of reforestation in the hearts of the people (teaching people to comprehend the importance of forest conservation and development), communal rather than individual benefits, loss is gain (giving and sacrificing lead to gains, namely the happiness of the people), one-stop service, working with joy, and last but not least, knowledge, passion and unity. (For knowledge, it is knowledge of the relevant factors of the problems and of the solutions. As for passion, it is passion for action. And lastly unity it is and unity as in a joint effort to work together until the job is done).

His Majesty's knowledge of the law was second to none. King Bhumibol Adulyadej truly understood the spirit of law. The laws serve to uphold justice and ensure happiness for the

His Majesty saw the laws for what they were, and emphasised the importance of justice, incorporated with morality and reason.

people. Laws are therefore passed based on the situation in the country, and the lives of the subjects of the kingdom. His Majesty saw the laws for what they were, and emphasised the importance of justice, incorporated with

morality and reason, as evidenced in his speech for the 33<sup>rd</sup> graduating class of the Thai Bar at the New Hall, Ambara Gardens, on 29 October 1981: “...the law is not justice in itself, but it is simply a tool to maintain and accord justice. Implementing laws is therefore

*“...If we are to govern the country, or maintain peace, we cannot follow every law exactly. We have to also consider matters of jurisprudence as well as political science. There has to be a compromise, not abuse...”*

a matter of upholding justice, not upholding the law itself. And upholding justice in the land is not limited to the law itself, but also encompasses morality, reason and fact...”

The law is simply a tool to maintain justice; it is not justice in itself. The rule for implementing laws is to let justice prevail over the law, rather than using the law to maintain the law. Implementing the law also requires the application of jurisprudence as well as good judgment and reasonableness, as His Majesty once remarked in a speech to the organizing committee of Chulalongkorn University's Faculty of Law Day at Chitralada Villa on 13 March 1969: “...If we are to govern the country, or maintain peace, we cannot follow every law exactly. We have to also consider matters of jurisprudence as well as political science. There has to be a compromise, not abuse...”

For the sustainable development of the country, King Bhumibol Adulyadej believed that it has to start with the people, which has to be done by teaching them how to earn their own livelihood, to have an occupation that will provide a sustainable income for them, as His Majesty remarked in a speech on 4 December 1998: “...We should not give them fish; it's much better to give them a fishing rod and teach them how to fish...” King Bhumibol Adulyadej never taught his people to aim for wealth; he never taught them how to get rich. On the contrary, he promoted the philosophy of sufficiency economy which was a principle for the sustainable development of both people and country based on the Middle Path, or moderation, reason, prudence, and morality. He wanted the country to create a firm base first on which to build prosperity and development. He wanted his people to have “enough to eat and live on,” which would then lead to “eating well and living well.” Then development and progress can take place. He compared sufficiency economy as a foundation for life. A strong base for the country is like strong foundations that will provide a stable support for further structures. When a house has a strong foundation, it will remain permanently strong. Residents of the house will have stability, and achieve progress and happiness.

King Bhumibol Adulyadej believed that to achieve happiness, one had to appreciate a sufficient lifestyle. Sufficiency could keep you from greed, wrong thoughts and wrong deeds, and keep you on the path of reason and righteousness. Sufficiency would lead to happiness of body and mind, as he remarked in his speech on 4 December 1998: *"...If we are content with our needs, we will have little greed. When we have little greed, we will not exploit others. If every country believed in sufficiency, meaning moderation, not extreme, not excessively greedy, then we could live with happiness..."* His Majesty taught others the principle of sufficiency through his own behaviour, and his own lifestyle.

Throughout his life, His Majesty received numerous accolades: recognitions, honorary degrees, awards, and citations, on both national and international levels. Yet his greatest reward was the happiness of his people.

The happiness of his subjects was His Majesty's greatest wish. He dedicated his entire life to developing the country and the people. The triumph of his endeavours was the well-being of his people. His entire life was that of sacrifice, and doing good on a daily basis. There was never a day when he didn't work, not even

when he was ill. He gave without expecting anything in return, adhering to the principle "Our loss is our gain." To lose is to make a profit. His personal loss was a gain for the people. If his giving and sacrifice meant the happiness of the people, then the well-being of his people was considered invaluable. Throughout his life, His Majesty received numerous accolades: recognitions, honorary degrees, awards, and citations, on both national and international levels. Yet his greatest reward was the happiness and well-being of his people.

For King Bhumibol Adulyadej, his life was a continuous journey, beginning with the journey from the USA, his place of birth, to his homeland in Thailand, from Thailand to Switzerland, the country where he lived for 19 years and felt a great attachment to, then finally from Switzerland back to Thailand. His 70-year reign was a long and arduous journey, travelling to every corner of the kingdom, from north to south, from east to west. He travelled over plains, highlands, hillsides, mountains, mountain ranges, valleys, streams, lakes, canals, rivers, seas, fields, forests, jungles, dirt roads, wagon tracks, asphalt roads, dry and remote areas, danger zones and even places where government units had yet to penetrate. The goal of his travels was not the destination itself, but determination to reach out to his people on their doorsteps. He endured difficult journeys; he toiled and travailed without being discouraged, so that he could see with his own eyes how well or badly his people lived.




Thanks to his commitment and hard work, His Majesty made remote areas accessible. He changed arid land into farmland. He revived denuded hills into watershed forests. He transformed poppy fields into vegetable plots, fruit plantations and flower beds under the Royal Projects. He changed shifting cultivation into New Theory farms. He changed humble produce into quality products. He transformed dry, hopeless land into lush greenery. He overcame poverty through his sufficiency economy principles. Desert land became reservoirs, poor soil became rich with nutrients, drought was overcome by royal artificial rain that refreshed and renourished the land. His Majesty changed the lives of his people from destitution to having enough to eat and live on and further onto eating well and living well, ready to step forward into the future with full hope in their hearts deriving from the compassion of their King. Over 4,000 royal initiated projects are like natural streams of water that wind their ways in every direction throughout the country. After 70 years of his reign, His Majesty's efforts have blossomed and borne fruit throughout the country. This is the tangible evidence of His Majesty's perseverance to bring happiness to his people of different generations from fathers and mothers to sons and daughters and onto grandsons and granddaughters without end.

His Majesty changed the lives of his people from destitution to having enough to eat and live on and further onto eating well and living well, ready to step forward into the future with full hope in their hearts deriving from the compassion of their King.

No one loves the people more than King Bhumibol Adulyadej. No one loves this land more than His Majesty. No one has worked harder and longer for the country than this King. No one has trodden on almost every square inch of the country like this Monarch. This was his resolution, his perseverance, his wisdom, and his compassion shown towards his subjects. His Majesty's passing on 13 October 2016 brought great desolation to all his people, like the sun that sets on the horizon and will never again rises in the sky. Although His Majesty is gone, the close and affectionate bond between this great King and his subjects will linger on in the hearts of all Thai people. The King's wisdom and his Development Principles will remain and be with Thailand, like a guiding light leading towards happiness in many long years to come.





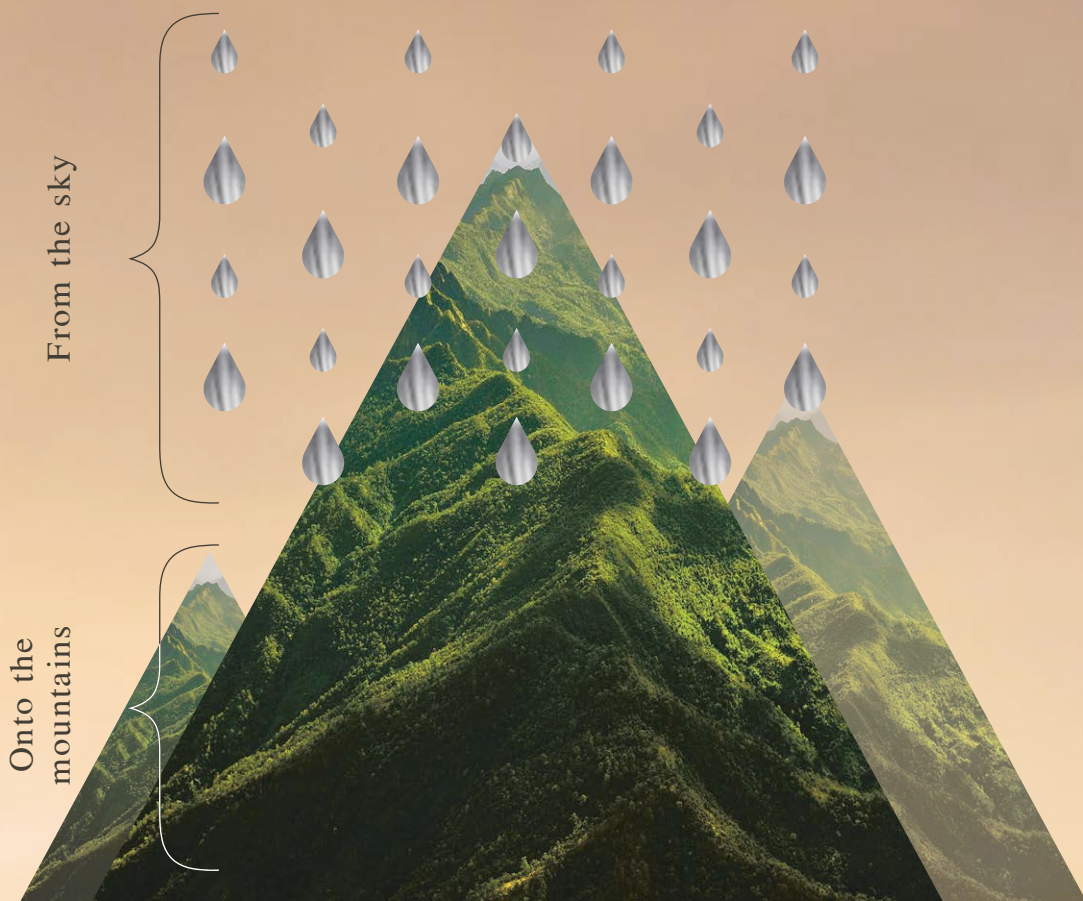


The Royal Initiated Projects relating to water resources grew out of drought and flood problems. Since water is a basic necessity for humans and all living things, His Majesty initiated reservoir construction and rain-making projects.

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## Royal Initiated Projects Relating to Water





Into the oceans

Systematic and  
holistic water resources  
management, linking  
and agreeing with  
the social geography  
of the area.









*“...Water is an essential factor for human beings. Not only human beings; all living things, animals and plants, need water. Without water, they cannot survive, because water is essential for life... This is to help you understand why the first step of rural development has to be irrigation projects as well as environmental projects that will help improve water sources. With these two, others will be possible...”*

*Speech at Dusidalai Hall,  
Chitralada Villa,  
29 December 1989*

### Royal Initiated Projects Related to Water

King Bhumibol Adulyadej had been interested in irrigation since he was young, leading to his close relationship with water. He once recounted to Royal Irrigation Department officials during a royal audience that he used to dig the sand into a little pond in front of Klai Kangwon Palace, Hua Hin District, Prachuap Khiri Khan Province. He called his little pond a reservoir. He would wait until the tide came in and the sea water would fill up the reservoir. When the sea water receded, the reservoir would still hold water. He would then dig trenches to divert the water into surrounded areas. It would please him greatly to see how the water flowed from the reservoir into the surrounding trenches.

Ever since King Bhumibol Adulyadej acceded to the throne in 1946, he travelled all over the country to visit his subjects, and found that water was the single most significant problem that provided an obstacle for the well-being of the people. He remarked to an audience at Dusidalai Hall, Chitralada Villa, on 29 December 1989: *"...Water is an essential factor for human beings. Not only human beings; all living things, animals and plants, need water. Without water, they cannot survive, because water is essential for life... This is to help you understand why the first step of rural development has to be irrigation projects as well as environmental projects that*

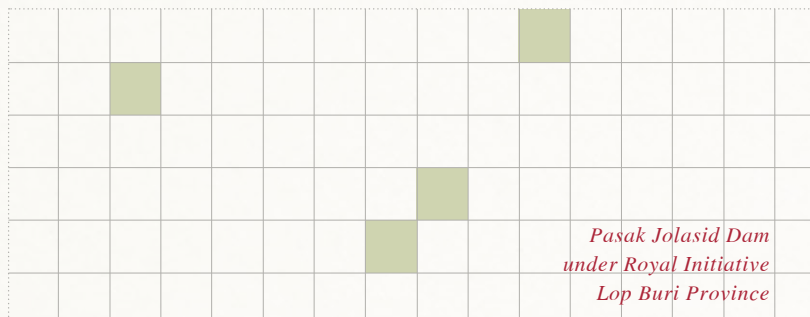
*will help improve water sources. With these two, others will be possible..."*

*"...Drought seems to be a problem with no solution. Nowadays people say with low spirits that water will soon have to be rationed or even tap water in Bangkok has to be cut. So we need to find a solution. To do this, I have been preparing a plan for several years now. If we follow this plan, there would be no need to talk about water shortage. I even have specific projects, which I confirmed last month when I was in Narathiwat. I came up with a plan that might not yet be able to prevent water shortage this year or next, but if we do it well, in five or six years Bangkok will no longer have any problem with water shortages..."*

*Speech by King Bhumibol Adulyadej on the occasion of his birthday, 4 December 1993*

King Bhumibol Adulyadej offered food for thought on water-related problems, particularly water shortages which would contribute to drought, to an audience of relevant government officials including those from the Royal Irrigation Department whose job was to develop water sources. They went back to study and implement various projects that became royal initiated projects scattered in various regions of the country. His Majesty spoke on the topic of water during his royal birthday audience on 4 December 1993, saying: *"...Drought seems to be a problem with no solution. Nowadays people say with low spirits that water will soon have to be rationed or even tap water in Bangkok has to be cut.*





*Pasak Jolasid Dam  
under Royal Initiative  
Lop Buri Province*



So we need to find a solution. To do this, I have been preparing a plan for several years now. If we follow this plan, there would be no need to talk about water shortage. I even have specific projects, which I confirmed last month when I was in Narathiwat. I came up with a plan that might not yet be able to prevent water shortage this year or next, but if we do it well, in five or six years Bangkok will no longer have any problem with water shortages.

You might think that five or six years is a long time, but in fact it's not. Meanwhile, you have to address immediate problems, but if you know that in 5 - 6 years these problems will be gone, then you will surely have the will to continue fighting. When I say 5 - 6 years, in fact these projects started 5 - 6 years ago. I have to admit that I didn't dare mention these projects for many years for fear of protests from experts and activists. But this project is doable, even though it requires a large investment. But if it's implemented, then in

*"...This project comprises two dams; one is at Pasak River, the other at Nakhon Nayok River. Together, the dams will collect enough water for consumption in Bangkok and its environs in the central plains..."*

5 - 6 years, we will have it easy. But if we don't do it now, in 5 - 6 years the cost of construction materials will increase 2 - 3 times, and we will no doubt delay it even further. And when we delay it, we will never do it, and we will not have any water. It will become a desert, and we won't be able to escape.

*This project comprises two dams; one is at Pasak River, the other at Nakhon Nayok River. Together, the dams will collect enough water for consumption in Bangkok and its environs in the central plains..."*

King Bhumibol Adulyadej closely monitored the progress of the Pasak Jolasid Dam under royal initiative that stored water from the Pasak



River, and the Khun Dan Prakan Chon Dam under royal initiative that stored water from the Nakhon Nayok River. During his royal birthday address on 4 December 1994, His Majesty said: *"...I refer to what the Prime Minister mentioned about some of the activities. There are many more like those that I mentioned last year like the Pasak River Basin Development Project, the Nakhon Nayok River and Pak Phanang. This year I'm pleased to say that they have finally been implemented. To be sure, there are several obstacles that must be overcome for the Pasak River project. But I hope that within the next five years, if there are no major problems, in another five years, problems with water shortages or drought and flooding will be alleviated by 80 percent, bringing happiness to hundreds of thousands of people through the Pasak and Nakhon Nayok projects. I would like to praise the people and government officials like the governors of Nakhon Nayok and Lop Buri who*

*helped to create an awareness among the local people to gain their cooperation..."*

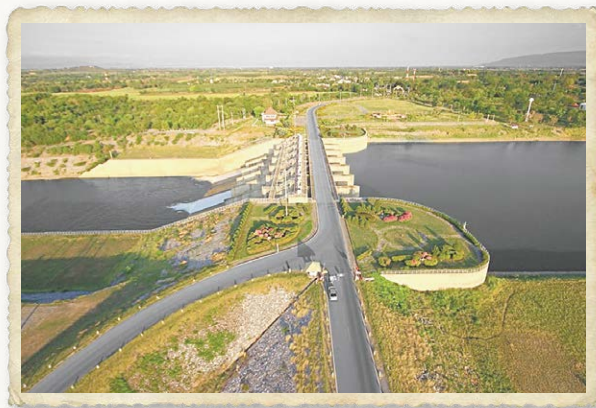
### **Pasak Jolasid Dam under Royal Initiative**

#### **Project Timeline**

The Royal Irrigation Department began surveying the location for the dam on Pasak River, Lop Buri and Saraburi provinces, in 1965. Then on 19 February 1989, King Bhumibol Adulyadej proposed that the Royal Irrigation Department conduct serious and urgent studies on the suitability of the project, to solve problems of water shortages and flooding. The Royal Irrigation Department compiled and presented its findings to the Ministry of Agriculture and Cooperatives to forward to the Council of Ministers. It was approved that studies should be conducted in detail on the suitability of the project, with the Office of the Royal Projects Development Board as the focal point.

# เขื่อนป่าสักชลสิทธิ์

## PASAK JOLASID DAM

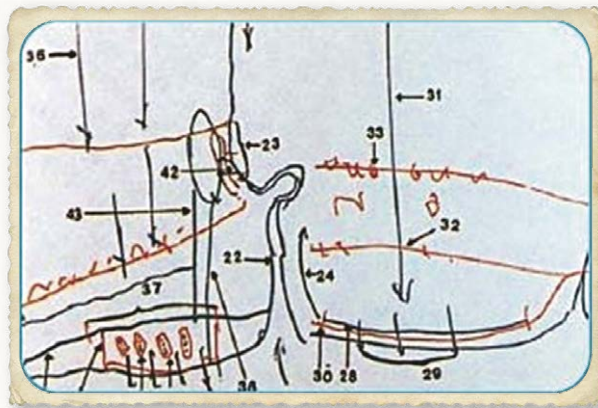


On 10 July 1990, the Cabinet approved the establishment of Pasak River Basin Royal Development Project by the Royal Irrigation Department to conduct a feasibility study as well as the environmental impact assessment starting from 13 July 1992, to be completed by September 1993. The Cabinet approved the studies on 21 December 1993, and submitted the environmental impact assessment as well as environmental impact mitigation plan to the National Environment Board, which approved the project on 23 February 1994.

### Project Approval Process

The Cabinet approved the project on 3 May 1994, to be completed by 1999 to mark the 72<sup>nd</sup> birthday of His Majesty King Bhumibol Adulyadej on 5 December 1999. Due to the limited construction period, it was therefore necessary to get several activities operating simultaneously. To create public awareness about the objective and benefits of the project, as well as the environmental impact mitigation plan, the Order of the Office of the Prime Minister No.138/1999 dated 23 November 1994 was issued to appoint an executive committee





*Topographic map showing  
the Pasak River  
and its tributaries.*

*His Majesty the King's  
sketches of the Kaem Ling  
(Monkey Cheeks) project.*

in charge of the Pasak River Basin Royal Development Project to set the policies and operating guidelines. The executive committee set priorities and operating procedures to ensure the smooth running of the project, and to address problems within their jurisdiction effectively and consistently, to enable the project to be completed within the estimated time frame.

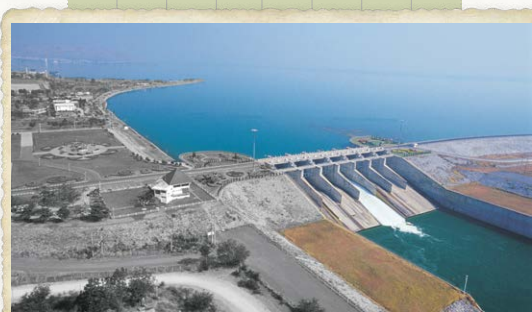
#### Land Acquisition Process

A total of 114,119 rai (18,259 hectares) of land would be affected by the construction of the Pasak River Basin Royal Development Project, including 2,500 rai (400 hectares) in Bang Nong Bua, Phatthana Nikhom District, Lop Buri Province, and Ban Kam Pran, Wang Muang District, Saraburi Province, which was originally occupied by farmers and their farms

and orchards, and now designated to be the actual dam and the appurtenant structures.

In true patriotic spirit, a group of 87 farmers who earned their livelihood farming on land in this area, allowed the Royal Irrigation Department to conduct surveys and move in to build the dam without even knowing how much compensation they would get per rai. This allowed the Royal Irrigation Department to begin construction on 2 December 1994.

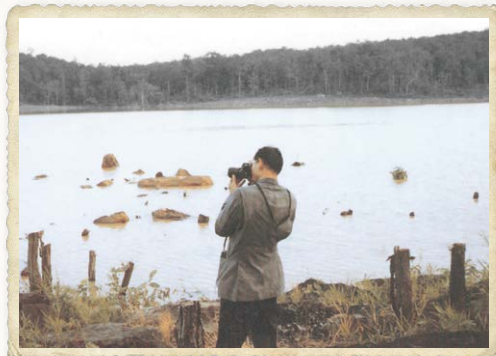
His Majesty King Bhumibol Adulyadej always insisted as part of his rural development principle: "...Don't create trouble for the people... Don't let anyone take advantage of this project..." Simple words but clearly indicative of His Majesty's compassion towards his subjects who sacrificed their land. This feeling was reflected in the words of the farmers



*The Pasak River Basin Royal  
Development Project*

like 70-year-old Phram Vanida, who said, *"I originally came from Ayutthaya, but I couldn't survive there because it was too dry. There was no water, and our farms and orchards did not yield anything. So I moved to the Self-Help Settlement in Lop Buri in 1953. And then I moved again to this area in 1964. I bought a 7 - 8 rai plot of land first, then gradually expanded it to 62 rai (10 hectares) where I grew rice and corn. I first heard of this project in 1991 from a television broadcast of the King saying he was building the Pasak Dam so there would be a good water supply, and prevent floods in Lop Buri, Saraburi, Ayutthaya, Pathum Thani and Bangkok. Two years later, a survey team came to take soil samples."* Mr. Phram Vanida proudly remarked that although he had moved several times already, he was pleased and honoured to sacrifice his land for the Pasak River Basin Royal Project due to his deep respect for the King.

The Pasak River Basin Royal Project was completed according to schedule as a result of the initial sacrifice of the 87 farmers, a praiseworthy act that should be held as a model for other regions of the country where large-scale reservoir projects are to be constructed, for the benefit of the country and the local people.



*His Majesty King Bhumibol Adulyadej commissioned the Royal Irrigation Department to conduct an urgent feasibility study of the Pasak River Basin Royal Development Project to alleviate problems related to lack of water and flooding.*

#### Construction Process

## 1

**Construction of the dam,  
appurtenant structures  
and other related amenities**

1. Construction of the dam, appurtenant structures and other related amenities. This first phase began on 2 December 1994, with additional supporting excavation equipment supplied by the Military Engineer Department to ensure that the project was completed in time. It was completed in 1999. The dam has a storage capacity of 960 million cubic metres. The first phase was the construction of the zoned-type embankment earth dam 4,860 metres in length.

## 2

**Construction of four  
irrigation systems in the new  
agricultural land**

2. Construction of four irrigation systems in the new agricultural land. This second phase took place from 2000 to 2009, and include the pump irrigation system in Kaeng Khoi-Ban Moh, Phatthana Nikhom, and Phatthana Nikhom-Kaeng Khoi, as well as the agriculture water supply system in Lop Buri, which would increase the amount of arable land benefiting from the Pasak River Basin Royal Project by another 174,500 rai (27,920 hectares).



## Laws relating to this project

### Royal Initiated Projects Relating to Water

Laws relating to and supporting the project are as follows:

1.

**State Irrigation Act,  
B.E. 2485 (1942)**

The State Irrigation Act, B.E. 2485 (1942) has defined the term "Irrigation" as the work done by the Royal Irrigation Department in order to acquire water, keep and store water, control, distribute, discharge or extricate water for the purpose of agriculture, energy, public utilities or industry. It extends to the prevention of water-related disasters, as well as transportation on waterways within the irrigation areas. "Irrigation waterways" refers to waterways designated by the minister as irrigation waterways. "Irrigation area" means agricultural land that benefits from the irrigation project. Irrigation waterways shall be divided into four categories: 1) Waterways used to convey, drain, store or block water for irrigation purposes; 2) Waterways used for transportation purposes, but linked to irrigation specifically in areas benefiting from irrigation; 3) Waterways reserved for irrigation purposes; and 4) Waterways that are irrigation tools. The authority to build irrigation water sources must meet the objectives of overcoming the lack of water and preventing floods.

Where there is a need to acquire immovable property for the purpose of irrigation, and if no prior arrangement has been made, then land should be expropriated according to the law governing the Expropriation of Immovable Property. The immovable property that is acquired through other means other than under the Expropriation of Immovable Property Act shall be exempted from fees and duty stamps.

2.

**Immovable  
Property  
Expropriation Act,  
B.E. 2530 (1987)**

The Immovable Property Expropriation Act, B.E. 2530 (1987) has defined the term "Expropriation" as the compulsory acquisition of land or other immovable properties under the provisions of this Act. In the case where it is necessary for the State to acquire any immovable property for the provision of any necessary public utility or national defense, for the acquisition of natural resources, for town and city

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## Laws relating to this project

### Royal Initiated Projects Relating to Water

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planning, for the development of agriculture, industry or land reform, or for other public purposes, if the transfer of ownership of such immovable property is not agreed upon otherwise, the expropriation under this Act shall apply. Though the provisions on expropriation are prescribed in any other specific law, the Council of Ministers may, if it thinks fit, have a resolution that the expropriation shall be conducted under the provisions of this Act. For the purpose of the expropriation, the Royal Decree on demarcation of the area to be expropriated may be enacted prior to the expropriation. The ownership of immovable property to be expropriated shall be transferred to the officer on the date the Act on immovable property expropriation comes into force, but the officer shall have the right to take possession of or use that immovable property only upon payment or deposition of compensation as prescribed by this Act. If the expropriated immovable property is subjected to mortgage, preferential right or any *jus in rem*, such mortgage, preferential right or *jus in rem* shall expire, but the mortgagee, the holder of preferential right or the beneficiary to such *jus in rem* is still entitled to the performance of debt or to obtain benefit from the compensation to be paid for that immovable property. In this case, the request for the performance of debt or for that benefit shall be made within sixty days as from the date the written notification was made known to him. As from the date the Act on immovable property expropriation comes into force, if the person entitled to that property transfers his right to a third party, the transferee shall be entitled only to the claim for compensation.

In the case where it is necessary to expropriate any part of the land, but the remaining part is less than twenty-five square wah or any side of the remaining land is shorter than five wah and the remaining

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### Laws relating to this project

#### Royal Initiated Projects Relating to Water

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part is not adjacent to any other plot of land owned by the same owner, the officer shall, upon request of the owner, expropriate or buy that remaining part.

While the Royal Decree is in force, the officer or his entrusted person shall have the power to deal with the owner of, or the person who legally takes possession of, immovable property to be expropriated with a view to buy that immovable property, to negotiate the price of, or compensation to be paid for, that immovable property, and to buy or pay compensation in accordance with the procedure to be mentioned. That price or compensation shall not exceed the price appraised by the Committee. If the deal to buy immovable property is agreed upon, but not the amount of compensation, the owner of, or the person who legally takes possession of, that immovable property may collect the compensation in an amount equal to the price appraised by the Committee and reserve the right to appeal for more to the Minister. In this case, the officer or his entrusted person shall conclude the sale contract with such reservation and pay compensation in an amount equal to the appraised price to the owner of, or the person who legally takes possession of, that immovable property within one hundred and twenty days as from the date of the sale contract has been made. In making of the sale contract, the officer or his entrusted person shall, in the case where such immovable property is the land with title deeds, have written notice to the registrar under the Land Code for inscription of that sale into the title deeds. In this case, the registrar shall inscribe the sale in both title deeds kept at the Land Office, Amphoe Land Office or King-Amphoe Land Office and title deeds hold by the person who is entitled to that land. Such inscription shall be deemed as the registration of right and juristic



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## Laws relating to this project

### Royal Initiated Projects Relating to Water

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act under the law and this sort of inscription shall be exempted from all fees and revenue stamps. The date on which the payment is made shall be deemed the date that immovable property is transferred. The registrar shall, for the purpose of this inscription, have the power to summon the title deeds held by the owner of, or the person who legally takes possession of, that immovable property and to conduct the inscription therein. In this case, the owner of, or the person who legally takes possession of, that immovable property may submit that title deeds to such officer by hand or by registered mail.

If the officer or his entrusted person pays the price of immovable property later than the designated period or pays compensation later than the designated period, the person entitled to that price or compensation shall also be entitled to receiving interest on that price or compensation at the highest interest rate of the fixed-term account of the Government Savings Bank as of the expiry of the payment deadline.

If any work or act done on the course of expropriation causes the price of the remaining part of that immovable property goes up high, such higher price shall be deducted from the amount of compensation. In this case, it shall be deemed that that price is not greater than the amount of compensation in order to claim the differential from the owner of, or the person who legally takes possession of, immovable property to be expropriated. If immovable property has been expropriated in part and the price of the remaining goes down low, compensation to be determined shall cover the price of that remaining. The calculation for the high price under paragraph two or the low price under paragraph three shall be in accordance with the rules and procedure prescribed by the Royal Decree. If the owner of, or the person who legally takes possession of, immovable property to be expropriated, lives or runs

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## Laws relating to this project

### Royal Initiated Projects Relating to Water

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business or other legally works on the immovable property to be expropriated and such person may be susceptible to damage on the ground that he has to leave that immovable property, compensation for such damage shall also be determined.

Unless otherwise prescribed by any Act on immovable property expropriation, the followings shall be taken into the consideration in determining the amount of compensation to be paid to the entitled person: (1) commercial price of immovable property to be expropriated on the date the Royal Decree comes into force; (2) price of immovable property appraised for collection of local tax; (3) price of immovable property appraised for collection of tax on registration of right and juristic act; (4) conditions and location of that immovable property; (5) objectives and purposes of such expropriation; such regard shall be had to in order for balancing of justification between the right of individual who has been expropriated and public benefit.

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3.  
**Enhancement and  
Conservation  
of the National  
Environmental  
Quality Act,  
B.E. 2535 (1992)**

The Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992) stipulates that the Minister shall, with the approval of the National Environment Board, have the power to prescribe categories and sizes of projects or activities of a government agency, a state enterprise, or a private entity that produce impact on the environment and for which a report on environmental impact assessment is required in order to submit for approval. In the case where an environmental impact assessment has already been prepared for a project or activity of a particular category or a particular size, or for an area in which a project or activity is to be realised, and such assessment can be used as a standard of assessment applicable to the project or activity of the same category or size or to the project

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## Laws relating to this project

### Royal Initiated Projects Relating to Water

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or activity in an area of similar characteristics, the project may be exempt from an environmental impact assessment. Nevertheless, the proponent of such project or activity shall express its consent to act in compliance with various measures prescribed in the environmental impact assessment. In the case where the project is being undertaken by a government agency, a state enterprise, or a project or activity jointly undertaken with a private entity, an environmental impact assessment report from the stage of a feasibility study must be prepared for approval. The Council of Ministers may also request a person or institution, being an expert or specialising in the environmental impact assessment, to study and submit a report or opinion for its consideration thereof. With regard to projects or activities of a government agency or a state enterprise, the agency responsible for such project or activity shall prepare the environmental impact assessment report so as to submit for approval prior to the initiation of such project or activity. In the case where a project or activity of which an environmental impact assessment report is required is a project or activity that must receive official approval prior to construction or operation according to the laws related thereto, the person applying for permission shall submit the environmental impact assessment report to the competent authority under such law and to the Office of Natural Resources and Environment Policy and Planning. Such report may be made in the form of a preliminary environmental impact report. The official having the power to grant permission according to the law shall withhold the granting of permission for the project or activity until being informed of the result of the examination of the environmental impact assessment report by the Office of Natural Resources and Environment Policy and Planning. If the Office of Natural Resources and Environment Policy and Planning deems that the report as submitted is not accurate pursuant to the



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## Laws relating to this project

### Royal Initiated Projects Relating to Water

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criteria and procedures, or that the documents and data therein are incomplete, the Office of Natural Resources and Environment Policy and Planning shall notify the applicant within fifteen days from the date of receiving such report. In the case that the environmental impact assessment report and related documents submitted are deemed as accurate and complete, or have been duly amended, the Office shall review and make preliminary comments on the report within thirty days from the date of receiving such report so as to refer such report to the expert committee for further consideration. The committee shall be composed of experts or specialists in related academic disciplines. The competent authority having the power to grant permission for the project or activity under review, or its representative, shall be included as a member. The examination by the expert committee shall be carried out within forty-five days from the date of receiving the environmental impact assessment report from the Office of Natural Resources and Environment Policy and Planning. If the expert committee fails to complete the examination within such duration, the report shall be deemed approved, and the competent authority shall grant permission to the applicant. In the case where the expert committee disapproves, the competent authority shall withhold the granting of permission to the applicant until such applicant resubmits the environmental impact assessment report as amended or entirely revised in accordance with the guidelines or details as determined by the expert committee. When such applicant has resubmitted the environmental impact assessment report that has been amended or entirely revised, the expert committee shall complete the examination within thirty days from the date of receiving the resubmitted report. If the expert committee fails to complete the examination within such duration, the report shall be

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## Laws relating to this project

### Royal Initiated Projects Relating to Water

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#### 4. Announcement of the National Peacekeeping Council No. 44, announced on 24 February B.E. 2534 (1991)

deemed approved by the expert committee and the competent authority shall grant permission to the applicant.

The Announcement of the National Peacekeeping Council No. 44, announced on 24 February B.E. 2534 (1991) made amendments to the Immovable Property Expropriation Act. The Immovable Property Expropriation Act, B.E. 2530 (1987) stipulates that an appraisal of the price of immovable property for collection of local tax or for collection of tax on registration of right and juristic act shall be determined on whichever is higher. Other criteria shall be taken into account for greater fairness. Nowadays, the economic situation has changed rapidly, with land prices hiking so much that the owner of the land to be expropriated perceives the deal is unfair. Therefore, for greater fairness to the owner of immovable property to be expropriated, the price of immovable property and amount of compensation can be adjusted accordingly.

If it appears to the Minister having charge and control of the execution of the Royal Decree that the land price goes up high after the appraised price of the land to be expropriated, wholly or partly, has been notified and the price of immovable property paid by the officer or the price of immovable property appraised and notified by the Committee becomes unfair to the person, the Minister shall, with approval of the Council of Ministers, order the Committee to justify the price of immovable property or the appraised price in accordance with the rules and conditions approved by the Council of Ministers. The justified price of immovable property shall be deemed the sale price as agreed upon and the justified price shall be deemed the price appraised by the Committee as the case may be. The officer or his entrusted person

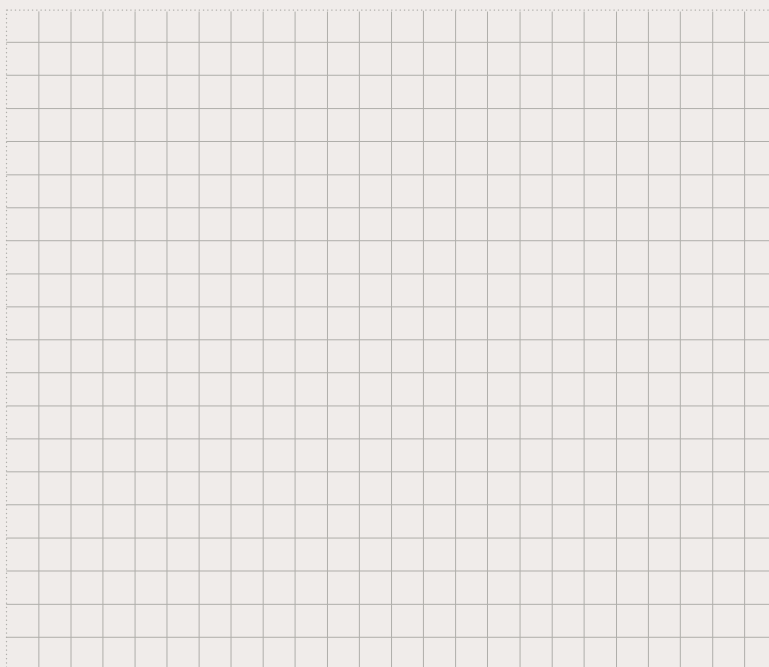
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### Laws relating to this project

#### Royal Initiated Projects Relating to Water

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shall have written notification; within one hundred and twenty days as from the date the justified price has been published, to the entitled person to collect the additional price. Once any person has already enjoyed the justification of the price, the order to re-justify the price for that person shall not be made. The person entitled to compensation who is not satisfied with the price of immovable property or the amount of compensation determined by the Committee may appeal to the Minister having charge and control of the execution of the Royal Decree or the Minister having charge and control of the execution of the Act on immovable property expropriation within sixty days as from the date he receives the written notice from the officer or his entrusted person to collect that compensation.



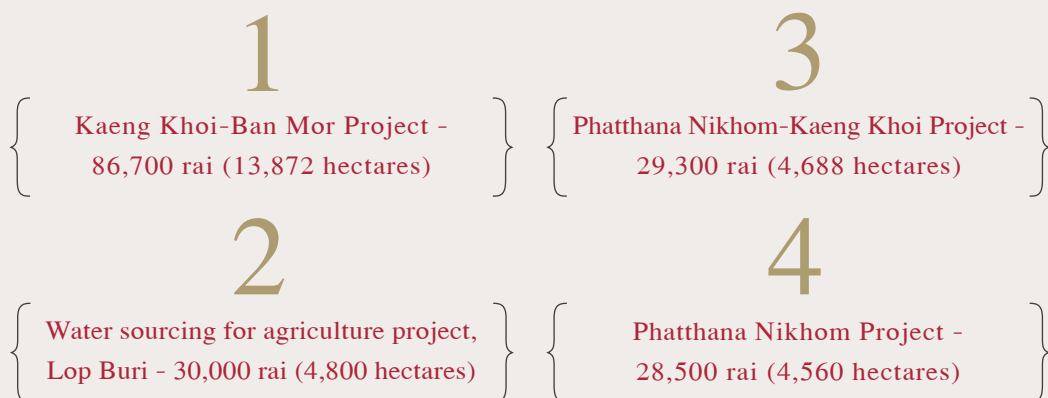


### Project Outcome

Pasak Jolasid Dam under Royal Initiative is capable of holding a maximum of 960 million cu.m., while it receives an annual average of 2,932 million cubic metres of water, 78 percent of which is from the riverine flow during the rainy season (July-December). The Pasak Jolasid Dam under Royal Initiative can therefore handle a total of 699 million cu.m. of water per year for utility and consumption, agriculture, irrigation, industry and ecological preservation on the east side of the lower Pasak River Basin and lower Chao Phraya River Basin. It provides a total of 840 trillion cu.m. water for agriculture in the newly irrigated areas of Lop Buri and Saraburi provinces comprising 174,500 rai (27,920 hectares) of farmland: 1) Kaeng Khoi-Ban Mor project 86,700 rai (13,872 hectares); 2) Water sourcing for agriculture project, Lop Buri 30,000 rai (4,800 hectares); 3) Phatthana Nikhom-Kaeng Khoi Project 29,300 rai (4,688 hectares); and 4) Phatthana Nikhom Project 28,500 rai (4,560 hectares).

The Pasak Jolasid Dam under Royal Initiative provides a supplementary source of water for original irrigation project areas of 2.2 million rai (352,000 hectares) in the lower east Chao Phraya Basin, reducing the need to use water from the Chao Phraya River. Water is drawn directly from the Pasak River for farmlands in Lop Buri and Saraburi, helping to reduce water shortage, and increasing the effective use of water supply. Meanwhile, it also helps to reduce the risk of flooding in the Pasak River Basin in Lop Buri and Saraburi provinces, decreasing the level of flooding by 10 - 25 centimetres, and between 2 - 10 centimetres in the lower Chao Phraya River Basin in Ayutthaya, Pathum Thani, Nonthaburi and Bangkok, thereby massively lessening economic losses for Thailand.

Pasak Jolasid Dam under Royal Initiative helped to stabilise the utilisation of water for consumption and industry purposes, which were secondary to water for agricultural purposes. This comprised pipelines to the



municipal water supply treatment plant and for factories in Lop Buri and Saraburi provinces. This led to an increase in industrial activities in the area. It also became a large area of fish farms and fisheries, due to the flat surface of the dam, allowing sunlight and oxygen to reach all areas of the dam, creating a perfect environment for the propagation of fish and other aquatic creatures. Surveys conducted by the Faculty of Fisheries, Kasetsart University, have discovered some 130 species of fish in the dam, with 52 new species in addition to the original 80 species, making Pasak Jolasid Dam under Royal Initiative one of the country's newest significant fisheries, creating new occupations and incomes for surrounding residents, and preserving the area's ecological balance.

The effect of the Pasak Jolasid Dam under Royal Initiative led to an accumulation of artesian water in surrounding areas as well as below the dam, which also benefited local villagers for their utility, consumption and agriculture. The increased moisture was good for reforested areas. The dam also became a tourist attraction, as the large body of water resembled a lake. A new railway line that went past the dam also helped boost tourism.

On both sides of the road to Pasak Jolasid Dam under Royal Initiative were sunflower fields which bloomed from November to January, adding to the attraction of the area for visitors. In total, the Pasak Jolasid Dam under Royal

Initiative generated a gross benefit of 49,788.51 million baht, with a profit to investment ratio of 1.39, and a rate of return of 16.75 percent. This benefit might have been as high as 63,701.24 million baht with a sustained project development and management plan.

From interviews with Mr. Pramote Maiklad, former Director General of the Royal Irrigation Department, on 29 July 2016, and with the current Director General Mr. Suthep Noipairoj on 8 August 2016, it was evident that the Pasak Jolasid Dam under Royal Initiative was a multi-purpose dam with a large-scale water management system. It was significant for the Pasak and Chao Phraya river basins by helping to effectively prevent both flooding and drought as well as the problem of stagnant water in the Rangsit plain, as well as being used for fish farming.

Its success grew out of the integrated efforts of various sectors. The construction of the Pasak Jolasid Dam under Royal Initiative was carried out in the flatlands, affecting large numbers of residents, providing a challenge for construction and land expropriation. This required the combined efforts of many different sectors - public, private as well as the general public - right from the start of the project, to achieve full integration and success. Several committees were set up, such as the Committee for the Management of the Pasak River Basin Development Project under Royal Initiative, chaired by the Prime Minister, with the

1

The Sub-Committee for Public Relations and Public Awareness chaired by the Permanent Secretary of the Office of the Prime Minister

4

The Sub-Committee for Transportation Route Adjustment chaired by the Permanent Secretary of the Ministry of Transport

2

The Sub-Committee for Land Acquisition chaired by the Permanent Secretary of the Ministry of Interior

5

The Sub-Committee for Irrigation Construction chaired by the Permanent Secretary of the Ministry of Agriculture and Cooperatives

3

The Sub-Committee for Resettlement of the Displaced chaired by the Permanent Secretary of the Ministry of Agriculture and Cooperatives

6

The Sub-Committee for Environmental Rectification and Development chaired by the Permanent Secretary of the Ministry of Science, Technology and Environment

responsibility of supervising the work of six sub-committees responsible for different fields. These are the Sub-Committee for Public Relations and Public Awareness chaired by the Permanent Secretary, Office of the Prime Minister; Sub-Committee for Land Acquisition chaired by the Permanent Secretary of Interior; Sub-Committee for the Resettlement of the Displaced chaired by the Permanent Secretary of Agriculture and Cooperatives; Sub-Committee for the Transportation Route Adjustment chaired by the Permanent Secretary of Transport; Sub-Committee for Irrigation Construction chaired by the Permanent Secretary of Agriculture and Cooperatives; and Sub-Committee for Environmental Rectification and Development chaired by the Permanent Secretary of Science, Technology and Environment.

An operations centre was also set up, with Mr. Pramote Maiklad, member and secretary of the Executive Committee for the Management of the Pasak River Basin Development Project under Royal Initiative, as director of the centre.

The Pasak Jolasid Dam under Royal Initiative project complied with the geo-social environment, was constructed to utilise the full potential of the river basin, and also conformed to the theory of hydrology and available technology. It was also suitable for the local natural environment. King Bhumibol Adulyadej advised the project and also followed up through the entire process, with the aim that the dam would be able to store water within five years (or by 1999). Since then, he continued to follow up on the operations of the dam.





*His Majesty King Bhumibol Adulyadej presided at the foundation stone laying ceremony for Khun Dan Prakan Chon Dam, Nakhon Nayok Province, on 2 June 2001.*

## The Khun Dan Prakan Chon Dam Project under Royal Initiative

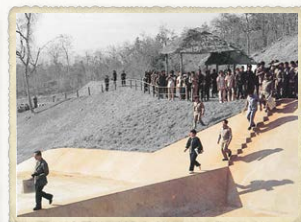
### Planning Phase

On 4 December 1993, His Majesty King Bhumibol Adulyadej shared his royal initiative with the Royal Irrigation Department on the planning and construction of the Khlong Tha Dan Dam, Ban Tha Dan Village, Hin Tang Sub-district, Mueang District, Nakhon Nayok Province. This was part of the Nakhon Nayok River Basin Development Project that would allow people living downstream from the dam, who formerly had only degraded soil and rainwater for farming, to have access to water for agriculture, utility, consumption and industry. It would also solve problems of acid soil and annual floods in Nakhon Nayok.

The government at the time assigned the Ministry of Agriculture and Cooperatives,

with the Royal Irrigation Department as the task leader, to carry out His Majesty's royal initiatives. The construction of Khlong Tha Dan Dam began on 6 May 1999. His Majesty King Bhumibol Adulyadej, accompanied by Her Royal Highness Princess Maha Chakri Sirindhorn laid the foundation stone on 2 June 2001. The construction of the dam was completed in December 2004, taking five years. Water retention in Khlong Tha Dan Dam began during the rainy season of 2002. On 5 June 2006, His Majesty King Bhumibol Adulyadej bestowed the name "Khun Dan Prakan Chon Dam, meaning "Khun Dan Dam: the water wall."

Prior to the construction of the Khun Dan Prakan Chon Dam under Royal Initiative, a thorough feasibility study of suitability and environmental impact was conducted.



*“Khun Dan Prakan Chon”  
literally means Khun Dan Dam  
that is a water barricade.*

On 5 June 2003, His Majesty  
King Bhumibol Adulyadej  
bestowed the name  
“Khun Dan Prakan Chon Dam.”

The study covered details in every dimension, from climate and hydrology to ecology of the surrounding environment, together with strategies to combat all impacts, as well as compensation for land and assets. Only then did construction begin, starting with the dam and appurtenant structures, using technology and materials that were suitable for the particular environment and usage. After completion, maintenance had to be carried out regularly and professionally to ensure the stability of safety of the dam. It was also necessary to have an effective water

management system to maximise the use of water. A potential environmental impact assessment was also conducted to plan the resettlement of local villagers and wildlife.

#### Approval Phase

After the Cabinet resolution on 13 February 1996 to proceed with the construction of the Khlong Tha Dan Dam under Royal Initiative, the Office of the Prime Minister issued an order No. 55/1997, dated 4 February 1997, appointing the Executive Committee of the Khlong Tha Dan Dam under Royal Initiative to supervise and advise on all aspects of the dam, with four sub-committees.

#### Land Acquisition Phase

The land making up the Khun Dan Prakan Chon Dam under Royal Initiative comprised 490 plots covering 3,030 rai 1 ngan 58 square wah.



*Reservoirs are a fish propagation centre and fishing centre for fresh water fish, giant freshwater prawns, yielding 58 tons a year.*



(485 hectares). But since the government was not able to acquire land for the resettlement of the people, the Cabinet resolution of 30 November 1999 approved the payment of compensation as a special case instead of providing resettlement for residents who met the criteria. This comprised 246 households, amounting to 57.47 million baht. For a total of 27 households who owned houses but no farmland, were impacted by the project, but did not meet the criteria for compensation, the Nakhon Nayok provincial authorities, together with the Royal Irrigation Department, contacted Wat Nang Rong temple, requesting that 17 households be allowed to rent 200 square wah of land each for the residential purposes at Ban Tha Chai Village, Moo 4, Hin Tang Sub-district, Mueang District, Nakhon Nayok.

The authorities would install electricity and supply some construction materials, and also support them to do mixed-crop farming instead foraging on the hillside for things to sell, which was illegal.

The Royal Irrigation Department requested permission to build the Khun Dan Prakan Chon Dam under Royal Initiative on National Park land from the Royal Forest Department (now the Department of National Parks, Wildlife and Plant Conservation). The National Park Committee thus issued a resolution to revoke no more than 1,939 rai (310 hectares) of land in the Khao Yai National Park. Then the Cabinet issued a resolution dated 3 March 1998, giving approval for the Royal Irrigation Department to use that land to build the dam.





*Map indicating the location of the  
Khun Dan Prakan Chon Dam  
under Royal Initiative project*



When the construction of the Khun Dan Prakan Chon Dam under Royal Initiative was completed in 2004, the Royal Irrigation Department submitted a letter dated 11 January 2008 to the Department of National Parks, Wildlife and Plant Conservation, reverting 1,042 rai 1 ngan 88 square wah (167 hectares) of land in Khao Yai National Park to be used as a national park. The Royal Irrigation Department had set aside 882 rai 3 ngan 85 square wah (141 hectares) in the area of the dam crest, the royal pavilion and the front side of the dam for a length of 1 kilometre as an area for dam safety examination, maintenance and water management.

#### Construction Stages

The crest of the Khun Dan Prakan Chon Dam under Royal Initiative is 2,594 metres in length,

or almost 3 kilometres. The dam body is 93 metres high, and retains a total of 224 million cubic metres. It is a Roller Compacted Concrete (RCC) Dam which combines two types of construction technology - for an earth dam and a concrete dam. The construction process used low water concrete as the main material, while the technique of compacting into layers used for earth dams helped to reduce construction time, being ten times faster than using concrete. This dam was the longest RCC dam in the world at the time (2006). Significantly, during the construction process, ash mixed with lignite from the Mae Moh Lignite Power Plant in Lampang Province was used, which was a form of recycling discarded but strong materials, enhancing the strength and endurance of the dam.



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## Laws relating to this project

### Khun Dan Prakan Chon Dam under Royal Initiative

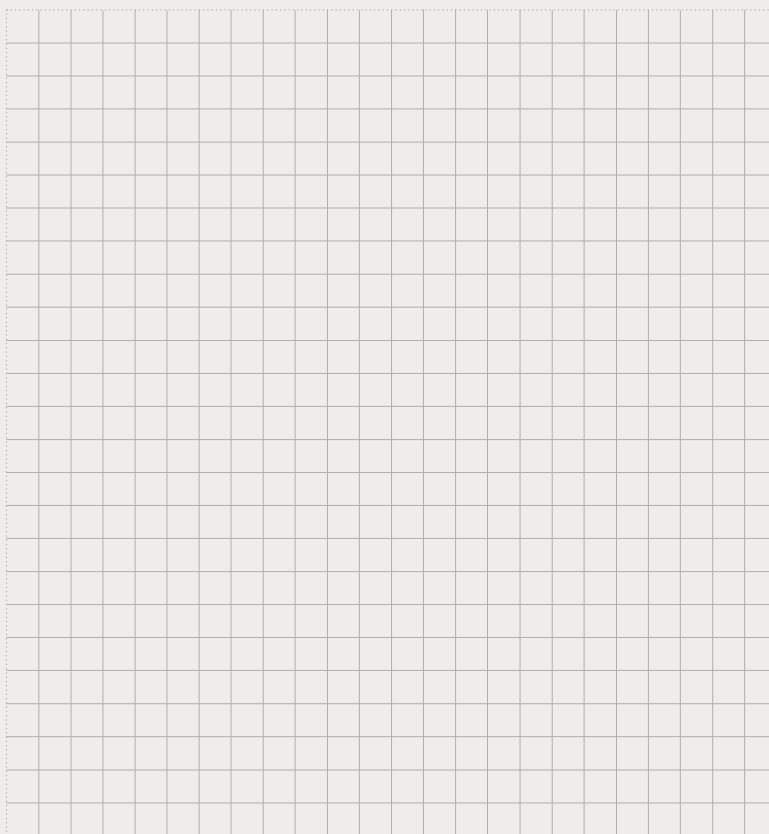
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Laws relating to and supporting the project are as follows:

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#### Royal Irrigation Act, B.E. 2485 (1942)

The Royal Irrigation Act, B.E. 2485 (1942), the Expropriation of Immovable Property Act, B.E. 2530 (1987), Announcement of the National Peacekeeping Council No. 44 dated 24 February 1991 on the amendments to Expropriation of Immovable Property laws, and the Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992) which have earlier been referred.



### Project Outcome

The Khun Dan Prakan Chon Dam under Royal Initiative is the largest roller compacted concrete (RCC) dam in Thailand. It is 93 metres in height high, 2,594 metres in length with a crest of + 112 metres wide. The water storage area covers an area of 3,087 rai (494 hectares) with storage capacity of 224 million cubic metres. Water storage began in October 2004, and soon became a major source of water with an efficient irrigation system to manage and distribute water for various activities in the Nakhon Nayok River basin and surrounding areas.

The Khun Dan Prakan Chon Dam under Royal Initiative supplies water to an area of 185,000 rai (29,600 hectares), which is divided into 1) agricultural land in Nakhon Nayok - 165,000 rai (26,400 hectares) in the rainy season, and 42,000 rai (6,720 hectares) during the dry season; 2) agricultural land in Tha Dan - 20,000 rai (3,200 hectares). Crops cultivated include rice, fruit (pomelo, Marian plum, mangosteen, mango, sweet yellow Marian plum etc.), and vegetables (sweet corn, gourd, chilli, kale etc.). It also helps to prevent floods along both banks of the Nakhon Nayok River, with a 35 percent reduction in damages, valued at 30 million baht per annum. The eco-social environment of the people in the area improved as a result.

The Khun Dan Prakan Chon Dam under Royal Initiative has a water management system that

provides enough water for the entire season. It relieves drought, allowing annual rice crops to grow as scheduled. Former paddy-sown rice could be changed to transplanted rice, increasing the area of rice fields by over 100,000 rai (16,000 hectares). People living in the area of Nakhon Nayok and the irrigated area now have water for general use as well as for industry.

Increased access to water allows for greater variety of crops, and fishing also has become a new occupation earning money for villagers. The dam creates a source for fish breeding and fishing, with freshwater fish and giant freshwater prawns of approximately 58 tons a year. This helps reduce household expenses provides more income, promotes occupations both within and outside the agricultural field, the development and preservation of the natural environment, eco-tourism, and helps improve general well-being. The development of fishing sources and livestock also contribute to a reduction in household expenses.

The water from the Khun Dan Prakan Chon Dam under Royal Initiative helps maintain the level of underground water, and helps soil to retain moisture. Problems with acidic soil have been overcome in over 100,000 rai (16,000 hectares) as a result of the increased availability of water to clean the soil and increase moisture. The pyrite in the soil does not come into contact with the air and does not produce sulphuric

acid, making the soil more fertile. Organic fertiliser was used which increased yield and also protected the ecology of the Nakhon Nayok River. It also helped push back a total of 2 million cubic metres of sea water between January and April. The plan calls for 20 million cubic metres of water to be drained to help farmers along the irrigation canals on both sides of the Nakhon Nayok River, and another 40 million cubic metres for drought relief and to protect the ecological system and push back the sea water that flows up the Prachin Buri River back into the Bang Pakong River and into the sea at Chachoengsao Province.

The drainage of 1 million cubic metres of water per year from the Khun Dan Prakan Chon Dam under Royal Initiative into the river has also indirectly helped to promote tourism, since visitors can ride the rapids all year round (compared to 4 - 5 months per year prior to dam construction). The landscape around the dam has also promoted tourism, with more accommodations, restaurants and other tourism-related services. Residents of the area now have a better quality of life.

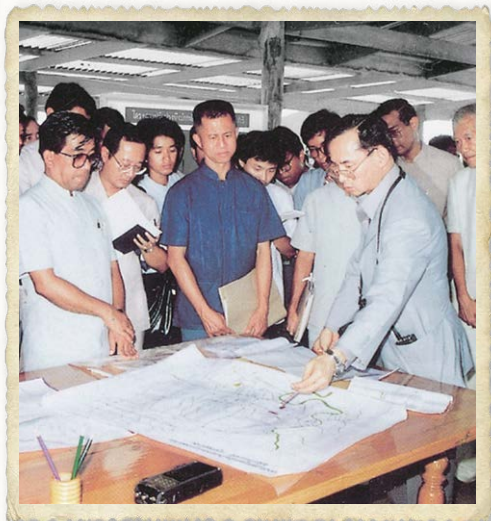
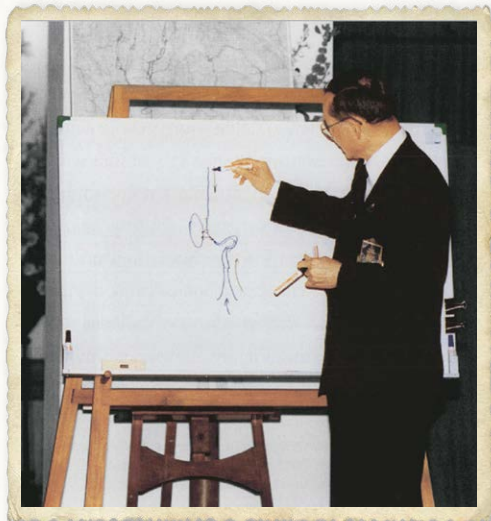
In an interview with Mr. Pramote Maiklad, former Director-General of the Royal Irrigation Department, on 29 July 2016, and Mr. Suthep Noipairote, Director-General of the Royal Irrigation Department, on 8 August 2016, it was revealed that the construction of the Khun Dan Prakan Chon Dam under Royal Initiative as a roller compacted concrete (RCC) dam was an extremely complex engineering feat. It is one of the largest and longest roller compacted concrete (RCC) dams in the world. Due to the fact that the area had very little soil, there was a need for roller compacted concrete which came from lignite ash. The project has proven successful and could solve problems of flood, drought and acidic soil in Nakhon Nayok and Bang Pakong.

The key to success was due to the perfect selection of location by King Bhumibol Adulyadej. Being on the edge of Khao Yai National Park, made the study and analysis of the project straightforward, kept the construction cost down, yet contributed to its success in solving problems of flood and drought for the Nakhon Nayok River basin. It was truly worth the investment.



King Bhumibol Adulyadej  
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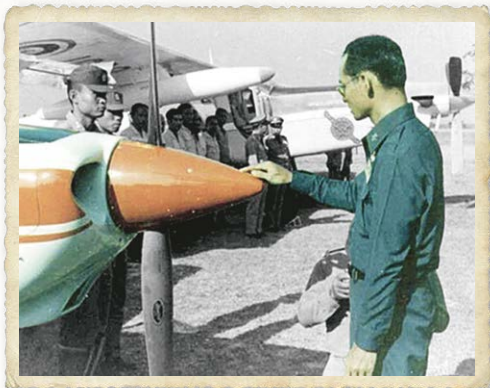
### Royal Rainmaking Project

His Majesty King Bhumibol Adulyadej's note "The Rainmaking Story," which he handed to Mr. Metha Rajatapiti through His Majesty's Private Affairs Division on 30 April 2000, provided background information on sources and starting point of the Royal Rainmaking Project:

Between 2 and 20 November 1955, the King visited 15 northeastern provinces. On 14 November 1955, he travelled by car (a green Delahaye sedan) from Nakhon Phanom to Kalasin via Sakon Nakhon and the Phu Phan Mountains. He made a scheduled stop at the intersection of Kuchinarai and Sahatsakhan districts, where he questioned villagers about their rice harvests. He believed that the drought must

have adversely affected them, but he was surprised to hear that they suffered more from floods. He found that unusual because the surrounding terrain looked like dusty desert. In fact, the villagers suffered from both floods and drought, and that was a reason why the northeasterners were so impoverished.

One main problem was that the entire northeastern region was widely known for being dry and arid. At that moment, His Majesty looked up at the sky and saw a lot of clouds, but soon they were all blown away from the dry area. How could the clouds be brought together and induced to rain in that area? His Majesty wrote that this was the inspiration for the Artificial Rainmaking Project (officially



*Aerial trials began on 19 - 20 July 1969  
at Nong Taku Airport,  
Khao Yai National Park,  
Pak Chong Khao Yai District,  
Nakhon Ratchasima Province.*



*"Royal Rain" was  
a royal initiative  
derived from various  
research studies  
on artificial rain  
conducted by  
different countries.*



*The Royal  
Rainmaking  
insignia*

renamed the Royal Rainmaking Project in 1974) which not long after became a success.

Not only did King Bhumibol Adulyadej come up with an idea, but he put it into action to achieve tangible results. When he returned to Bangkok, he called in M.R. Theparit Devakul, a well-known engineer who had invented the tractor, and explained his idea. M.R. Theparit promised he would study this issue immediately. His Majesty also instructed Privy Councillor M.L. Dej Snidvongse to give to M.R. Theparit the research documents that he had already studied as reference.

Years later, M.R. Theparit Devakul came back with his initial ideas for a possible aerial

trial. Responsible for putting this into action were Dr. Sawaeng Kulthongkham, Permanent Secretary of the Ministry of Agriculture and Cooperatives, and M.C. Chakrabandhu Pensiri Chakrabandhu, Director-General of the Rice Department in those days. The trial began on 19 - 20 July 1969 at Nong Taku Airport, Khao Yai National Park, Pak Chong Khao Yai District, Nakhon Ratchasima Province.

The "Royal Rain" was therefore a royal initiated project that grew out of academic studies on artificial rain conducted by various countries such as the US, Australia and Israel, with His Majesty the King providing his input throughout the process. Later, a government office, the Royal Rainmaking Operations



*The Patent Office, Department of Intellectual Property, Thailand, presented King Bhumibol Adulyadej with a patent for his Royal Rainmaking Project on 29 November 2002.*



*World Intellectual Property Organization (WIPO) presented King Bhumibol Adulyadej with a Global Leaders Award on 29 January 2007. The award recognised His Majesty as an inventor and artist, and a strong advocate of intellectual property, which have been put to practical use in a range of rural development projects in Thailand.*



*On 20 August 2002, the Cabinet proclaimed King Bhumibol Adulyadej as "Father of Royal Rainmaking".*



Office was set up in 1975 to conduct rainmaking activities for the benefit of the people. The Office was upgraded and its name was changed to the Department of Royal Rainmaking and Agricultural Aviation.

King Bhumibol Adulyadej provided three guidelines for the Royal Rainmaking Project: 1) The need for a scientific approach in the project's development, improvement, operations, and evaluation, and the use of computer imaging to study cloud formations and rainmaking operations; 2) The importance of modifying the climate and artificial rainmaking as an integral part of the process of improving

water sources for public utilities 3) the need for integration between various relevant government offices which is crucial for the success of the project.

After the success of the rainmaking technology, King Bhumibol Adulyadej created a one-page manual illustrating the six stages of the Royal Rainmaking technical process and distributed to academics and those related to the Royal Rainmaking process. He also instructed that this manual be made in a portable size for academics and Royal Rainmaking pilots to ensure that the six stages of rainmaking are completely implemented.





### Stage 1: Triggering

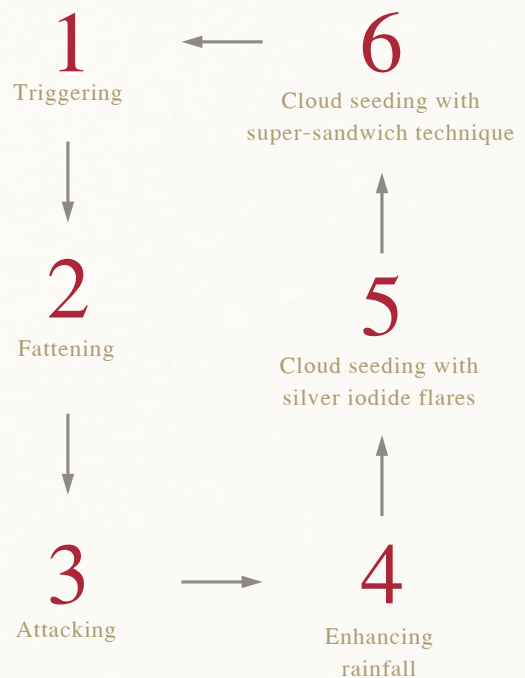
Stimulate the formation of clouds, or increase the mass of existing clouds by agitating the balance or stability of the air.

### Stage 2: Fattening

Fatten new and existing rain clouds to enlarge both the base and the height of the clouds, and also stimulate the formation of new clouds, increasing the water droplets in an artificial manner which is quicker than letting nature take its course.

### Stage 3: Attacking

When the clouds from Stage 2 have reached the target area, then choose the clouds that are most highly condensed and upwind, and accelerate rainfall by using the “sandwich technique.”





#### Stage 4: Enhancing rainfall

This is to prolong Stage 3 and increase the amount of rainfall. It also keeps the air under the clouds cool, preventing it from rising, increases the downflow of air and relative humidity, and reduces the evaporation of raindrops. This is done when the clouds from Stage 3 have travelled downwind to the target area.

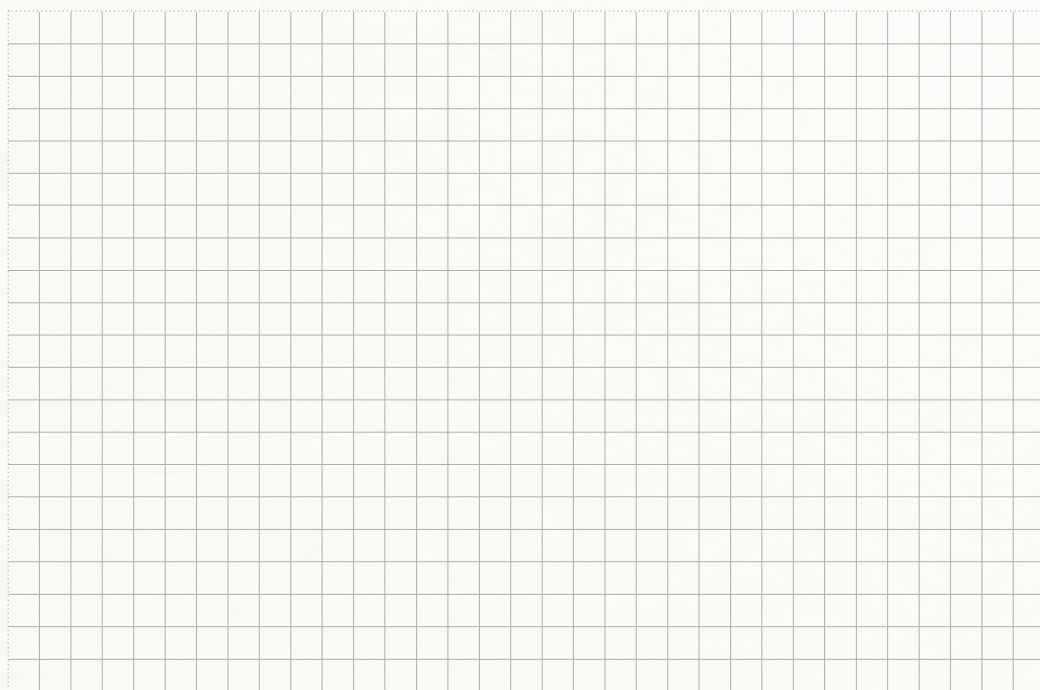
#### Stage 5: Cloud seeding with silver iodide flares

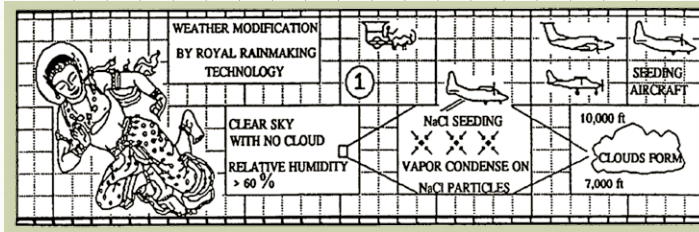
When the cloud formations from Stage 2 have moved downwind to the target area, and the top has reached over 20,000 feet (freezing

point), and shown a clear cloud formation, then silver iodide flares are ignited towards the top of the cloud to instigate a transformation within the cloud.

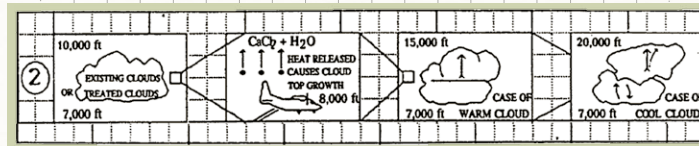
#### Stage 6: Cloud seeding with super-sandwich technique

When the cloud formations from Stage 2 have moved downwind to the target area, and the top has reached over 20,000 feet (freezing point), and shown a clear cloud formation, then stages 3-4-5 are combined to attack super-cooled clouds and warm clouds together. This combination of techniques will result in prolonged and heavy rainfall.

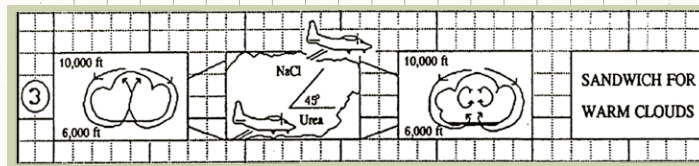




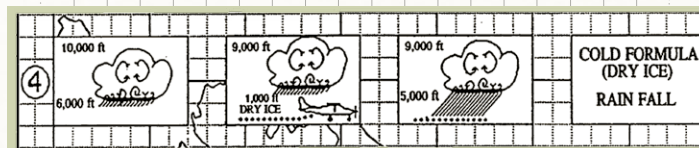
Stage 1: Triggering to stimulate the formation of clouds.



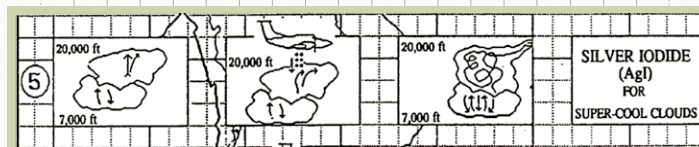
Stage 2: Fattening new and existing rain clouds



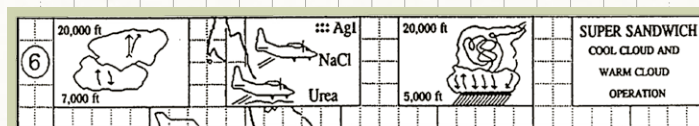
Stage 3: Attacking, accelerating rainfall by using the "sandwich technique" to increase quantity and area.



Stage 4: Enhancing rainfall, increasing the rainfall period, preventing the air from rising, increasing the downflow of air relative humidity, and reducing the evaporation of raindrops.



Stage 5: Cloud seeding with silver iodide flares to instigate a transformation within the cloud.



Stage 6: Cloud seeding with super-sandwich technique to achieve prolonged and heavy rainfall.

## Laws relating to this project

### The Royal Rainmaking Project

Laws relating to and supporting the project are as follows:

1.  
**Reorganisation  
of Ministry,  
Sub-Ministry,  
and Department  
Act (No. 10),  
B.E. 2556 (2013)**

Reorganisation of Ministry, Sub-Ministry, and Department Act (No. 10), B.E. 2556 (2013) raised the status of the Royal Rainmaking and Agricultural Aviation Bureau, under the Office of the Permanent Secretary of the Ministry of Agriculture and Cooperatives to the Department of Royal Rainmaking and Agricultural Aviation, under the Ministry of Agriculture and Cooperatives. The administrative organisation of the Department of Royal Rainmaking and Agricultural Aviation shall be in accordance with the Ministerial Regulation dividing the organisation of the Department of Royal Rainmaking and Agricultural Aviation, under the Ministerial Regulation dividing the organization of the Office of the Permanent Secretary of the Ministry of Agriculture and Cooperatives (No. 3), B.E. 2556 (2013), and the Ministerial Regulation on work clusters (No. 8) B.E. 2556 (2013), published in the Royal Gazette Issue No. 130 Section 40 A dated 9 May 2013.

2.  
**Royal Decree  
on the organisation  
of the Office of the  
Permanent Secretary,  
Ministry of Agriculture  
and Cooperatives,  
B.E. 2518 (1975)**

The Royal Decree on the organisation of the Office of the Permanent Secretary, Ministry of Agriculture and Cooperatives, B.E. 2518 (1975) established the Royal Rainmaking Operations Office under the Office of the Permanent Secretary of the Ministry of Agriculture and Cooperatives.

3.  
**Royal Decree  
on the organisation  
of the Office of the  
Permanent Secretary,  
Ministry of Agriculture  
and Cooperatives,  
(No. 2), B.E. 2535  
(1992)**

The Royal Decree on the organisation of the Office of the Permanent Secretary, Ministry of Agriculture and Cooperatives, (No. 2), B.E. 2535 (1992) raised the status to the Royal Rainmaking and Agricultural Aviation Bureau, under the Office of the Permanent Secretary of the Ministry of Agriculture and Cooperatives.

### Project Outcome

The Royal Rainmaking Project brings relief from drought during the dry season and lengthy periods of delayed rain which adversely affected crops that were just bearing fruit in provinces such as Chantaburi, Phetchaburi and Prachuap Khiri Khan. It also helps to increase water in river catchment areas with low water levels such as the Ping, Wang, Yom and Nan Rivers. It also helps to increase water levels in reservoirs and dams for the purpose of agriculture and electricity generating. This included the year of the water crisis in Sirikit Dam, Uttaradit Province. From 28 January to 28 October 1993, the last day of operations that year, the Royal Rainmaking Project increased the total amount of water in the dam from 3,497.79 million cubic metres to 4,204.18 million cubic metres providing water for a total of 216 million rai (34.5 million hectares) of farmland per year.

The Royal Rainmaking Project also improves the availability of water for public use and consumption. Water for these basic needs was greatly lacking in the northeast of the country because the sandy soil did not hold water. It also helps alleviate annual problems from haze resulting from wildfires in the north, and from increasingly heavy hail storms that caused much damage to lives and assets. The project also helps improve riverine communication channels.

Low water levels in rivers and canals adversely affected transportation by water, even in the Chao Phraya River. Since transportation by water is most cost effective, and road transportation was very inconvenient, the Royal Rainmaking project has proven very significant in raising the water level and improving the situation. The northeast, in particular, has a large area of salt deposits. Small and medium sized reservoirs do not have proper drainage systems that allow the salt deposits at the bottom to drain away. They therefore float to the top, causing brackish or salty water. This also prevents environmental degradation; if the water in the Chao Phraya River is too low, then salt water from the Gulf of Thailand will be pushed into the river, causing brackish water, destroying crops and affecting drinking water. It is therefore necessary to release water from Bhumibol Dam to push back the sea water. It also helps relieve pollution in the water caused by waste discharged into the river by humans. This water pollution is evidenced by the floating waste and difference in colour of the polluted currents from the mouth of the Chao Phraya River all the way to Ko Lan in Pattaya.

The Royal Rainmaking Project also helps alleviate other problems such as disease outbreaks, cholera, pests such as plant lice and Bombay locusts. Forests also benefit from this rainfall particularly during the dry season.



The additional moisture from the Royal Rain helped to prevent wildfires. This success of the Royal Rainmaking technology and manual became known among the international community, and various countries suffering from drought which came to seek this expertise, such as Australia, Israel and China. Further knowledge exchanges took place between countries with experience in weather modification.

His Majesty King Bhumibol Adulyadej placed a significance on the patenting this technology to ensure that the rainmaking technology belongs to Thailand, invented and developed by Thai people. He allowed the National Research Council of Thailand to register a patent both in Thailand and internationally. In Thailand, the Patent Office, Department of Intellectual Property, presented the King with a patent for “Weather Modification to Induce Rain” on 29 November 2002. On the international level, the European Patent Office presented the King with a patent for “Weather Modification by Royal Rainmaking Technology” on 12 October 2005, while the Hong Kong Special Administrative Region of the People’s Republic of China issued and presented to the King a patent on 7 April 2006.

His Majesty the King’s Royal Rainmaking Technology was well accepted among scientists

and weather modification organisations worldwide. He received numerous awards and certificates in recognition of his innovatives and inventive skills. He has been proclaimed an inventor of royal rainmaking technology, new concept and theory, that has contributed to economic, social and human development around the world.

On 18 February 1997, the World Meteorological Organization (WMO), which has 178 member countries, presented a certificate to His Majesty King Bhumibol Adulyadej in recognition of his ingenuity and skills in applying his knowledge and expertise in the field of meteorology to reduce natural disasters.

On 29 January 2007, the World Intellectual Property Organization (WIPO), with 183 member countries, presented King Bhumibol Adulyadej with a Global Leaders Award. The award recognised His Majesty as an inventor and artist, and strong advocate of intellectual property, which have been put to practical use in a range of rural development projects in Thailand, such as the Chaipattana Aerator and the Royal Rainmaking Technology.

On 20 August 2002, the Cabinet proclaimed King Bhumibol Adulyadej as “Father of Royal Rainmaking,” and that 14 November be observed as the “Father of Royal Rainmaking Day.” In 2006, His Majesty was also recognised as the “Father of Thai Inventions.”

On 26 May 2006, UN Secretary-General Kofi Annan presented the UNDP Human Development Lifetime Achievement Award to King Bhumibol Adulyadej of Thailand in recognition of the King's efforts to improve the well-being of the Thai people, with the Royal Rainmaking Project being one of the projects that benefits mankind.

In 2007, the International Federation of Inventors' Associations (IFIA), with 184 member countries, and the Korea Invention Promotion Association (KIPA) proclaimed King Bhumibol Adulyadej the "Father of World Invention", becoming the only monarch in the world to have received this accolade. The title was an acknowledgement of the King for his long-term contributions and innovations for the benefit of the Thai people and mankind in general, such as the Royal Rainmaking Project, which His Majesty, upon request, allowed to be used to help relieve drought in many countries.

In an interview on 29 July 2016, Mr. Lersak Rewtrakulpaiboon, Director-General of the Department of Royal Rainmaking and Agricultural Aviation, summarised the main points and unique aspects of this project, saying that His Majesty King Bhumibol Adulyadej studied various research papers on weather modification until he was certain that the technology for artificial rain could

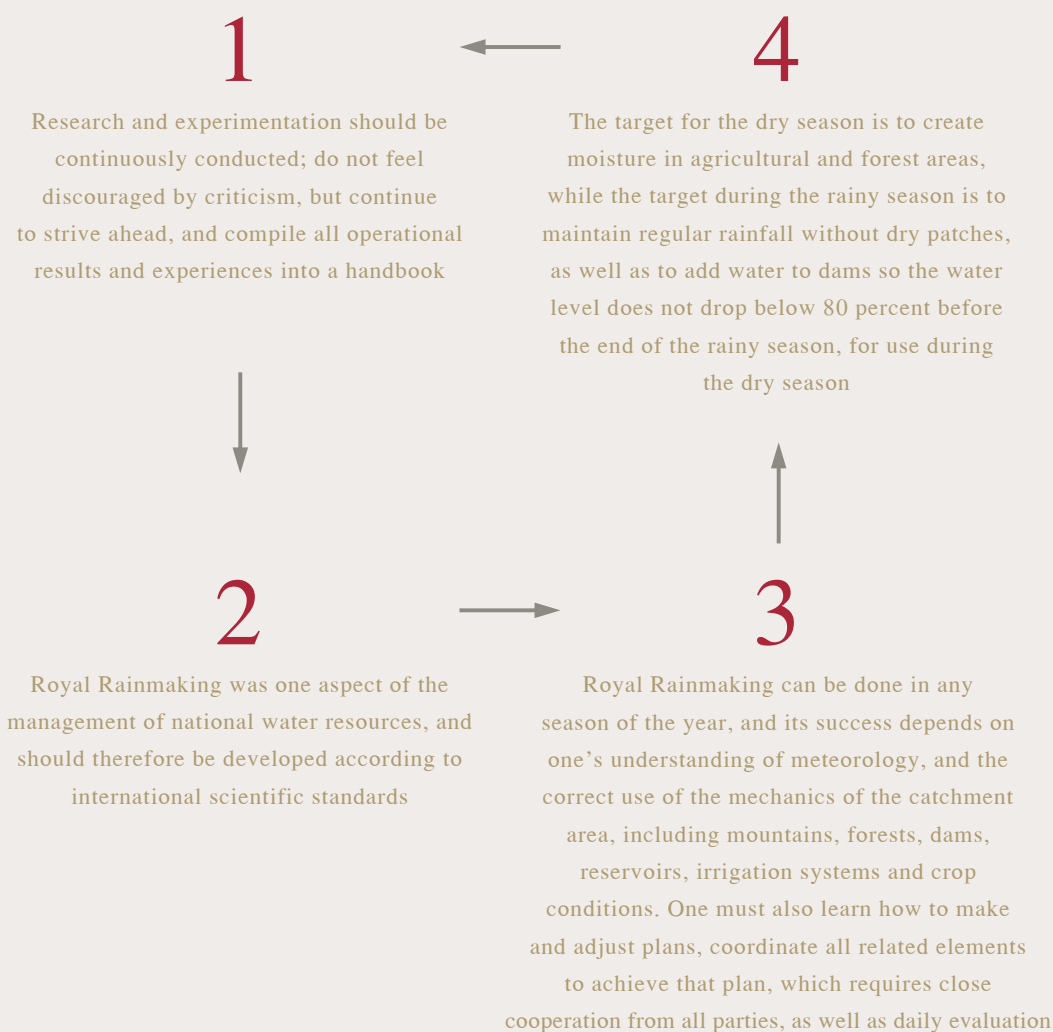
be done through scientific means. From this origin, the project was developed. This knowledge was quickly promoted among poor Thai farmers in remote and arid areas of the country. This knowledge has furthermore been disseminated to other countries which conduct weather modification activities.

The key to success of the Royal Rainmaking Project resulted from concerted cooperation between relevant government agencies as well as a strong Royal Rainmaking volunteer network, an accurate weather forecast, and sufficient equipment for aerial rainmaking that would induce rain in target areas, and a dedicated team who were ready and willing to carry out His Majesty the King's vision to help relieve drought.

His Majesty the King's directives as given to executives, academics and the operations team of the Royal Rainmaking Project can be summarised as follows: 1) Research and experimentation should be continuously conducted; do not feel discouraged by criticism, but continue to strive ahead and compile all operational results and experiences into a handbook; 2) Royal Rainmaking was one aspect of the management of national water resources, and should therefore be developed according to international scientific standards; 3) Royal Rainmaking can be done in any

season of the year, and its success depends on one's understanding of meteorology, and the correct use of the mechanics of the catchment area, including mountains, forests, dams, reservoirs, irrigation systems and crop conditions. One must also learn how to make and adjust plans, coordinate all related elements to achieve that plan, which requires close cooperation from all parties, as well as

daily evaluation, and 4) the target for the dry season is to create moisture in agricultural and forest areas, while the target during the rainy season is to maintain regular rainfall without dry patches, as well as to add water to dams so the water level does not drop below 80 percent before the end of the rainy season, for use during the dry season.

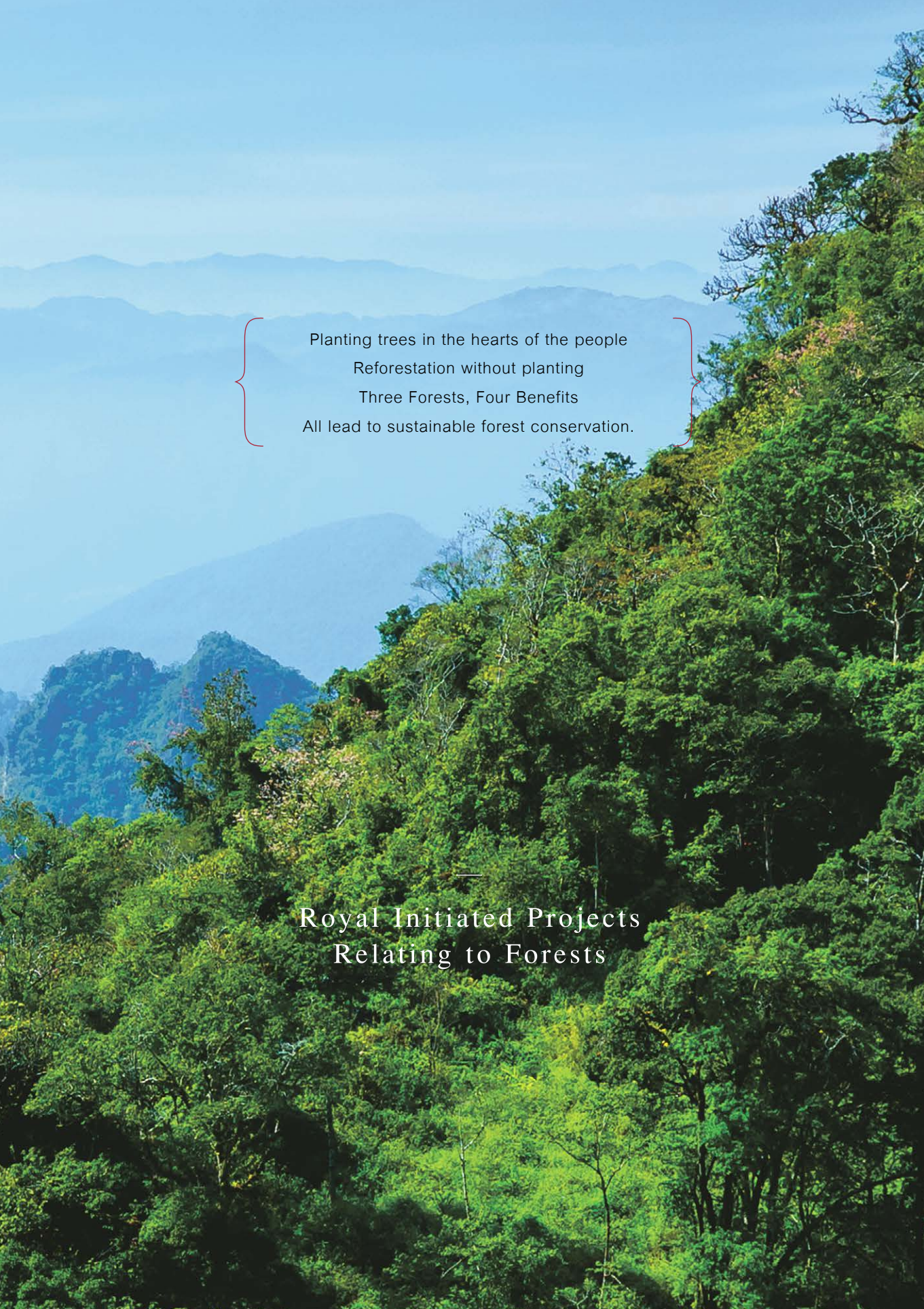


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rainmaking technology, new concept  
and theory, that has contributed  
to economic, social and human  
development around the world.



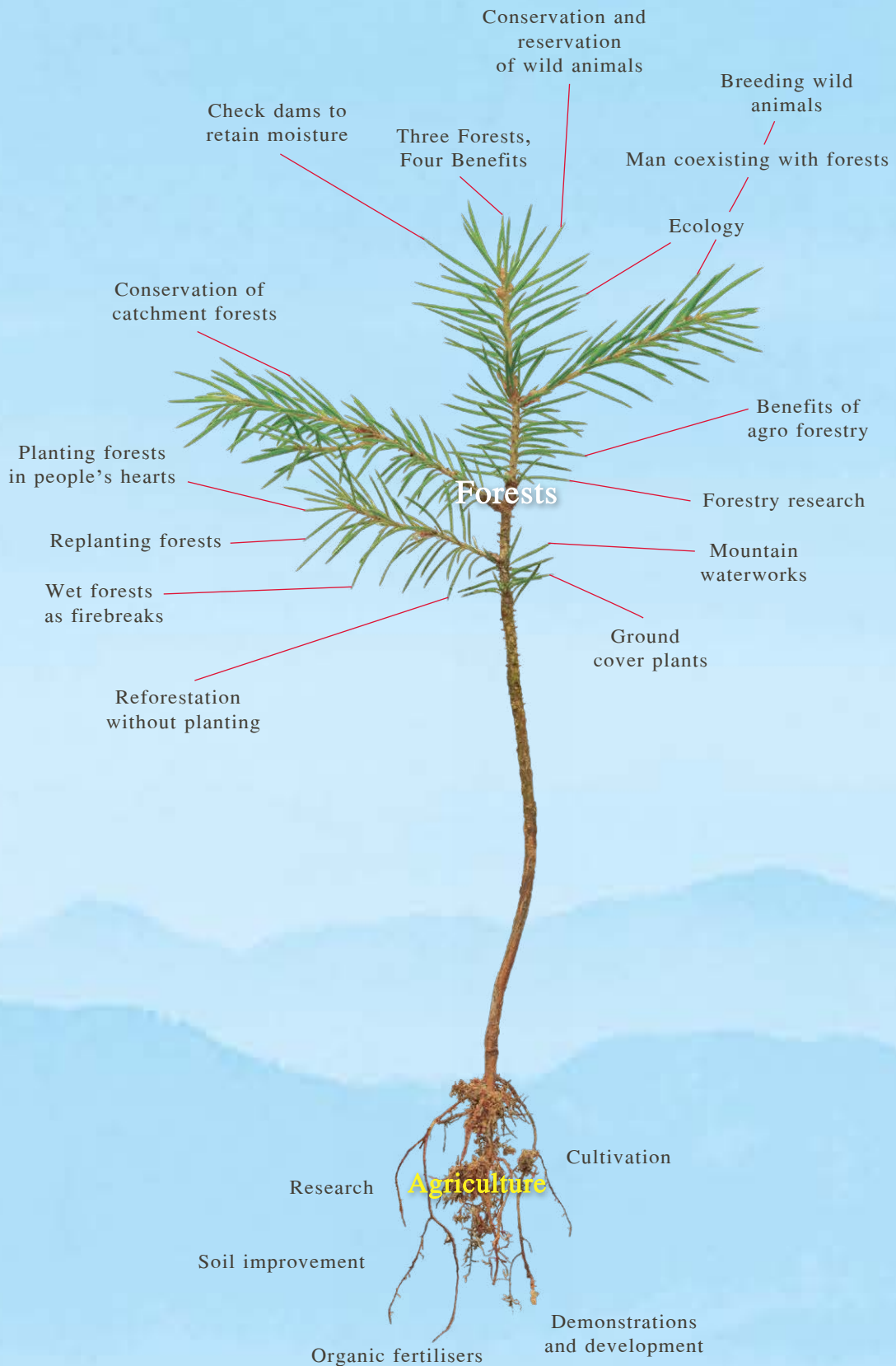






Planting trees in the hearts of the people  
Reforestation without planting  
Three Forests, Four Benefits  
All lead to sustainable forest conservation.

Royal Initiated Projects  
Relating to Forests





**Royal Initiated Projects  
Relating to Forests**

**THE WISDOM  
OF THE  
MONARCH**

Sustainable forest conservation means that man and nature must be able to coexist and be mutually dependent on each other. This is achieved through the Natural Tree Generation method which relies on the natural regeneration of forest cover, as well as the Three Forests, Four Benefits method.

His Majesty King Bhumibol Adulyadej remarked on the subject of forest development that it has to start with planting forests in the hearts of the people, instilling a conscience and awareness of the value of forests. On His Majesty's visit to Thung Jor catchment development unit in Chiang Mai in 1976, he said to forest rangers, "...Forest rangers should plant trees in people's hearts first, and these people will then plant trees in the ground, and nurture the trees on their own..." For sustainable forest conservation, man and forest must co-exist for their mutual benefits. According to His Majesty's concepts on forest conservation, this is not an independent process, but requires the integration of all relevant fields of development with an area-based approach in order to provide a sustainable ecological balance. His Majesty encouraged reforestation without planting, allowing forests to revive naturally through the natural replacement cycle, as well as the concept of "Three Forests, Four Benefits," namely fruits for consumption, construction materials, firewood, as well as preservation of soil and water catchment areas.



*(His Majesty's speech to committee members  
of Lions Club International District 310  
at Chitralada Villa on 25 September 1969)*

*“...I remember when I was 10 years old, there was a teacher at school who has passed away. He taught science and soil conservation. He made us write down that mountains needed forest cover, otherwise rain would wash away the soil into the rivers and cause damage. Mountains would be left without soil which has been washed away into the rivers. This is the principle of forest and soil conservation...”*

#### Royal Initiated Projects Relating to Forests

His Majesty King Bhumibol Adulyadej was interested in the conservation and development of natural resources and the environment ever since he was young. This is evident by his speech given to committee members of Lions Club International District 310 at Chitralada Villa on 25 September 1969:

*“...Some people may wonder why I'm interested in irrigation or forestry. I remember when I was 10 years old, there was a teacher at school who has passed away. He taught science and soil conservation. He made us write down that mountains needed forest cover, otherwise rain would wash away the soil into the rivers and cause damage. Mountains would be left*

*without soil which has been washed away into the rivers. This is the principle of forest and soil conservation, and the principle of irrigation. If we don't protect the forests high up, the entire system will suffer; mountains will disappear, silt will wash into the dams and the rivers, causing floods. I learned this since I was 10 years old..."*

The development principles of His Majesty King Bhumibol Adulyadej emphasise direct benefits for the people first and foremost, in order to alleviate their suffering and allow them to "survive with sufficiency." He also paved the way towards their "well-being" in the future. Each of the numerous Royal Initiative Projects serves different purposes, but they mostly target the livelihood of the people. Most of the Thai people are farmers, so most Royal Initiative Projects serve to develop the basic factors that help maximise productivity such as soil, water, land, capital, knowledge of agriculture, and the conservation of natural resources and the environment. His Majesty's principles always call for simplicity in the process, from the concepts to the technical elements. They have to be logical, quick and effective in solving the problems of the people, as well as sustainable.

As a result of the visits of His Majesty King Bhumibol Adulyadej and Her Majesty Queen Sirikit to remote areas, they witnessed the problems that threatened forest resources.

His Majesty's principles always call for simplicity in the process, from the concepts to the technical elements. They have to be logical, quick and effective in solving the problems of the people.

They were determined to solve these problems and return the forests to their natural conditions as in the past that would benefit the people. His Majesty the King's principles on the development of forest resources are as follows:

# 1

Royal Initiatives on  
Forest Resources Development

## Royal Initiatives on Forest Resources Development

### 1. Reforestation without planting

"Reforestation without planting" reflects His Majesty's deep understanding of nature. He promoted the idea that forests can regenerate naturally if you neither interfere with nor destroy them, intentionally or not. If left on their own, the forests will regenerate themselves. Reforestation without a true understanding such as removing rich topsoil or planting trees that are unsuited to the environment and ecology of the area destroys planted trees and the environment. This insightful quote has therefore been taken to heart by those working in the Royal

Initiated Projects. His Majesty's principles on reforestation are based upon the natural cycle of forest regeneration, as indicated in the following royal speeches

Royal speech of May 1994: *"...In fact, you don't have to do anything with deciduous dipterocarp forests and degraded forests. Tree stumps will sprout by themselves, and although they might not look beautiful, they can grow to be large trees. The ground will also have smaller plants and seeds that will also sprout by themselves. If no one intrudes and destroys them again, the forest will regenerate to its former condition..."*

*"...Do not remove the weeds, because they help prevent soil erosion and retain moisture. If you wish to plant trees, then just clear an area of 50cms in diameter and plant the seedling. The weeds will provide a cover to protect the seedling from the sun..."*

*"...Thick weed covers like grass have to be thinned before reforestation, though it is unnecessary to eliminate weeds in deciduous dipterocarp forests and catchment forests..."*

His Majesty the King's speech on the occasion of his birthday, 4 December 1994: *"... Leave forests alone for five years without doing anything. The forests will regenerate without the need to replant a single tree. Reforestation is actually just letting the forests regenerate..."*

*"...In fact, you don't have to do anything with deciduous dipterocarp forests and degraded forests. Tree stumps will sprout by themselves, and although they might not look beautiful, they can grow to be large trees. The ground will also have smaller plants and seeds that will also sprout by themselves. If no one intrudes and destroys them again, the forest will regenerate to its former condition..."*

**Royal speech of May 1994**

*"...Do not remove the weeds, because they help prevent soil erosion and retain moisture. If you wish to plant trees, then just clear an area of 50cms in diameter and plant the seedling. The weeds will provide a cover to protect the seedling from the sun..."*

*"...Thick weed covers like grass have to be thinned before reforestation, though it is unnecessary to eliminate weeds in deciduous dipterocarp forests and catchment forests..."*

*"... Leave forests alone for five years without doing anything. The forests will regenerate without the need to replant a single tree. Reforestation is actually just letting the forests regenerate..."*

*"...One can talk on endlessly about reforestation, but there's one thing I need to explain. If you have selected a suitable location, then just leave it without disturbing anything. The trees will regenerate..."*

**Royal Speech on the occasion of  
His Majesty's birthday, 4 December 1994**

*"...If you are planning reforestation, you have to think about planting trees for utility purposes, trees for fruits, and trees for fuel. This is a broad concept. Planting trees for these purposes according to analysis by the Royal Forest Department, is not actually planting forests, but rather plantations. But in the sense of conserving catchment areas, all forests, whether they are fruit plantations or trees grown for fuel, are all valid forest covers since they serve the purpose of trees, and also serve the purpose of resources as fruits for the benefit of the people..."*

*Royal speech by His Majesty King Bhumibol Adulyadej to mark the closing of the northern region agricultural seminar at the Office of the Northern Region Agriculture, Chiang Mai Province, on 26 February 1981.*

*"...The concept of Three Forests -- fruits for consumption, construction materials and firewood -- is well understood by the people, both those who live on the mountains and those who live in the plains. They have the knowledge, and they have led this existence for generations. They have done well, and they are intelligent. They know where they should grow crops, and where they should conserve the trees. The forests are lost because of those who don't understand, those who have not led this existence for a long time, who have left farming behind them, and no longer have this intuitive understanding. They have come to live in areas with convenience, and have therefore forgotten that life can survive with proper agriculture..."*

*"...One can talk on endlessly about reforestation, but there's one thing I need to explain. If you have selected a suitable location, then just leave it without disturbing anything. The trees will regenerate..."*

## 2. Three Forests, Four Benefits

His Majesty King Bhumibol Adulyadej gave a speech to mark the closing of the northern region agricultural seminar at the Office of the Northern Region Agriculture, Chiang Mai Province, on 26 February 1981: *"...If you are planning reforestation, you have to think about planting trees for utility purposes, trees for fruits, and trees for fuel. This is a broad concept. Planting trees for these purposes according to analysis by the Royal Forest Department, is not actually planting forests, but rather plantations, But in the sense of conserving catchment areas, all forests, whether they are fruit plantations or trees grown for fuel, are forests, and also serve the purpose of resources as fruits for the benefit of the people..."*

*"...The concept of Three Forests -- fruits for consumption, construction materials and firewood -- is well understood by the people, both those who live on the mountains and those who live in the plains. They have the knowledge, and they have led this existence for generations. They have done well, and they are intelligent. They know where they should*



*grow crops, and where they should conserve the trees. The forests are lost because of those who don't understand, those who have abandoned this way of living for a long time, who have left farming behind them, and no longer have this intuitive understanding. They have come to live in areas with convenience, and have therefore forgotten that life can survive with proper agriculture..."* The fourth benefit is an important factor -- the conservation of soil and catchment areas.

### 3. Check dams to retain moisture

The use of check dams to retain moisture is another of His Majesty the King's royal initiatives. This method which helps to retain moisture in the forests through very simple means, is inexpensive yet effective. The idea is to build small check dams that blend in with the natural surroundings, using local materials that can be found in the area. There are two kinds of check dams: 1) check dams at the source of waterways to retard the flow of water, allowing the soil in the surrounding area to retain moisture, and 2) check dams that block the flow of sediment and sand, preventing them from flowing downriver. Both kinds of check dams are able to create and retain moisture in a holistic manner, reducing soil erosion and the velocity of water in the stream, helping to revive and conserve surrounding forests effectively.

## 2

{ His Majesty the King's principles  
on wildlife conservation }

### His Majesty the King's principles on wildlife conservation

These principles include wildlife conservation, the breeding of rare species, the establishment of open zoos for the public, and the promotion of wildlife breeding as an occupation.

## 3

{ His Majesty the King's principles  
on forestry research }

### His Majesty the King's principles on forestry research

These principles include methods of forestry research that differ according to local environment, the study of the relationship between forests and other ecological factors such as forests and fishery in mangrove forests, forest development with an irrigation system that delivers water from water sources during the dry season so that catchment forests retain moisture throughout the year, the study of the prevention of wild fires by using moisture or "wet forests," a method devised for long term fire prevention. His Majesty the King advised the Royal Development study centres to conduct studies until satisfactory results are achieved. Wet forests are created by planting a variety

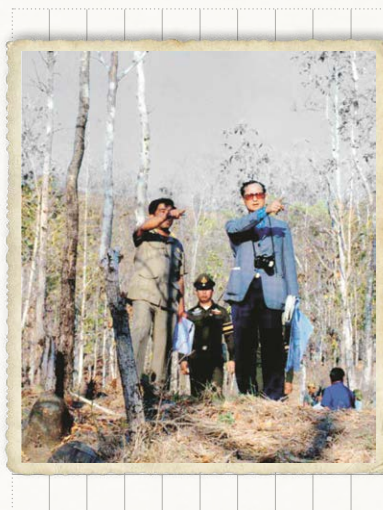
of plants along the irrigation canals, creating fire prevention systems with fast-growing trees along the length of the irrigation canals to increase the moisture level which will expand on both sides, helping trees to grow and preventing wildfires.

## 4

{ His Majesty the King's principles  
on replacement forests }

### His Majesty the King's principles on replacement forests

These principles include reforesting areas that have been denuded and degraded forests, planting trees on high mountains in degraded catchment areas that would otherwise affect water sources downriver, reforestation to improve river basins and water sources, reforestation by local villagers would help increase their income and raise their awareness of the importance of reforestation. The reforestation will also help increase the habitat for wildlife. His Majesty the King's guidelines for reforestation included reforestation in denuded areas first, and along newly constructed roads, and along routes that will soon become roads in the future. In this case, trees that should be planted are those that can be used for consumption such as the Hummingbird tree (*Sesbania grandiflora*), Siamese Cassia, *Moringa oleifera*, neem and mango. They should be planted in clusters for beauty and also utility purposes.



## 5

{ Planting trees in  
people's hearts }

### Planting trees in people's hearts

His Majesty the King's royal initiatives on reforestation were not simply to solve the problems of degraded forests that would adversely affect soil and water, and lead to socio-economic and other problems. It was therefore necessary to integrate reforestation with other development work. His Majesty stressed the need to choose indigenous plants that would thrive in the area, and were widely known by the local people. Reforestation should be done in denuded areas, or in utility forests near villages. Trees should be planted in a natural setting, not in rows, so when they grow they can revert back to the natural condition of the forest, not as plantations. This will result in deciduous dipterocarp forests and create a

*His Majesty's speech to officials of  
the Royal Forestry Department on 5 April 1983:*

*“...Forestry officials should first plant trees  
in the hearts of the people, and those people  
will later plant trees into the ground,  
and take care of those trees themselves...”*

balance that will serve the purposes of both the government and the communities. In His Majesty's speech to officials of the Royal Forestry Department on 5 April 1983, he said, “...Forestry officials should first plant trees in the hearts of the people, and those people will later plant trees into the ground, and take care of those trees themselves...” This was truly a reforestation principle that led to sustainability.

#### **Huai Hong Khrai Royal Development Study Centre**

##### **Origin of the Huai Hong Khrai Royal Development Study Centre**

On 11 December 1982, His Majesty King Bhumibol Adulyadej granted an audience to Prince Chakrabandhu Pensiri Chakrabandhu, Director-General of the Royal Irrigation Department and Secretary-General of the Office of the Royal Development Projects

Board and officials at Chitralada Villa. His Majesty instructed the Royal Irrigation Department to urgently source water for the Huai Hong Khrai Royal Development Study Centre, Doi Saket District, Chiang Mai Province. “...You should consider locating the project and building a reservoir at the source of the Huai Hong Khrai stream, upstream from the Huai Hong Khrai 1 Reservoir that the Department of Rural Roads has already built. This will be used for the development of the Huai Hong Khrai catchment area...” Then on 3 February 1984, His Majesty King Bhumibol Adulyadej visited the Huai Hong Khrai Royal Development Study Centre and offered further guidelines on the planning of the study centre: “...You should conduct studies on the reforestation of catchment areas and all the way downriver, and use this as the basis of your





*planning. Study the topic of fishery in all water reservoirs that will benefit the local people. Also study the subjects of cooperatives, agriculture and livestock (including dairy farms), and agro-industry as well as marketing, so that the Huai Hong Khrai Development Study Centre can become a comprehensive study centre for all who conduct study visits here, so they can apply the knowledge for their own benefits..."*

#### Royal Initiatives on Forest Development

His Majesty the King's speech on forest development given on 3 February 1984 at the Huai Hong Khrai Royal Development Study Centre which made this project internationally recognised: "...A number of new methods to urgently restore and conserve a degraded water catchment area have been tried such as diverting water from upriver reservoirs

*along natural water channels to allow moisture to gradually spread. The rest of the water will flow into downriver reservoirs for the purpose of agriculture. Trees should be planted on either side of the water channels. This area contains more moisture than watershed mountain ridges, and will therefore achieve quicker results, require fewer saplings and be less prone to forest fires. When the water channels are sufficiently moist, check dams should be built at intervals upriver to collect water, with bamboo pipes to distribute moisture to surrounding areas along the length of the water channel..."*

Forest development principles at the Huai Hong Khrai Royal Development Study Centre therefore comprise the following elements:

- 1) Forest development in irrigation areas
- Forest development using irrigated water



*His Majesty the King's principles on the revival of water catchment areas take into account "Forests upstream, fisheries downstream, agriculture midstream."*



*The Huai Hong Khrai Royal Development Study Centre, Doi Saket District, Chiang Mai Province.*



by releasing water from upriver reservoirs into forest areas requires a fish-bone water distribution system. Forests and areas by natural creeks will benefit from this water distribution system, particularly during the dry season. Forests will remain moist and green throughout the year, and become a natural firebreak as well.

2) Forest development outside irrigation areas  
This is done by building check dams along natural water channels, creating water for surrounding areas. Bamboo pipes will help further distribute water along both sides of the creek along the mountainside, so with the added moisture, reforestation can take place, creating a dense forest cover and a natural firebreak.

3) Forest development with check dams  
On 15 March 1989, His Majesty the King said

in his speech, "...A check dam should be built to the northwest of the study centre in order to retain moisture and protect catchment areas. Two areas need to be considered: areas with irrigation and areas which depend only on natural rainwater. This is so we can compare the difference between the two..." His Majesty also added, "...*This study centre should show the comparative experiment between the two areas -- the area with irrigation and the area dependent only on rainwater with check dams to help retain moisture, and the area left to its own devices. It doesn't matter whether the trees flourish or wilt because that is a comparative experiment to show the difference, which is the objective of the study centre...*"

After three decades of reforestation efforts at the Huai Hong Khrai Royal Development



Study Centre, the positive results on the ecology have been substantive. Plant diversity has improved as well as the density of forest cover, the increase of biodiversity, as well as a change in the environment. This constitutes a success for His Majesty's reforestation principles that have led to sustainable benefits of natural resources.

#### Forest conservation

Not only is forest conservation the sustainable utilisation of forests and its biodiversity, but also brings about the balance of water in the riverine ecological system, from an increased quantity and quality of water in streams, and a regulated flow of water that will help prevent flash floods during the rainy season as well as drought during the dry season in a sustainable manner. This knowledge can be integrated into the management of natural resources and

the environment by relevant organisations. The knowledge should also be shared with educational institutes at all levels so that the younger generation will recognise the significance of the natural and environmental conservation.

#### Man and forests: Sustainable coexistence

Villagers in the areas surrounding the Huai Hong Khrai Royal Development Study Centre, Doi Saket District, Chiang Mai Province have benefited from the knowledge gained through the studies, research and experiments conducted by the Centre. They have also participated in forest conservation, based on the guidelines developed by the study centre following His Majesty the King's royal initiatives. The success has been tangible, such as the relief of drought. Mountain water systems have helped the villagers enjoy better

*His Majesty the King combined  
principles on water management  
and forest conservation.*

“  
*Forests upstream  
fisheries downstream  
agriculture midstream*  
”

quality of life based on His Majesty's Sufficiency Economy Philosophy. This proves that the Huai Hong Khrai Royal Development Study Centre has achieved its objective in improving the well-being of the people in the area. The knowledge gained from the studies, research and experiments conducted by the Centre has countless benefits. It has become a knowledge centre for visitors, both Thais and foreigners who make study visits there on a regular basis.

His Majesty the King's royal initiative “Forests upstream, fisheries downstream, agriculture midstream” combines water management and forest conservation, and brings a sustainable livelihood to the people living upstream. The results of the studies have been positive and tangible, and can be adapted to any area. The participatory approach has allowed the people to enjoy a better quality of life based on the Sufficiency Economy Philosophy. This success can now be considered as a model for sustainable upstream water management.

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## Laws relating to this project

### Royal Initiated Projects Relating to Forests

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Laws relating to and supporting the project are as follows:

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1.

**National Park Act,  
B.E. 2507 (1964)**

The National Park Act, B.E. 2507 (1964) gives authority to the Director-General of the Ministry of the Royal Forest Department to issue written approval to a government agency or other State agency to use land in some area of a national reserved forest in compliance with rules, procedures and conditions determined by the Director-General, if it is for the purpose of study or research. The Huai Hong Khrai Royal Development Study Centre is located in Khun Mae Kuang National Forest Reserve. Its establishment complied with all legal approval procedures, the Royal Forest Department, the supervisory agency, granted approval for the project to proceed in the area.

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2.

**Plant Quarantine Act,  
B.E. 2507 (1964)**

The Plant Quarantine Act, B.E. 2507 (1964) serves to control and regulate the importation or exportation of plants, on the importation of plants for experiment or research. Controlling measures include inspection of imported and exported plant species and agricultural materials in order to prevent an epidemic of plant pests that may accompany exportation and importation.

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3.

**Fertilisers Act,  
B.E. 2518 (1975)**

The Fertilisers Act, B.E. 2518 (1975) is a law that serves to protect farmers by ensuring that fertilisers are up to standard, controlling manufacturers and retailers of chemical and organic fertilisers used in the agricultural process to ensure they meet the standards set by the Ministry of Agriculture and Cooperatives.

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4.

**Plant Variety Act,  
B.E. 2518 (1975)**

The Plant Variety Act, B.E. 2518 (1975) is a law that serves to protect farmers by ensuring they have access to quality seeds of the desired variety, controlling seed manufacturers and retailers according to the standards set by the Ministry of Agriculture and Cooperatives.



## Laws relating to this project

### Royal Initiated Projects Relating to Forests

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5.  
**Hazardous  
Substance Act,  
B.E. 2535 (1992)**

The Hazardous Substance Act, B.E. 2535 (1992) is a law that serves to control hazardous substances (pesticides) that farmers use in the agricultural process, from importation, manufacturing, retailing and possession, in order to ensure safety for users and consumers, and prevent negative impacts on the environment.

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6.  
**Act on the Partial  
Transfer of Authority  
from the Office of  
the National  
Economic and Social  
Development Board  
to the Office of the  
Royal Development  
Projects Board,  
B.E. 2538 (1995)**

Act on the Partial Transfer of Authority from the Office of the National Economic and Social Development Board to the Office of the Royal Development Projects Board, B.E. 2538 (1995)

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7.  
**Plant Variety  
Protection Act,  
B.E. 2542 (1999)**

The Plant Variety Protection Act, B.E. 2542 (1999) protects plant varieties rights derived from research and plant variety development, genetic modification, plant variety registration, and plant variety breeding.

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8.  
**Emergency  
Decree on Fisheries,  
B.E. 2558 (2015)**

The Emergency Decree on Fisheries, B.E. 2558 (2015), particularly in the chapter on the Aquaculture Promotion, allows fishermen to breed aquaculture along the Thai coastline. The decree covers fishing in Thai waters and offshore, aquaculture, and community participation. It synchronises the conservation and management of aquatic animal resources with the international standard. The key issue of this decree is the management of aquatic animal resources, with an improvement of the aquatic animal management system by classifying three fishing

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## Laws relating to this project

### Royal Initiated Projects Relating to Forests

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areas: 1) Freshwater fishing – all fishing areas on land; 2) Coastal seas fishing – fishing areas in the sea starting from the coastline farther than 3 nautical miles to 12 nautical miles under the authority of the Minister; and 3) Offshore seas fishing – fishing area beyond the coastal seas upto the extreme of the territorial waters of the Kingdom of Thailand. To reduce conflicts among the increasing number of fishing groups, the fishing areas are designated on the grounds of fishing capabilities of fishermen and the applied fishing equipment. Owing to a decline in the quantity of marine life, the decree has been announced to prohibit the possession of fishing equipments being harshly harmful to marine varieties, for the effective fishery management, in order to protect and develop fishing as an occupation.

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9.  
Royal Decree on  
the Organisation  
of the Office of the  
Royal Development  
Projects Board,  
B.E. 2538 (1995)

The Royal Decree on the Organisation of the Office of the Royal Development Projects Board, B.E. 2538 (1995)

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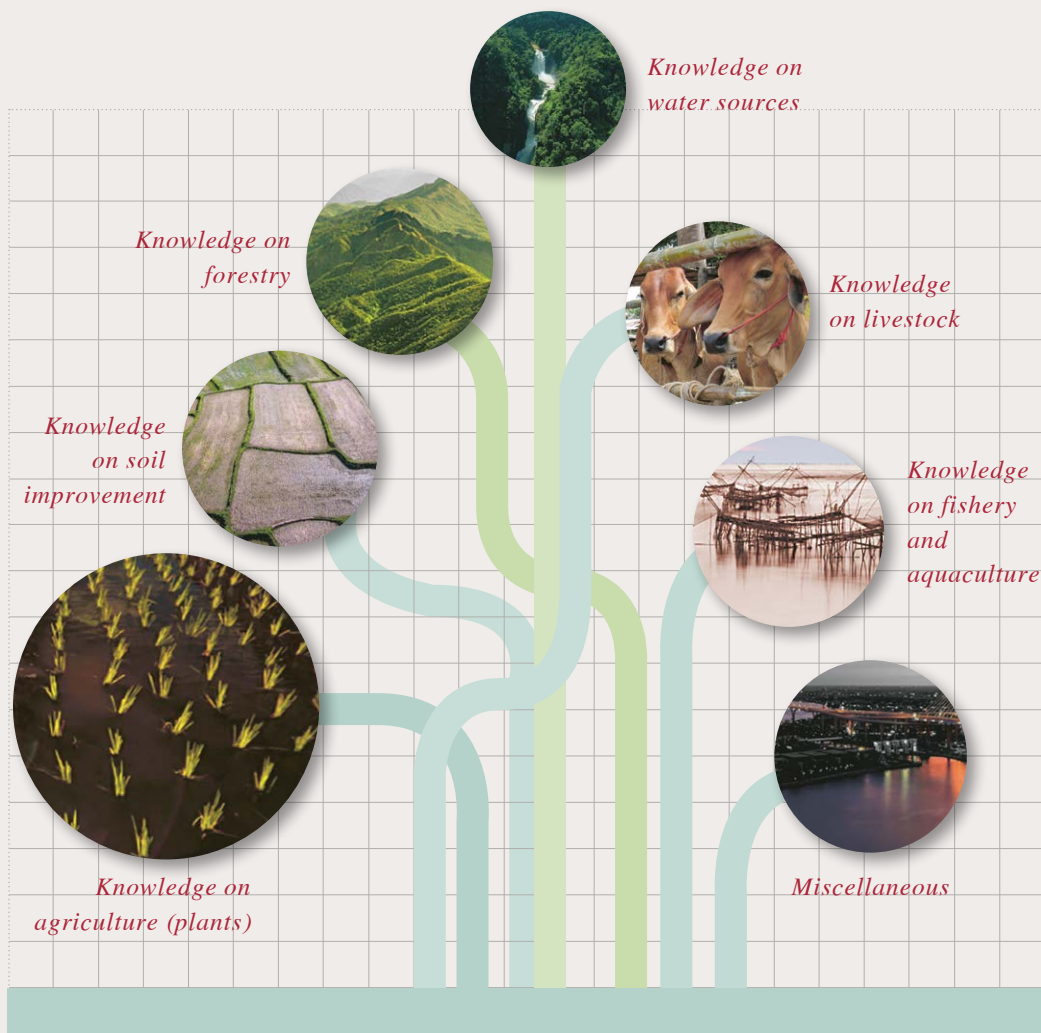
10.  
Ministerial  
Regulation on the  
Organisation of the  
Office of the Royal  
Development  
Projects Board,  
B.E. 2551 (2008)

The Organisation of the Office of the Royal Development Projects Board is a governmental agency that is not under the Office of the Prime Minister or any other ministry or sub-ministry. It is equivalent to a department under the supervision of the Prime Minister. One of its responsibilities is to support the royal development study centres, supervise, follow up and evaluate performance in compliance with His Majesty's initiatives and the policies of the administrative board of the Royal Development Study Centre Project chaired by a privy councillor.

**Project Outcome**

There are a total of 266 papers that resulted from experiments undertaken at the Huai Hong Khrai Royal Development Study Centre between 2009 and 2016: 38 on soil improvement, 101 on agriculture (plants), 37 on livestock, 31 on fishery and aquaculture, 33 on

forestry, 11 on water sources, and another 15 miscellaneous topics. Important topics such as running water fish culture and the study of the systematic planning of fishing in reservoirs as well as fishing techniques have helped villagers to fish from reservoirs, and learn about fish breeding, so that fishing can be



done without taking advantage of each other, and without destroying and exploiting fish varieties. It can also be applied to other reservoirs.



There are two methods of fish culture: fish culture in cement ponds, and fish culture in floating baskets. After 128 days of breeding Channel catfish in cement ponds with running water, the results were fish weighing an average of 522 gms, with an average length of 35.7 cm, and an average survival rate of 96.5 percent. With such a high survival rate, Channel catfish can be bred in cement ponds with running water.

Commercial mushroom farming in plastic bags in a comprehensive manner requires a number of important steps, from producing pure spores, spawning, casing, pinning to cropping.

Breeding bullfrogs using a natural method. Bullfrogs are medium to large sized frogs that originate in North America, from the east coast to the mid-west. They were later bred in the west coast.

The knowledge from the Huai Hong Khrai Royal Development Study Centre is disseminated through 35 similar study centres, which are surrounded by 18 villages with 4,003 households (16,015 residents). From October 2011 to March 2016, a total of 45,427 people were trained at the centre, and another 286,162 people visited the Centre on study trips. 31 different courses have been devised comprising 16 core courses, 7 supplementary courses, and 3 other miscellaneous courses. A total of 7,817 people have taken these courses, which are listed below in order of their popularity.

- 1

Upstream check dams for sustainable conservation and development
- 2

Fish culture for livelihood
- 3

Frog breeding



## 4

Commercial mushroom farming

## 5

Composting and using organic fertilisers  
to reduce agricultural production costs

First, the upstream check dams for sustainable conservation and development course with 1,944 participants; second, the fish culture for livelihood course with 868 participants; third, the frog breeding course with seven groups totalling 210 participants; fourth, the commercial mushroom farming course with 567 participants; and fifth, the composting and using organic fertilisers to reduce agricultural production costs course with 399 participants.

The sustainable conservation of riverine ecology, allowing man and forest to co-exist with mutual benefit is a holistic form of development on the concept “Forests upstream, fisheries downstream, agriculture midstream.” Royal initiatives necessary for riverine management include 1) Reforestation on the concept “Three Forests, Four Benefits,” 2) Planting forests in people’s hearts, and 3) Utilisation of forest resources in the form of agro-forestry. Check dams are upstream blockades of degraded water channels that

serve to retain the flow of water and prevent soil erosion and silt from accumulating downstream. The moisture that is retained upstream will help revive the riverine ecology and conserve soil and water.

Economic benefits from these activities such as bullfrog culture through natural farming techniques bring in a good income for farmers. Mushroom farming in 4x6m sheds requires an investment of 5,000-12,000 baht depending on the type of mushroom. After harvesting, profits range between 4,000-8,520 baht. The result of all these conservation activities at the Huai Hong Khrai Royal Development Study Centre, from the sustainable catchment area riverine ecology conservation projects, the Three Forests, Four Benefits reforestation method, the agri-forestry concept and the construction of check dams, have helped to improve bio-diversity in the area and increase economic benefits for the local villagers who depend on the forests for their livelihood.

The Huai Hong Khrai Royal Development Study Centre is a model for the sustainable development and the balance between the conservation and the utilisation of natural resources. This is considered a know-how on the sustainable conservation of riverine ecology in line with His Majesty the King’s royal initiatives to allow man and forest to co-exist with mutual benefits.

“

*Three methods of reforestation:*

*1) Planting forests in people's hearts*

*2) Reforestation without planting trees*

*3) Three Forests, Four Benefits*

”

Wiriya Chuaybamrung, former official of the Department of National Parks, Wildlife and Plant Conservation, attached to the Huai Hong Khrai Royal Development Study Centre from the start of the project, said that the Huai Hong Khrai Royal Development Study Centre is a model for the sustainable development and balance between conservation and utility of natural resources. This is considered a know-how on the sustainable conservation of riverine ecology in line with His Majesty the King's royal initiatives to allow man and

forest to co-exist with mutual benefits, with forests upstream, fisheries downstream, and agriculture midstream. The Huai Hong Khrai Royal Development Study Centre is like a living museum where visitors can take away know-how for their own implementation. The success of the Huai Hong Khrai Royal Development Study Centre is the result of His Majesty King Bhumibol Adulyadej's integrated approach to development.









Royal Initiated Projects relating to soil grew out of problems of dry infertile soil. Such natural methods as planting vetiver grass to prevent soil erosion were employed to overcome this problem.

## Royal Initiated Projects Relating to Soil



## Vetiver Grass (The King's Grass)

### Revitalising Soil



Sandy Soil:  
Reinforce the soil

Rocky, gravelly,  
and dry soil:  
prevent erosion and  
increase moisture

Hardpan soil and  
lateritic soil: cover the  
bad soil with the good soil

Eroded Soil:  
plant a living wall

Acid Soil:  
Aggravate the soil  
by tricking the soil

Royal Initiated Projects  
Relating to Soil

THE WISDOM  
OF THE  
MONARCH

The application of the principle of nature will help create and maintain ecological balance and will “breathe new life into the soil.”

One of these methods was the use of vetiver grass, which was like a living wall that could prevent soil erosion and retain moisture.

His Majesty King Bhumibol Adulyadej always emphasised the balance of nature. He viewed that all natural elements -- soil, water, forests and are interdependent and interconnected in a natural cycle. If one living things is affected, others in the cycle will also suffer the consequences which will, in turn, affect human beings. His Majesty studied the problem and gave his royal initiatives to revitalise soil by means of natural procedures and methods. The application of the principle of nature will help create and maintain ecological balance and will “breathe new life into the soil.” These royal initiatives differed according to geographical environment and conditions of the soil, but whatever the condition, the natural method would be used. One of these methods was the use of vetiver grass, which was like a living wall that could prevent soil erosion and retain moisture. The method was always simple and cost-effective, and more importantly, farmers could operate on their own.



“...The various departments would tell me that the soil here was not good, and it would not be worth setting up a project. There are a lot of places with bad soil in Thailand, and if we do nothing to improve the situation, then in the end the whole country will become a desert. The officials got the idea, and therefore tried to find ways to improve the soil to make it good for cultivation...”

*Speech by His Majesty King Bhumibol Adulyadej  
(Commemorative book to mark the 44<sup>th</sup> anniversary  
of the Land Development Department)*

#### Royal Initiated Projects Relating to Soil

His Majesty King Bhumibol Adulyadej placed significance on soil, which he viewed as another basic factor, just like water. He initiated land development projects in 1968 to revive land that was dry and arid, lacking nutrients, making it suitable for cultivation. He also proposed the study and experimentation to find different ways to create a natural balance in the environment. That's why his royal initiatives on soil improvement differed according to geography and conditions of each region.

He used natural methods to solve the problems of soil, and these became models used in his various royally-initiated projects around the country. These tried and tested methods could then be replicated or adapted to each location.

“...The various departments would tell me that the soil here was not good, and it would not be worth setting up a project. There are a lot of places with bad soil in Thailand, and if we do nothing to improve the situation, then in the end the whole country will become a desert.

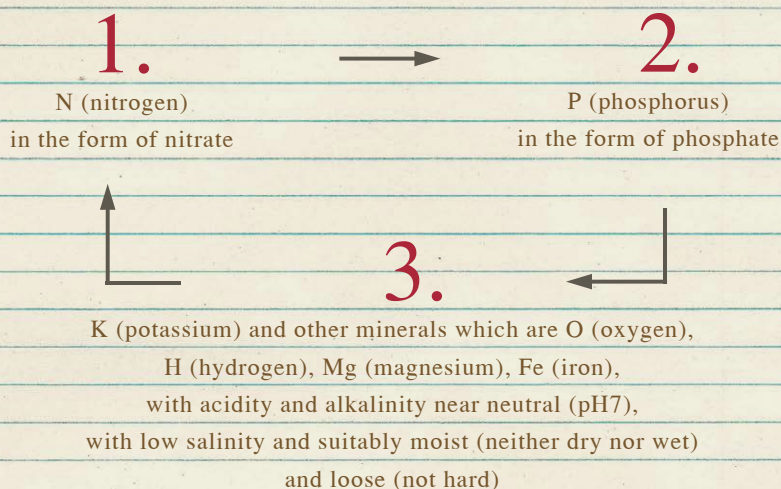
*The officials got the idea, and therefore tried to find ways to improve the soil to make it good for cultivation..."*

On the topic of soil improvement, His Majesty King Bhumibol Adulyadej had several royal initiatives that conformed to the principles of

agronomics, even though His Majesty was not a professional agronomist. In his speeches, he gave simple definitions on the quality of good soil for agricultural purposes. He analysed the soil conditions in various locations, especially in the six royal development study centres around the country.

A diagram of His Majesty the King's faxed message  
on the subject of "soil"

The minerals known as fertilisers are composed of





“...We cover the bad soil with the good soil in order to build up a new layer of soil...”

Royal speech on 14 July 2002 at the Huay Sai Royal Development Study Centre.



1. Khao Hin Sorn Royal Development Study Centre: sandy soil, lacking minerals
2. Huai Hong Khrai Royal Development Study Centre: rocky, gravelly, dry soil
3. Pikun Thong Royal Development Study Centre: highly acid soil
4. Huai Sai Royal Development Study Centre: sandy soil, lacking minerals, hardpan soil
5. Puparn Royal Development Study Centre: sandy, saline, dry soil
6. Khung Krabaen Bay Royal Development Study Centre: saline soil
7. Khao Cha-ngum Project: hard, lateritic soil and rocks
8. Wat Mongkol Chaipattana Area Development Project: lacking of water
9. Pak Phanang Valley Development Project: saline and highly acid soil
10. Ban Prik Sub District, Ban Na District: saline soil, flooding, drought
11. Nong Phlap-Klat Luang Project: lateritic soil, hardpan soil
12. Hub Kapong-Don Khun Huai Project: sandy soil, lacking of minerals, hardpan soil, lacking water
13. San Kamphaeng Cooperative Project: lateritic soil, lacking water

## Royal initiatives on soil improvement in Thailand

### 1 Sandy Soil

Sandy soil: reinforce the soil

Sandy soil lets water and roots go through easily. During the rainy season it has a low amount of nutrients. Plants thrive because there is sufficient water. But during the dry season there is a lack of water and plants begin to wilt. Newly planted trees usually die because of the heat and extreme aridity. The solution is to increase moisture and organic nutrients to reinforce the soil.

### 2 Rocky, gravelly, and dry soil

Rocky, gravelly, and dry soil: prevent erosion and increase moisture

Rocky and gravelly soil is similar to sandy soil; the soil surface is completely eroded, leaving only the sand and gravel where plants cannot thrive.

### 3 Hardpan soil and lateritic soil

Hardpan soil and lateritic soil: cover the bad soil with the good soil

Hard soil and laterite soil is made of fine particles of soil. It is heavy and does not drain easily. In the dry season it will harden and crack. Roots can hardly penetrate through, so it is difficult to cultivate.

### 4 Eroded soil

Eroded soil: plant a living wall

Eroded soil is fertile soil to top layer of which has been removed by water and wind.

### 5 Acid soil

Acid soil: aggravate the soil by tricking the soil

Peat is made up of decomposed vegetable matter. Peatland, according to the taxonomy of agronomics is soil that comprises at least a 50cm layer of organic matter with a marshy cover, and acidity at pH4.5 - 6.0. The decomposed organic matter will transform into organic soil that has a high carbon content with a high level of sulfuric acid.

*United Nations**The Humanitarian Soil Scientist**Commemorative  
coin*

His Majesty King Bhumibol Adulyadej's royal initiative on solving the problem of soil erosion was the use of vetiver grass. Various government offices studied and promoted the use of vetiver grass, such as the Land Development Department, the Royal Forest Department, the Doi Tung Development Project, the Botanical Garden Organisation, and the Office of the Royal Development Projects Board.

His Majesty gave several speeches on this topic:

On 22 June 1991 and 29 June 1991 at Klai Kangwon Palace, Hua Hin District, Prachuap Khiri Khan Province:

*"...I have proposed the testing of vetiver grass to prevent soil erosion at the Royal Development Study Centres and at other suitable locations..."*

World Soil Day falls on 5 December each year, as endorsed by the United Nations Food and Agriculture Organisation following its 144<sup>th</sup> conference on 11-15 June 2012 at the UN FAO headquarters in Rome, Italy. The date of 5 December for World Soil Day was chosen because it corresponds with the official birthday of His Majesty King Bhumibol Adulyadej.

His Majesty's royal speech on 5 July 1991 at Klai Kangwon Palace, Hua Hin District, Prachuap Khiri Khan Province, can be summarised as follows:

1. Natural methods for the conservation of topsoil have been studied for a long time. In most areas, the topsoil is tilled for agriculture, such as furrowing which is not a natural method and will cause problems in the

future. The Royal Development Study Centre has therefore been instructed to test different forms of agriculture that do not destroy nature, such as not tilling the ground, using the Huai Sai Royal Development Study Centre as the model. The results are then shared with farmers.

2. His Majesty studied documents from the World Bank on using vetiver grass to conserve





*HM King Bhumibol Adulyadej planting and propagating vetiver grass in various types of location*



topsoil, then instructed the Huai Sai Royal Development Study Centre to conduct experiments by planting and propagating vetiver grass in various types of location such as along water channels, in cashew nut orchards, on steep inclines, or along natural creeks. Rocks should be used to create a small check dam, and vetiver grass planted along the front, or in agricultural land such as maize fields. Photographs should be taken prior to and after the exercise to show results. All projects within the Huai Sai Royal Development Study Centre should do the same.

Royal speech on 20 February 1992 at the Royal Project, Huai Kaeo Sub-district, Mueang District, Chiang Mai Province, and at the vetiver grass propagation plot, office of the Land Development Department Region 6, Chiang Mai Province:

*"...Vetiver grass is a plant with long roots that grow downwards in tufts, like a wall that helps strain away the soil and protects the topsoil. We should therefore experiment with growing this grass..."*





*Vetiver grass project to prevent soil erosion*

*"...Vetiver grass should be planted in single rows with a space of 10 - 15 centimetres between each tuft to save space. They are easy to care for. Try planting them along water channels and steep inclines to prevent soil erosion..."*

*"...Vetiver grass is a new concept that we should test without raising too much expectation. But the results should be very beneficial. You do not have to try planting it in land belonging to farmers; just plant it at land development stations as models for the purpose of specimen selection. Choose good specimens that do not propagate by flowering. See which one is hardy even in dry conditions. If it's still green during the dry season, then that's perfect. Plant them before the rain comes, so the farmers nearby can also see..."*

On 22 July 1992, His Majesty travelled to the Huai Sai Royal Development Study Centre, Phetchaburi Province, to plant vetiver grass, and gave the following speech: *"...This soil is so hard it can't be cultivated. But if we grow vetiver grass in rows, and the rain comes, it*

*will retain moisture in the soil. The roots of the vetiver grass go down very deep, so it is used as a dam instead of lay cement. These plants will form a living dam, and the surrounding area will soon have topsoil that we can cultivate. We can grow trees, or vegetables or vetiver grass..."*

*"...Vetiver grass is a plant with long roots that grow downwards in tufts, like a wall that helps strain away the soil and protects the topsoil. We should therefore experiment with growing this grass..."*

*Royal speech on 20 February 1992 at the Royal Project, Huai Kaeo Sub-district, Mueang District, Chiang Mai Province.*

*"...Vetiver grass should be planted in single rows with a space of 10-15 centimetres between each tuft to save space. They are easy to care for. Try planting them along water channels and steep inclines to prevent soil erosion..."*



*The Huai Sai Royal Development Study Centre holds training and demonstrations on how to grow different types of vetiver grass.*



*"...Vetiver grass is a new concept that we should test without raising too much expectation. But the results should be very beneficial. You do not have to try planting it in land belonging to farmers; just plant it at land development stations as models for the purpose of specimen selection. Choose good specimens that do not propagate by flowering. See which one is hardy even in dry conditions. If it's still green during the dry season, then that's perfect. Plant them before the rain comes, so the farmers nearby can also see..."*

*Royal speech on 20 February 1992 at the Royal Project, Huai Kaeo Sub-district, Mueang District, Chiang Mai Province.*

On 31 August 2009, Mr. Ampol Senanarong, Privy Councillor and Chairman of the Committee on the Development and Promotion of the Utilization of the Vetiver Grass under his Royal Initiative, was granted an audience with His Majesty King Bhumibol Adulyadej

at Piemsuk Villa, Klai Kangwon Palace. His Majesty gave the following remarks:

*"...I have studied vetiver grass for 17 years as you mentioned just now, which is a long time. But it has proved to be a good use of time, yielding good results. It's amazing how it has taken 17 years to study one single type of grass, but you must understand that there are several types of vetiver grass, and if didn't study them, we would not have achieved the results that we have. These 17 years have been most beneficial, because during this time, we have found that vetiver grass or similar grass can perform miracles and yield benefit to different kinds of terrain. Some vetiver grass are suitable for flat areas, others are fit for mountains with deep soil or shallow soil. For deep soil, it has been proven that vetiver roots go down up to 5 - 6 metres. Previously no one knew that grass could have such deep roots. More importantly, the roots go down 5 - 6 metres, but do not spread sideways, which means they don't disturb the roots of other plants..."*

*“...Vetiver grass should be used to develop overcome problems of soil degradation. Propagate seedlings. Most importantly, do not forget the water. In order to preserve soil, every government should cooperate with the Land Development distributing the seedlings to target groups...”*

#### Huai Sai Royal Development Study Centre

*“...Vetiver grass should be used to develop and improve the soil, to enrich the soil and overcome problems of soil degradation. Propagate the grass so that there are sufficient grass seedlings. Most importantly, do not forget the benefit of vetiver grass in conserving soil and water. In order to preserve soil, every government unit with the capacity to propagate grass should cooperate with the Land Development Department in propagating vetiver grass, and distributing the seedlings to target groups...”* Royal speech by His Majesty King Bhumibol Adulyadej at Sala Rerng,

Klai Kangwon Palace, Hua Hin District, Prachuap Khiri Khan Province, on 21 February 2003.

The royal development study centres were set up so that His Majesty King Bhumibol Adulyadej could experiment with his royal initiatives. There are 6 study centres around the country, which serve as knowledge centres on mixed-farming agricultural development for farmers and interested people who can adapt this knowledge in their own work. They are therefore important study centres for the research on vetiver grass under royal initiative. The various studies include experimentation and comparisons of different



*and improve the soil, to enrich the soil and the grass so that there are sufficient grass benefit of vetiver grass in conserving soil and unit with the capacity to propagate grass Department in propagating vetiver grass, and*

*Royal speech by His Majesty King Bhumibol Adulyadej at Sala Rerng, Klai Kangwon Palace, Hua Hin District, Prachuap Khiri Khan Province, on 21 February 2003.*

grass species from different locations. There are propagation plots and experiments to test different uses and benefits of the grass, and the sharing of knowledge to farmers through training courses and demonstrations at the study centre for the general public. Vetiver grass seedlings are also available for distribution to the public for planting.

The Huai Sai Royal Development Study Centre, Phetchaburi Province, suffered from soil erosion, a problem that was overcome successfully through the implementation of royal initiatives. Vetiver grass was planted in selected locations; around agricultural plots,

with one row down each plot. In crop fields, vetiver grass was planted in the furrows alternating with the crops. On slopes, vetiver grass was planted perpendicular to the slope, and in natural water channels to prevent the erosion of topsoil and retain moisture; above water retention areas; and also to act as a wall to prevent soil gravel and silt from flowing into water retention areas; around small reservoirs in the shape of an inverted “V” with the tip pointing upstream and the two legs straddling the stream along the slope to prevent soil erosion and expand the water channel. Benefits include decreased soil erosion, and increased agricultural crops in greater variety, reduce





*Promoting the use of vetiver grass to conserve soil and water in areas prone to soil erosion and in general agricultural areas.*

flash floods that destroy farmers' crops in surrounding areas.

Since 1992, a total of three billion vetiver grass seedlings have been propagated, with the Land Development Department as the focal point, responsible for splitting shoots in nurseries, tissue culture, promotion and distribution to various government and private units, farmers and the general public. It has also been responsible for vetiver grass demonstration and promotion projects in over 3,000 schools in the Vetiver Grass in Schools Project around the country, such as Border Patrol Police schools and schools in the Office of the Basic Education Commission areas. During the operational phase of the 4<sup>th</sup> Vetiver Grass Development and Campaigning under Royal Initiative Model (2007 -

Since 1992, a total of **three billion** vetiver grass seedlings have been propagated, with the Land Development Department as the focal point.

2011), several related units such as the Royal Irrigation Department, Department of National Parks, Wildlife and Plant Conservation, Royal Forest Department, Royal Thai Army, the Development Command, and the Territorial Defence Command also prepared seedlings for distribution to interested parties. Today, this is being conducted under the 6<sup>th</sup> Vetiver Grass Development and Campaigning under Royal Initiative Model (2016 - 2019).



Today, a total of 10,478,935 rai of land has been devastated by soil erosion at medium to extreme levels, or a loss of topsoil of 5 - 20 tons/rai/year.



*His Majesty experiments and research for various fields of agricultural development such as integrated farming, agro forestry, herb farming and doubled haploid plant breeding in order to select true varieties for farmers.*

There are also promotional activities for farmers to plant vetiver grass to conserve soil and water in areas prone to soil erosion and general agricultural areas, create awareness on the benefit of vetiver grass in soil and water conservation and the need to protect topsoil for farmers, as well as generating an income from handicrafts based on vetiver grass.

The next phase of the vetiver grass promotion and expansion programme will concentrate on areas

that are highly prone to soil erosion and high risk areas for potential disasters. Surveys conclude that today, a total of 10,478,935 rai of land has been devastated by soil erosion at medium to extreme levels, or a loss of topsoil of 5 - 20 tons/rai/year.

Two vetiver grass networks have been set up:

1. The Pacific Rim Vetiver Network which serves the 22 member countries of the Pacific Rim as the centre to collect, compile and disseminate information on the Vetiver System (VS) in the form of a newsletter, occasional technical bulletins and other publications. Over 70,000 have already been published and a website (<http://prvn.rdpb.go.th>) was created to disseminate information.

*His Majesty experimented with planting vetiver grass to prevent soil erosion in the form of "natural barricades" in various locations.*



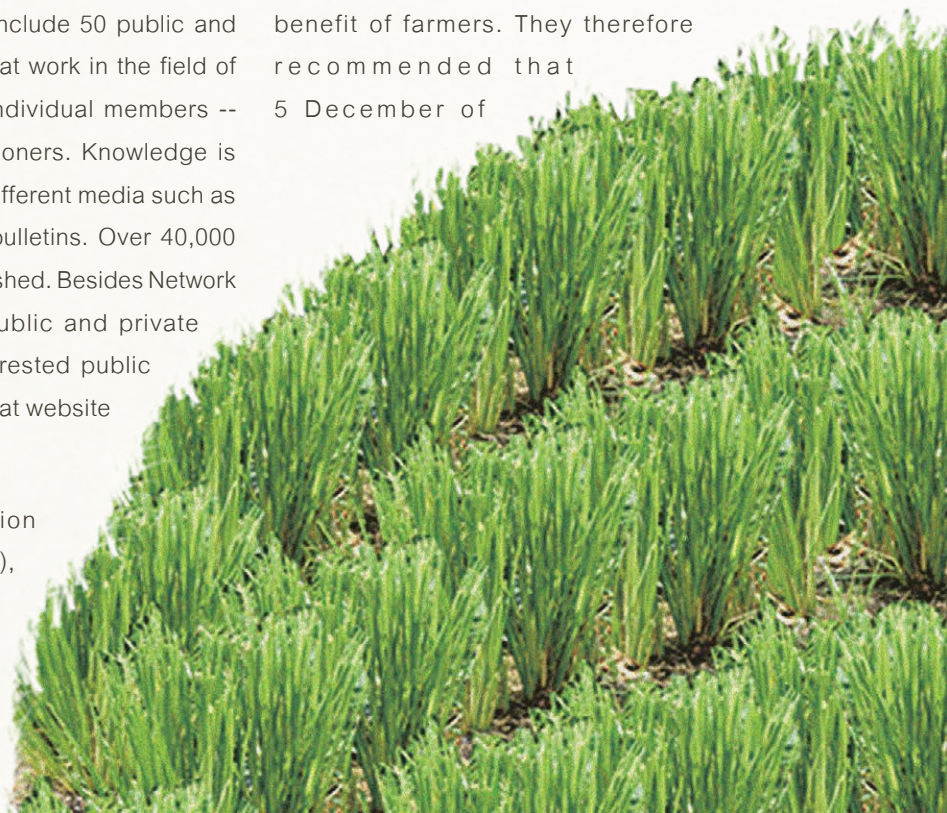


The Pacific Rim Vetiver Network serves the 22 member countries of the Pacific Rim as the centre to collect, compile and disseminate information on the Vetiver System (VS) in the form of a newsletter, occasional technical bulletins and other publications - over 70,000 have already been published.

2. The Thailand Vetiver Network which was set up by the Office of the Royal Development Projects Board in 1997 as a forum for the exchange of knowledge between vetiver experts in Thailand. Members include 50 public and private organisations that work in the field of vetiver and over 300 individual members -- academics and practitioners. Knowledge is disseminated through different media such as newsletters, technical bulletins. Over 40,000 have already been published. Besides Network members from both public and private sectors as well as interested public can access information at website (<http://thvn.rdpb.go.th>).

The International Union of Soil Sciences (IUSS), in collaboration with the Land Development Department, hosted

the World Soil Congress in Bangkok in 2002. The IUSS was greatly impressed with His Majesty King Bhumibol Adulyadej's research on soil management and solving soil issues for the benefit of farmers. They therefore recommended that 5 December of



Thailand Vetiver Network was set up by the Office of the Royal Development Projects Board in 1997. Members include 50 public and private organisations and over 300 individual members -- academics and practitioners. Over 40,000 bulletins have already been published.

each year be the World Soil Day. This recommendation was adopted by the United Nations General Assembly during its 68<sup>th</sup> conference on 20 December 2013. The General Assembly also voted in favour of the year 2015 being designated as the International Year of Soil.



*Planting vetiver grass on slopes is usually done in close tufts which will help reduce the flow of water that erodes the soil around water channels.*



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## Laws relating to this project

### Royal Initiated Projects Relating to Soil

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Laws relating to and supporting the project are as follows:

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1.

**Land Code,  
B.E. 2497 (1954)**

The Land Code, B.E. 2497 (1954), gives the following definition of land development:

“Land development” means any act done to the soil or land in order to increase the efficiency and quality of soil or land, or to increase agricultural productivity, and shall also mean improvement of soil or land, which is infertile either by natural cause or utilisation, and the conservation of soil and water for maintaining balance of nature or suitability in utilisation of land for agriculture.

“Soil and water conservation” means any action aims at preventing the soil and land from deterioration and loss, including any act for maintaining and improving soil fertility to preserve groundwater and surface water to maintain balance of nature and to suit agricultural use of the land.

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2.

**Land Development  
Act, B.E. 2551  
(2008)**

The Land Development Act, B.E. 2551 (2008) outlines the principles of solving problems of soil deterioration. With no soil and water conservation measures, causing soil erosion and adverse economic and social effects, government agencies can execute preventive measures against possible landslides and serious soil erosion for effective and beneficial land utilisation. The Act also prescribes legal measures on improving soil fertility, proper land utilisation, soil and water conservation, the analysis of land samples and the improvement of soil or land, which are important mechanisms in land development that will turn infertile soil into soil that can be cultivated.

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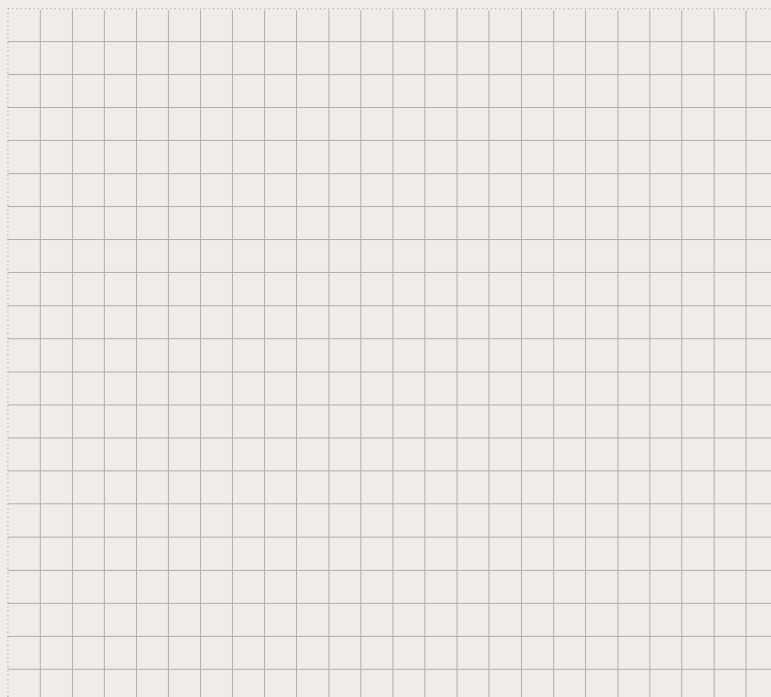
## Laws relating to this project

### Royal Initiated Projects Relating to Soil

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3.  
**Ministerial  
Regulation on the  
Organisation of the  
Land Development  
Department, Ministry  
of Agriculture and  
Cooperatives,  
B.E. 2557 (2014)**

The Ministerial Regulation on the Organisation of the Land Development Department, Ministry of Agriculture and Cooperatives, B.E. 2557 (2014) outlines the scope of authority of the Land Development Department in setting policies and plans for land utilisation in agricultural areas, land survey, soil classification, allocation of land utilisation, control of land utilisation in any area where the usage or contamination of chemical or any other substances is found, conservation of soil and water, soil improvement, map production and land census, the service provision and transfer of land development technology, soil data, and land utilisation to increase agricultural productivity, and promote sustainable land utilisation.



### Project Outcome

A wealth of knowledge gained from the research and development on soil improvement, forest rehabilitation and water management, particularly on vetiver grass with over 225 studies in various dimensions such as science (species, growth, propagation), agriculture and the use of vetiver to retain moisture in the soil in fruit orchards and perennial forests, soil and water conservation, environmental knowledge, vetiver promotion and utilisation.

The improvement of hard soil to make it suitable for planting perennials is done through the use of vetiver to break up the soil. Vetiver can thrive in degraded soil and help retain moisture with its deep roots, allowing other plants to take root. The creation of a moisture retention system is carried out through check dams, and dikes to divert water.

1) Check dams help to decrease the flow of water and reduce soil erosion. Each year, more soil and twigs will collect in the walls of the check dam, helping the water to slowly seep into the soil. The increased moisture around the check dams can be evidenced by the increased amount of grass around the area.

2) To build dikes, select a water catchment area and expand the area in terms of width and depth to increase capacity for water retention. However, it's important not to dig

across natural water channels that flow into catchment areas.

3) Water diversion dikes that connect to dikes that block the flow of water. In low-lying areas, a soil embankment is built, while in highlands, a ditch is dug to level the flow of water. This will increase the soil's potential to retain moisture in surrounding areas, enhancing reforestation efforts.

Water management and the development of water sources are done through a network of water basins according to royal initiative. The network allows for the shift of water from a large retention area to smaller basins for more efficient water utilisation. This helps support a wider agricultural area and rehabilitate the natural environment.

The rehabilitation of mountain forests through the wet forest system by setting up a solar-powered water pumping station to deliver water from the reservoir network to the highest point on the mountain.

Another outcome of the project was the dissemination of knowledge and technology to the public through demonstration areas in the Huai Sai Royal Development Study Centre. Learning stations on each topic were set up, from hard soil improvement, soil development (vetiver), integrated crop farming, livestock and wildlife propagation. The Living Museum



was also improved with additional herbal gardens and shrubs beneath large trees. Forest rehabilitation on Saveuy Kapi Hill, Rang Raeng Hill and Bo Khing Hill was done by pumping water from the reservoir network using solar power to moisten surrounding areas, bringing lush flora back to the three hills.

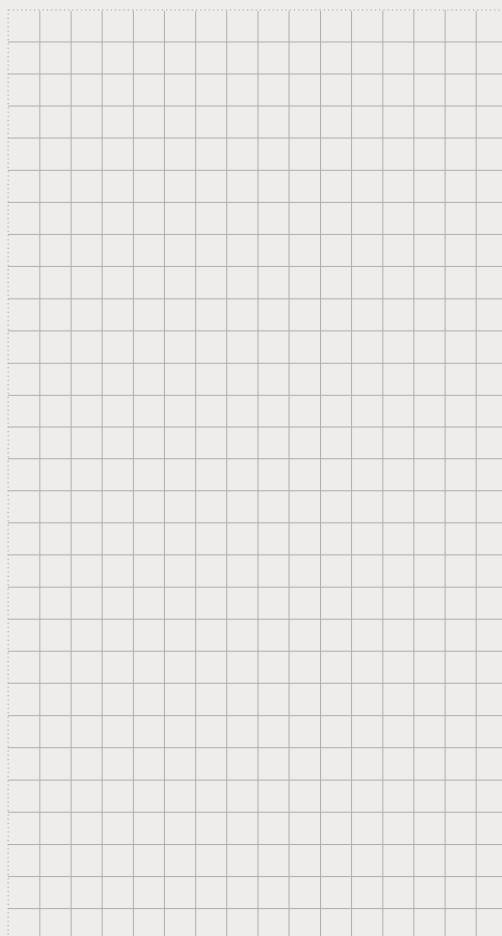
Another aspect was the development of the quality of life of the people in surrounding areas of the study centre through supporting 14 of them to be model farmers, the distribution of plant and animal stock such as 8,000 catfish to 60 farmers, 150 indigenous chickens to the local schools' lunch programme.

The effect on the ecological system was obvious: soil development efforts according to royal initiative and academic theory helped to alleviate soil erosion, improving the quality of the soil, making it suitable for the growth of natural vegetation.

Pol Lt Charn Ramun-udom, who has been working at the Huai Sai Royal Development Study Centre for over 10 years, explained that the Huai Sai Royal Development Study Centre was outstanding for its rehabilitation of the ecological system, soil and water, through the use of vetiver to improve hard soil, and emphasising the belief that man and forest can co-exist, stopping forest encroachment. The success was based on the principle of taking things step by step, and the implementation


of His Majesty the King's sufficiency economy philosophy in their daily lives.

The Huai Sai Royal Development Study Centre was outstanding for its rehabilitation of the ecological system, soil and water, through the use of vetiver to improve hard soil, and emphasising the belief that man and forest can co-exist, stopping forest encroachment.









The royal initiated projects on agriculture originated from King Bhumibol Adulyadej's wishes to help farmers become self-reliant. His Majesty aimed to conserve and develop natural resources which are the basis for long-term national development.

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## Royal Initiated Projects Relating to Agriculture



Farm and  
horticultural crops

30 per  
cent

Pond

30 per  
cent

Paddy fields

30 per  
cent

Housing area

10 per  
cent











*His Majesty's speech to Directors of the  
Office of the Royal Development Projects  
Board on 17 March 1986*

*“...The prosperity of the country  
depends primarily on the prosperity  
of the agricultural sector...”*

#### Project Overview

*“...The prosperity of the country depends primarily on the prosperity of the agricultural sector...”* (King's speech to Directors, Office of the Royal Development Projects Board on 17 March 1986).

His Majesty's speech above clearly shows the significance of the agricultural sector to the country and the Thai people.

Agricultural development has been one of the primary goals of national development. Low productivity and poor marketing, however, are the farmers' constant problems. The areas where farmers practise progressive agricultural methods may not suffer from these problems. But the areas where the King visited relied heavily on rainfall, and farmers practised traditional farming with low productivity. With only one harvest a year, the produce was

not enough to feed their families. In some areas, farmers may have already engaged in commercial farming, but they were still exploited by middlemen due to their inability to get organised, and the lack of market information. Subsequently, these farmers were trapped in cycles of poverty, low income and indebtedness.

In addition, unregulated development during the past decades had extensively destroyed the abundance of natural resources. The soil, forests, water resources as well as aquatic animals and plants had become severely degraded and unable to yield abundant foods like in the past.

Meanwhile, the government's attempts to provide assistance were met with many obstacles. The country was faced with economic problems



*His Majesty King Bhumibol Adulyadej's main goal is to help small farmers become self-reliant, particularly, in terms of food supply.*

and budget for national development was limited. Agricultural development was, thus, not comprehensive, sufficient, or timely enough. In addition, research and experimentation which were significant basis for agricultural development was still scarce. All these passed obstacles to agricultural development.

King Bhumibol Adulyadej's important royal guideline on agricultural development was the emphasis on agricultural research for new plant varieties to improve productivity. The King supported research and development of cash crops such as rubber and mulberry, to name just a few, as well as the crops that improved soil fertility, and all kinds of herbs. The royal initiatives also covered research on pest insect control and the breeding of more productive livestock, poultry, and fishes. The objective, as always, was to make available

what farmers needed to increase productivity with inexpensive and uncomplicated technology. What is important is that plant and animal varieties, the know-how had to be suitable for social conditions and environment of that specific locality.

The King's main goal was to help farmers become self-reliant, particularly in terms of food supplies such as rice, vegetables and fruits. The King fully realised that the rehabilitation of degraded natural resources directly contributed to agricultural development and productivity. Hence, His Majesty emphasised environmental conservation and restoration, which are the basis for long-term national development. The King had a keen interest in finding ways to restore the environment, whether degraded forests, soil, or water sources, so they could be rehabilitated and yield productivity.



*In 1962, King Bhumibol Adulyadej used the compound of his royal residence, Chitralada Villa, to set up pilot projects to study, research and experiment on agriculture and agricultural products.*



*King Bhumibol Adulyadej emphasised the need to minimise farm investment costs by making use of what was available in nature and each locality.*

King Bhumibol Adulyadej used several principles or techniques to achieve his goals in agricultural development. First of all, research was mandatory to find effective solutions. The implementation process, meanwhile, should be done step by step. He also advised against being too dogmatic about theory. In 1962, the King used the compound of his royal residence, Chitralada Villa, to set up several pilot projects to study, research, and experiment on agriculture and all sorts of agricultural products. The research was done both before and after the production of agricultural goods. Before the research started, the project had to consider the types of crops, the types of soil, and the suitable crops for certain soil conditions of the localities. The project also had to consider market viability. Study had to be done to make sure that there was market demand for the products. After the production of the agricultural goods, the project had to monitor market demands and quality control. In addition, the project had to equip the farmers with accounting, business, and marketing

skills so they could run the businesses on their own. It was also important for farmers to get organised and set up farmer groups and cooperatives in order to have their own self-supporting system, the King advised.

Apart from increasing farm productivity so farmers attain food security, the King emphasised the importance of helping farmers attain sustainable quality of life. The King wanted to see farmers prosper while still retaining family togetherness and happiness. The steps to attain success, therefore, had to be done step by step, avoiding a quest for quick riches which often entailed family stress and strain. The King's concerns for the farmers were clear in his royal speech on July 4, 2002: *"...It is not necessary to have maximum productivity as the ultimate goal. This may be a waste of production costs and it will destroy soil fertility. Instead, we should examine agricultural market situations and regulate agricultural prices to prevent the farmers from being affected..."*

*“...It is not necessary to have maximum productivity as the only goal. This may be a waste of production costs and it will destroy soil fertility. Instead, we should examine agricultural market situations and regulate agricultural prices to prevent the farmers from being affected...”*

*His Majesty's speech on 4 July 2002*

Another of King Bhumibol Adulyadej's development principles was to make the most of what exists in one's immediate natural environment. For example, making use of idle land, or finding new uses from what is already available in nature. Often, the new uses suggested by the King actually came from what had long been overlooked or taken for granted. For instance, the making of sealing lac from the rain trees along the highway to the Klai Kangwon Summer Palace.

Making use of what is given by nature also follows the King's principle of frugality. To help farmers, King Bhumibol Adulyadej emphasised the need to cut farm investment costs. One effective way was to use what is already available in nature. For example, encouraging the farmers to use cattle to plough the land instead of using machines, or adding nutrients to the soil by resorting to crop rotation, especially through planting bean plants and other legumes, which would reduce the cost of fertiliser. If and when fertilisers were necessary, the King supported the use

of organic instead of chemical fertilisers which were expensive and destructive to soil quality in the long run. To further save costs, the King encouraged farmers to produce biogas which would give them both clean energy and natural fertiliser. Apart from cost reduction, King Bhumibol Adulyadej repeatedly stressed the need for farmers to have a supplementary income outside farming. The King's suggestions included making wickerwork or other goods from natural materials in the localities such as bamboo and rubberwood.

King Bhumibol Adulyadej's initiatives in agricultural development were diverse. The myriad royal projects, however, mostly comprised research and development for new varieties of plants and animals that suit local topographies and the distribution of the more productive varieties to the farmers. The royal initiated projects also support the making of natural fertilisers and the training for farmers on modern agricultural techniques, food preservation, food processing, and the production of nutritious foods.

*“ King Bhumibol Adulyadej considered the lack of role models and agricultural development examples one of the rural farmers’ important problems. So they tend to continue with traditional farming, not knowing how to improve their yields both in quantity and quality. ”*

#### Royal Development Study Centres

The Royal Development Study Centres are testaments to King Bhumibol Adulyadej’s concerns for his people and his expertise in agricultural development. The King considered the lack of role models and agricultural development examples one of the rural farmers’ important problems. So they tended to continue with traditional farming, not knowing how to improve their yields both in quantity and quality.

There are 6 Royal Development Study Centres in different parts of the country in accordance with different topographies. The Royal Development Study Centres are the study, research and demonstration sites of integrated development where the King’s initiatives in agricultural development are carried out to help farmers restore the environment and improve yields.

The centres are open to the public to study the different agricultural techniques as well as to get assistance from officials. Given the focus on biodiversity, the Royal Development Study Centres are likened to the living museums of nature where farmers can study the various practical farm technologies in order to improve their livelihoods with a self-supporting system.

#### Six Royal Development Study Centres in Four Regions

1. **Khao Hin Sorn Royal Development Study Centre.** Located in Khao Hin Sorn Sub-district, Phanom Sarakham District, Chachoengsao Province, the royal initiated Khao Hin Sorn Royal Development Centre was set up on August 8, 1979. Covering 1,895 rai of land (303 hectares), the centre’s primary task

**1** The **Khao Hin Sorn Royal Development Study Centre** is located in Khao Hin Sorn Sub-district, Phanom Sarakham District, Chachoengsao Province. Covering 1,895 rai of land (303 hectares), it was set up on August 8, 1979.

**2** **Pikun Thong Royal Development Study Centre** is located in Kaluwo Neua Sub-district, Mueang District, Narathiwat Province, covering about 1,740 rai of land (278 hectares).





*King Bhumibol Adulyadej's principle on development is that effective agricultural development must come from actual implementation backed by continual experiments and research. The development should be done step by step and without being trapped by textbook theories.*

is to restore the environment through soil fertility improvement and reforestation. The centre also works with the development of livestock, fisheries, fruit trees and flowering plants. It also has cattle banks to help needy farmers and provides trainings in cooperative management. It has two branches. One is the Khao Cha-ngok Area Development Project in Nakhon Nayok Province. The other is the Royal Development Project at Ban Sang in Prachin Buri Province.

**2. Pikun Thong Royal Development Study Centre.** Covering 1,740 rai of land (278 hectares), the centre is located in Kaluwo Neua Sub-district, Mueang District, Narathiwat Province. King Bhumibol Adulyadej thought about setting up the Pikun Thong Royal Development Study Centre while he was residing at the Thaksin

Rajaniwet Palace during his visit to the rural South from August 18 to October 3 in 1981. The centre's primary task is to study the waterlogged soil conditions there in order to make the acidic land usable again for cultivation. Its research work includes the use of water and other scientific processes to remove soil acidity and the restoration of peat swamp forest biodiversity. The centre also works in the development of fisheries, livestock, fruit trees, flowering and decorative plants.

The centre has five branches. They are:  
1) Khao Tan Yong Para Rubber Plantation Project in Mueang District, Narathiwat Province;  
2) Pee Nae Moo Dor Village Development Project in Ra-ngae District, Narathiwat Province;  
3) Muno Livestock and Agriculture Village Project in Tak Bai District, Narathiwat Province;

**3 Kung Krabaen Bay Royal Development Study Centre** at Sanamchai Sub-district, Tha Mai District, Chanthaburi Province, covering 85,235 rai of land (13,637 hectares).

**4 Puparn Royal Development Study Centre** at Ban Na Nok Khao, Huai Yang Sub-district, Mueang District, Sakon Nakhon Province, covering 2,300 rai of land (368 hectares).



*Pikun Thong Royal Development Study Centre at Kaluwo Neua Sub-district, Mueang District, Narathiwat Province.*



*Kung Krabaen Bay Royal Development Study Centre at Sanamchai Sub-district, Tha Mai District, Chanthaburi Province.*

4) Ban Khok It-Khok Nai and Ban Yuyo Area Development Project in Tak Bai District, Narathiwat Province; and 5) The Royal initiated Pak Phanang River Basin Development Project in Nakhon Si Thammarat Province.

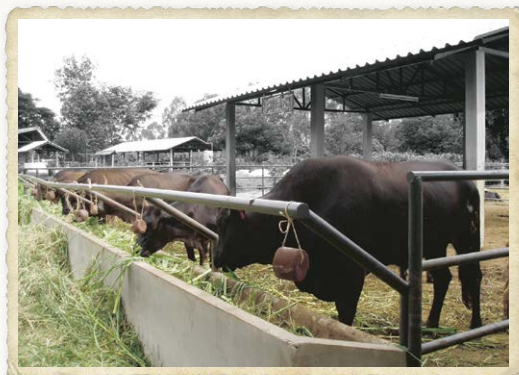
3. **Kung Krabaen Bay Royal Development Study Centre.** Located at Sanamchai Sub-district, Tha Mai District, Chanthaburi Province, the Kung Krabaen Royal Development Study Centre covers 33 villages in 85,235 rai of land (13,637 hectares) in the east coast. It was established following King Bhumibol Adulyadej's initiative on December 28, 1981 when he urged concerning authorities to "...consider finding appropriate areas for

*the setting up of a study centre to develop fisheries and agriculture along the east coast of Chanthaburi Province...*" Apart from conducting study, research and experiments, the Kung Krabaen Bay Royal Development Study centre also has demonstration sites for the public on the development and conservation of the coastal areas. The centre also works on the treatment of wastewater from prawn farms, the compilation of plant species in the mangroves, and biodiversity maintenance in mangrove forests. In addition, the centre also conducts experiments in integrated farming, gives occupational support in fisheries and livestock as well as organises cooperative management training for local villagers.

**5** **Huai Hong Khrai Royal Development Study Centre** was set up on December 11, 1982, covering an area of 8,500 rai of land (1,360 hectares).

**6** **Huai Sai Royal Development Study Centre** is located at Sam Phraya Sub-district, Cha-am District, Phetchaburi Province, covering an area of 42,640 rai of land (6,822 hectares).





*Puparn Royal Development Study Centre at Ban Na Nok Khao,  
Huai Yang Sub-district, Mueang District, Sakon Nakhon Province.*

4. Puparn Royal Development Study Centre. Located at the village of Ban Na Nok Khao in Huai Yang Sub-district in Mueang District, Sakon Nakhon Province, the Puparn Royal Development Study Centre was established on November 25, 1982. The centre covers an area about 2,300 rai (368 hectares) with an adjacent development site at about 11,000 rai (1,760 hectares). The centre's objectives

*“...consider finding appropriate areas  
for the setting up of a study centre to develop  
fisheries and agriculture along the east  
coast of Chanthaburi Province...”*

*King Bhumibol Adulyadej in a royal speech  
on December 28, 1981.*

include the development of new irrigation systems, new commercial crops and new rice varieties. The centre also studies forest ecology of the Northeast as well as the methods to improve poor soils. It also promotes fishery and livestock development for local farmers.

Puparn Royal Development Study Centre has four branches. They are: 1) The Royal Initiated Upper Bang Sai River Basin Area Development Project in Dong Luang District, Mukdahan Province; 2) The Royal Initiated Kam River Basin Development Project, Sakon Nakhon and Nakhon Phanom Provinces; 3) The Royal Initiated Reservoirs under the New Theory in Khao Wong District, Kalasin Province, and;

**There are 6 Royal Development Study Centres across Thailand.** In line with King Bhumibol Adulyadej's objectives, these centres conduct study, research, experiments, and demonstrations on cost-effective, practical agricultural techniques so local farmers can learn and use them in their farms.





*The Huai Hong Khrai Royal Development Study Centre conducts study, research and experiment in order to find an effective, eco-friendly development model for the mountainous North to set examples for other rain-catchment areas in the highlands.*

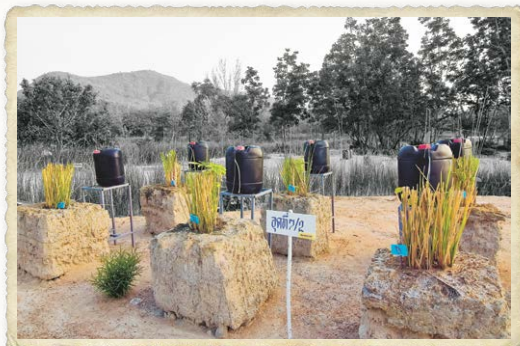
4) The Royal Initiated Phu Singh Agricultural Development Project in Si Sa Ket Province.

5. **Huai Hong Khrai Royal Development Study Centre.** Established on December 11, 1982, the centre is in the Khun Mae Kuang forest area in Doi Saket District, Chiang Mai Province. Under King Bhumibol Adulyadej's initiatives, the centre conducts study, research and experiment in order to find an effective, eco-friendly development model for the mountainous North to set examples for other rain-catchment areas in the highlands. The "model" features an eco-friendly irrigation system and the "Three Forests, Four Benefits" reforestation method in the communities in order to ease deforestation. The Huai Hong Khrai Royal Development Study Centre primarily focuses on the restoration of the degraded rain-catchment forests. The reservoirs downstream, meanwhile, serve as study areas on fishery.

The Huai Hong Khrai Royal Development Study Centre covers an area of about 8,500

rai (1,360 hectares). Once barren from severe deforestation, the area is now lush green and fertile. This very success has made Huai Hong Khrai a showcase for highlands ecosystem restoration, attracting leaders from around the world to learn from King Bhumibol's development principles.

The Huai Hong Khrai Royal Development Study Centre has five branches. They are: 1) The Royal Initiated Fruit and Flower Propagation Development Service Centre Project at Rai Village, Hang Dong District, Chiang Mai Province; 2) The Royal Initiated Ping Sub-River Basin Integrated Development Project, Hot and Chom Thong Districts, Chiang Mai Province and Ban Hong District, Lamphun Province; 3) The Royal Initiated Khun Mae Kuang Forest Area Development Project, Doi Saket District, Chiang Mai Province; 4) The Doi Tung (Royal Implementation Site) Development Project, Mae Fa Luang District, Chiang Rai Province; 5) The Royal Initiated Huai Larn



*The use of vetiver grass at Huai Sai Royal Development Study Centre to rehabilitate hard, infertile soil to make cultivation possible again.*



*King Bhumibol Adulyadej supervised the development work at Huai Sai Royal Development Study Centre, Sam Phraya Sub-district, Cha-am District, Phetchaburi Province.*

Area Development Project, San Kamphaeng District, Chiang Mai Province.

#### 6. The Huai Sai Royal Development Study Centre.

Located at Sam Phraya Sub-district in Cha-am District, Phetchaburi Province, the area that is now the Huai Sai Royal Development Centre used to be part of the Mrigadayavan Palace, a seaside royal residence of King Vajiravudh or King Rama VI. Once lush green and teeming with wildlife, thanks to the no-hunting royal order, the area later became deteriorated from forest encroachment, resulting in prolonged droughts and infertile land from soil erosion.

If these problems were not redressed, the area would eventually become a desert, said King Bhumibol Adulyadej. Hence his royal initiative to restore the environment there. On April 5, 1983, the King initiated a scheme to set up a study centre at Huai Sai to develop a multi-purpose reforestation model and a cultivation system that supports reforestation

efforts to rehabilitate the area. The centre also works on the development of water sources and tackles forest fires through the “wet forest” system. Equally important, the centre encourages forest encroachers to join its various development programmes so they can take part in the rehabilitation of the environment and reap the benefits from their efforts in ways that are in harmony with nature.

The Huai Sai Royal Development Study Centre covers an area of about 42,640 rai (6,822 hectares) with one branch, the Royal Initiated Cha-ngum Mountain Deteriorated Soil Rehabilitation Project, in Photharam District, Ratchaburi Province.

All 6 Royal Development Study Centres have the same objectives in conducting research and development in various aspects of agriculture. For example, the development of plants, fishery, soil rehabilitation, and the “New Theory” farming.





### Plants

The Royal Development Study Centres all engage in different fields of agricultural development to serve local needs. Their works include the development of irrigation systems, the study of forest ecologies, soil rehabilitation, and the promotion of livestock and fishery to generate income for local villagers. Farming is the focus of all centres. Apart from plant breeding, the centres also promote integrated farming and the processing of agricultural and food products.

The new, practical agricultural techniques and other support from the Royal Development Study Centres have increased farmers' income. For instance, since the start of its operation in 1984, the Puparn Royal Development Study Centre has been conducting research and experimentation to improve agricultural productivity by following the royal guidelines. According to the royal principles given by the King during his visits to the Puparn Royal

Development Study Centre from 1983 to 1990, practical efforts to improve yields and cost-effectiveness must take into account existing problems and constraints of each particular crops as well as specific social conditions of each different localities in order to effectively improve the local farmers' livelihoods.

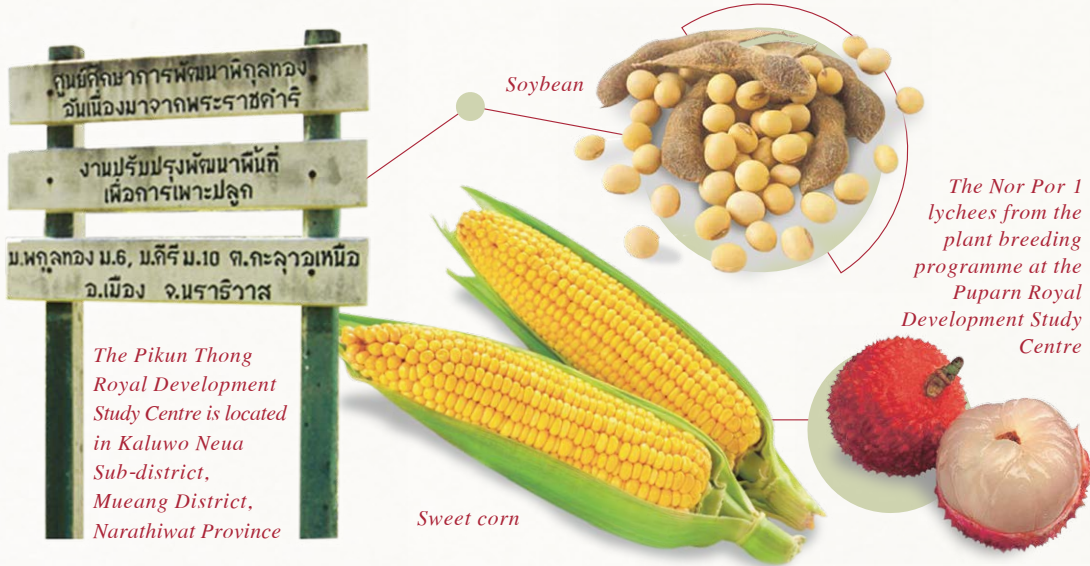
#### (1) Plant varieties development

King Bhumibol Adulyadej also gave royal guidelines on plant varieties development which is crucial to improving agricultural productivity and quality. The King advised selecting the plants that are suitable to local conditions. The crop varieties should be pest-resistant, high-yield, and flexible to different soil conditions in different topographies. His Majesty also supported the breeding of hybrids domestically to avoid reliance on foreign hybrids and possible patent issues.

#### (2) Farm and horticulture crops

As a learning centre for local farmers, the Puparn Royal Development and Study Centre





has demonstration plots of field crops and horticulture which come from its plant breeding programmes. They include the demonstration of rotation farming system by growing different crops in different seasons such as sweet corn, peanut, soybean, and mung bean.

As for horticulture, there are demonstration plots of fruit trees from the plant breeding programmes such as the Nor Por 1 lychee. As a result of careful breeding, the Nor Por 1 lychee is big and sweet with only a tang of sourness. This special variety of lychee yields fruits every year, with the flowering season in December and the harvesting season in April. The trees grow into bushes and the older the lychee trees are, the more fruit they give. The Nor Por 1 lychee variety then has very high economic potential in this region. Apart from the Nor Por 1 lychee, the Kaew mango from the plant breeding programme also grows very well in the area and is popular for the making of preserved mangoes.

### (3) Mushroom cultivation

Under the King's initiative, the Puparn Royal Development Study Centre has successfully researched and experimented on the cultivation of new kinds of mushroom to help farmers in Sakon Nakhon Province and nearby areas generate more income. Research findings on mushroom culture are tested in the local environment at the centre. Agricultural wastes are used to make mushroom compost as the centre experiments with new methods to grow all kinds of mushroom. They include straw mushroom, oyster mushroom, Shiitake mushroom which can be commercially grown and several indigenous mushrooms popular in the localities such as Hed Kradang or Hed Bod, Hed Khorn Khao, and Hed Teenrad. The centre also conduct research and tests on the Lingzhi mushroom which is used as traditional medicine. Apart from the demonstration sites on mushroom cultivation, the centre also develops better mushroom compost made from local materials to serve local farmers.



*Translucent soap bar with olive leaf extract of the Royal Chitralada Projects.*

*Seasonal Vegetables salad of the Royal Project Foundation.*



#### (4) Integrated farming

During a royal visit to the Puparn Royal Development Study Centre on 22 November 1989, King Bhumibol Adulyadej expressed his thoughts as follows:

*"...Integrated farming as a system is particularly effective in irrigated areas. This centre is doing quite well with a variety of different crops. It will be an interesting section to open to the public to study (integrated farming)..."*

The King also stated: *"...In the well-irrigated areas, we should make the farmers see that when water is abundant, they can increase productivity and income. Farming in a 2-rai plot of land (0.32 hectare) can produce as much as farming in 10 rai (1.6 hectares)..."*

Hence the projects to study, research and experiment on integrated farming as well as to set up demonstration sites for the public were implemented at the Puparn Royal Development and Study Centre.

Integrated farming is a system in which farmers grow crops and raise farm animals in the

same area on the basis of mutual benefits and cost-effectiveness. It uses the principle of interdependence between plants, animals, and the environment. Different plants can be grown together or different farm animals and animals coexist in the same area. To be successful, integrated farming requires good planning and implementation. Each activity in the farm must be suitable with the physical, social and economic environments. The use of labour, capital, land, production factor, and natural resources must be efficient. The waste from one farming activity should be used to support other farm activities as part of an integrating system. For example, poultry or pig raising on fish ponds, fish raising in rice fields, and beekeeping in fruit orchards.

There are two important principles in integrated farming. 1) There must be more than two farm activities; 2) The farm activities must serve each other, enabling farmers to maximise the use of limited land, reduce production risks,





*The reshaping  
of rice fields  
at the Puparn  
Royal  
Development  
Study Centre.*



*Honey from the  
Royal Project  
Foundation.*

*Brown rice from  
the highlands  
of the Royal Project  
Foundation.*



*Pasteurised  
milk of the  
Royal Project  
Foundation.*



production costs, and dependence on food from the outside. Making use of waste from crops or manure in farming also increases productivity and income.

The Puparn Royal Development Study Centre conducts two groups of field experiments in integrated farming. One is the experiments inside the centre and the other is the experiments in the villages surrounding the centre. Both use rice as the main crop.

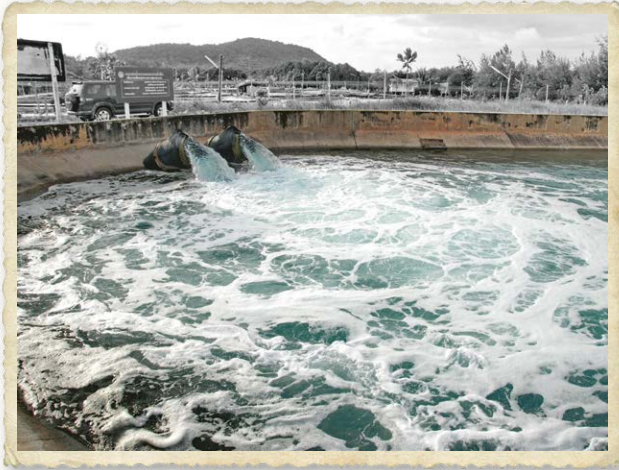
#### (5) Farm food processing

King Bhumibol Adulyadej expressed his ideas on farm food processing in November 1983: *"...For the beans under the experiments, the programme could well be developed into an agro-industry such as the setting up of a glass noodle factory. Things to be considered is the size of the factory, whether it's going to be medium size or small. A small factory should be set up in a village, but there might be quality control problem. So it might be necessary to build a medium-size factory..."*

The King also gave a royal guideline in November 1984: *"...As an example, build a small glass noodle factory in the village, run by a group of 5 - 6 households. If the factory is too small, it will be a waste of time. Not worthwhile. But the factory should not be too big because it will make the system too commercial..."*

Responding to the King's initiative, the Puparn Royal Development and Study Centre set up a glass noodle factory in 1985, using mung bean as raw material. The centre also set up demonstration sites to share with the public various kinds of farm food processing as the source of supplementary income for the farmers. Among the processed foods promoted by the centre include glass noodle from black cowpea, glass noodle from mung bean, sugar cane juice from brown sugar, traditional sugar coins from sugar cane juice, rice crisps made from mushroom, rice crisps with butterfly pea extract, preserved santol, pickled mushroom sausages, mushroom jerky, granola bars, fried beans with herbs, and mulberry juice, to name just a few.





*The study on the use of mangrove forests to treat wastewater from prawn farms.*

### Fisheries

King Bhumibol Adulyadej was very concerned about the villagers whose livelihoods were affected by environmental degradation. Their farmland and coastal seas have been seriously deteriorated, resulting in declining yields and catch. His Majesty deemed that the study and research to restore the land along the coasts would create a body of knowledge and alert the locals to protect the environment through sustainable uses.

In line with the King's initiative, the Kung Krabaen Bay Royal Development and Study Centre in Chanthaburi aims at studying, researching, experimenting and demonstrating methods to restore the environment along with developing fishery and coastal aquaculture. The centre also promotes integrated farming and sustainable use of coastal natural resources for long-term benefits from the seas and for the villagers' own well-being. The Fisheries Department, Ministry of Agriculture and Cooperatives, is the main coordinator among different state agencies there. Among the projects to improve

the coastal resources: increasing the amount of aquatic animals in natural water sources, promoting sustainable prawn farming, studying its impact on the environment, researching for new eco-friendly technology on aquaculture and disseminating it to the farmers and students. The centre works closely with 33 surrounding villages which also serve as examples for other communities on how to improve their sources of livelihood and increase productivity in their farms.

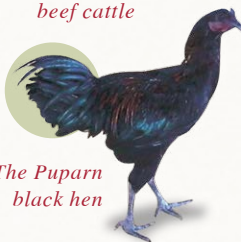
Prawn farming around the Kung Krabaen Bay Royal Development and Study Centre pays heed to environmental conservation. It uses a closed system which regulates the flow of water in and out of the farms to prevent aquatic diseases. There is a 8,820-metre long canal to transport seawater to feed the prawn farms around the centre. Using the law of gravity, the seawater flows into the prawn farms naturally. Under this system, the wastewater will be treated before being released back into the sea. When the sea does not deteriorate, prawn farming is a productive business again.



*The Chitralada tilapia*



*The Puparn  
beef cattle*



*The Puparn  
black hen*



*King Bhumibol Adulyadej deemed it useful to have  
a centre to study and develop the coastal areas and  
to transfer knowledge to the locals.*

At present, 197 prawn farmers at Kung Krabaen Bay have formed a group to work together. Their farms, covering 1,005 rai (160 hectares), produces about 401 tonnes of prawns worth 75 million baht a year. Theirs is not only a thriving business, but a sustainable one.

#### Soil development

The Royal Initiated Cha-ngum Mountain Deteriorated Soil Rehabilitation Project is a branch of the Huai Sai Royal Development Study Centre in Phetchaburi Province. The soil infertility surrounding the Cha-ngum Mountain resulted from severe deforestation. The land had become parched from prolonged droughts. Parts of the area used to be mined for laterite, leaving the soil surface full of potholes big and small which were aggravated by soil erosion. The soil layer was thin and unable to retain moisture from the run-off. The deeper layer of soil was dense and tough, making it difficult for the roots of plants to grow and expand and the run-off to seep through. Ploughing the land was also difficult. The soil was poor because it was mixture of sandy soil and gravels, thus

unable to hold water and low in soil nutrients. Plants grew poorly there.

In line with the royal initiatives and guidelines, the soil project at the Cha-ngum Mountain has conducted studies and experiments to rehabilitate poor soil and adjust the laterite-ridden land so that it can retain water. As part of the soil and water conservation projects, earthen dikes were built along the mountain slopes as physical barriers to delay and retain the run-off. The dikes also help prevent soil erosion. The centre also studies the various uses of vetiver grass which include its ability to rehabilitate degraded soil. The centre has several demonstration sites on soil rehabilitation techniques to disseminate the know-how to the locals. They include the demonstration plots on New Theory farming, organic and integrated farming, the making of green manure and other organic fertiliser, the growing of fruit trees in dry areas, the compilation of 28 varieties of vetiver grass, and a learning centre on the secret of soil quality. The Royal Initiated Cha-ngum Mountain Deteriorated Soil Rehabilitation



Project has extension programmes in 12 villages around the centre, covering 60,000 rai of land (9,600 hectares).

### New Theory

The New Theory is a farmland management system for small farmers with limited land so they maximise its uses to have food security and year-round water sources. It is an important farming concept which does not only effectively tackle the problem of droughts and water shortage for farming, but it is also environmental-friendly. This sustainable farming system is therefore beneficial to the country's economy, society, and the environment.

The New Theory attests to King Bhumibol Adulyadej's ingenuity in agriculture. It has only a few simple rules to go by. It is estimated that a Thai farmer owns 15 rai of farmland (2.4 hectares) on average. If the farmland is divided according to the New Theory Farming, 5 rai will be allocated for paddy fields, 5 rai (0.8 hectare) for fields and horticultural crops, 2 rai (0.32 hectare) for a housing area, and 3 rai (0.48 hectare) for a pond (about 4 metres deep) which can store 19,000 cubic metres. The ratio of New Theory land management is: 30:30:30:10.

His Majesty explained in writing about the New Theory farming in a document for the Chaipattana Foundation dated 5 March 1994. It says:

"(1) In a nutshell, this practice is for farmers with small plots of farmland, about 15 rai (2.4 hectares), which is an average rate of farmers' land ownership.

(2) The main principles: Farmers should have enough to be being self-supporting

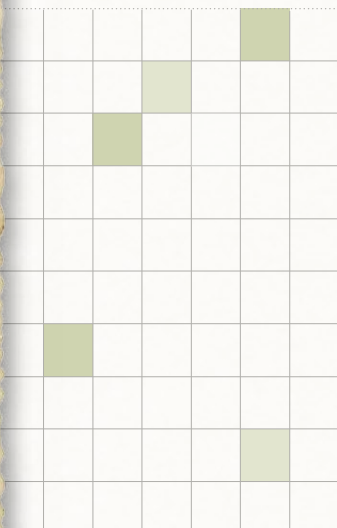


*New Theory demonstration plot*





*The sign in front of the  
Mongkol Chaipattana Temple*



(self-sufficiency). Frugality is the first step. Unity in the community is necessary.

(3) Their rice production should be enough for year-round consumption. A household with 5 rai (0.8 hectare) of paddy fields will have enough rice for all year. This is a core concept of this theory.

(4) To achieve this, using the average calculation, a rai of paddy field needs about 1,000 cubic metres of water. If each farm has five rai (0.8 hectare) of paddy fields, and if the farmland is divided under the 30:30:30:10 formula, the farmer primarily needs water to feed two portions of their land as follows:

The five rai of paddy fields needs  $5 \times 1,000 = 5,000$  cubic metres. Another five rai (0.8 hectare) of field and horticultural crops needs  $5 \times 1,000 = 5,000$  cubic metres. This comes to 10,000 cubic metres in total.

It is necessary, therefore, to have 10,000 cubic metres of reserved water for the dry season. Hence this rough formula. Each farm has 3 rai for the reservoir. If it is 4 metres deep, the reservoir can store about 19,000 cubic metres. The farm also has 2 rai (0.32 hectare) for the housing area, 5 rai (0.8 hectare) for the paddy fields, 5 rai (0.8 hectare) for field and horticultural crops. The whole plot comes to 15 rai (2.4 hectare) in total.

(5) The biggest obstacle is that the full reservoir or pond will be replenished only once during the rainy season. Meanwhile, the daily rate of evaporation is about 1 centimetre when it does not rain. On average, there are 300 days without rain. The level of water in the reservoir will go down by three metres. (In this case,



*A pond under the New Theory*



it is  $\frac{3}{4}$  of the 19,000 cubic metres). There will be only 4,750 cubic metres of water left. It is then necessary to fill the reservoir with enough water.

(6) Subsequently, if we want this theory to be complete so the reservoir can work efficiently to its full potential, it is necessary to have a bigger source of water to fill up the reservoir in the farm. It's like having a huge water tank that is used to constantly fill up small waterjars. In case of the Mongkol Chaipattana Temple Project in Saraburi Province, the Nam Huai Hin Khao Reservoir with a capacity of 800,000 cubic metres was built for this purpose. Under the old irrigation system, the irrigation canal can feed only 600 - 800 rai of farmland (96 - 128 hectares). If we use the New Theory, the reservoir can feed up to 3,000 rai (480 hectares), or 5 times more.

(7) The reservoir of 800,000 cubic metres can usually feed only 800 rai of land (128 hectares). (The Mongkol Temple Project covers 3,000 rai (480 hectares), divided into 200 plots). This reservoir then can feed 4 rai (0.64 hectare) per one plot. The pond in the

farm can only support 4.75 rai (0.76 hectare) ( $4.75 + 4 \text{ rai} = 8.75 \text{ rai}$  or 1.4 hectares).

We can see that this is quite risky considering that 8.75 rai (1.4 hectares) can be farmed fully while the other 6.25 rai (1 hectare) are left to nature. But considering that there are periods when there is no need for water, or when there is also rainfall to be stored in the reservoir and in the farm ponds in time of need, the reservoir and pond will work as water regulator. So it is believed that there will be sufficient water in this system.

(8) Another big problem is the high cost of farm investment. The farmers then need external assistance (from the government, foundations or the private sector). But the operation costs for farmers are not high."

All of the Royal Development Study Centres have demonstration plots on New Theory Farming to disseminate the concept and know-how to the farmers so they can learn the techniques and use them on their own farms.

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## Laws relating to this project

### Royal Initiated Projects Relating to Agriculture

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Laws relating to and supporting the project are as follows:

- 1.  
**Act on the Partial  
Transfer of Authority  
from the Office  
of the National  
Economic and Social  
Development Board  
to the Office of the  
Royal Development  
Projects Board,  
B.E. 2536 (1993)**

Act on the Partial Transfer of Authority from the Office of the National Economic and Social Development Board to the Office of the Royal Development Projects Board, B.E. 2536 (1993)
- 2.  
**Plant Quarantine  
Act, B.E. 2507  
(1964) and its  
amendments**

The law controls and regulates the import and export of plant varieties, the import of plant varieties for research on plant varieties development, and the export of plant varieties derived from research. The import and export of plant varieties and other materials for farming shall be inspected under this Act to prevent contagious plant diseases and insect pests.
- 3.  
**Fertilisers Act,  
B.E. 2518 (1975)  
and its amendments**

This law ensures farmers an access to fertiliser that meets standard quality and controls the manufacturers and distributors of chemical and organic fertiliser so the products meet the standard quality as prescribed by the Ministry of Agriculture and Cooperatives.
- 4.  
**Plant Variety Act,  
B.E. 2518 (1975)  
and its amendments**

This law ensures farmers an access to quality plant varieties and controls the manufacturers and distributors of plant varieties to meet the standard quality as prescribed by the Ministry of Agriculture and Cooperatives.



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## Laws relating to this project

### Royal Initiated Projects Relating to Agriculture

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5.

**Hazardous  
Substance Act,  
B.E. 2535 (1992)  
and its amendments**

This law controls and regulates hazardous substances (chemical pesticides) used by farmers. It also covers import, production, distribution and having in possession of hazardous substances to ensure safety for users, consumers and to avoid damage to the environment.

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6.

**Plant Variety  
Protection Act,  
B.E. 2542 (1999)**

This law ensures protection rights for plant varieties from research and development, plant varieties development, plant varieties registration, and the production of new varieties.

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7.

**Land Development  
Act, B.E. 2551  
(2008)**

This law empowers the Land Development Department to survey, analyse, and inspect the soil or land to identify its natural fertility, its suitability for land use or the land's economic condition, or land classification, land development, land use zoning, land demarcation for soil and water conservation, and for the land census system. All these are important missions of the Land Development Department in supporting the royal initiated projects on land development especially those on farmland rehabilitation across the country. For instance, the department is engaging in land rehabilitation at the royal initiated Cha-ngum Mountain Deteriorated Soil Rehabilitation Project. The soil there is thin, parched, ridden with gravel and infertile from severe soil erosion. Its deeper layer is dense and tough. The soil surface is damaged while the area is arid and dry.

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8.

**Emergency Decree  
on Fisheries,  
B.E. 2558 (2015)**

Under the Chapter on the Aquaculture Promotion, fishermen are allowed to engage in aquaculture along the Thai coastline. The decree covers fishing inside and outside Thai waters, regulates aquaculture, and encourages people's participation. The decree standardises the conservation and management of aquatic animal resources in line with

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## Laws relating to this project

### Royal Initiated Projects Relating to Agriculture

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international practices. The main points in the decree deal with the management of aquatic animal resources, in which the fishing zones are classified into 3 zones as follows:

- (1) Freshwater fishing means all fishing areas on land.
- (2) Coastal seas fishing means the fishing ground in the sea starting from the coastline farther than 3 nautical miles to not exceeding 12 nautical miles with authorisation from the Minister.
- (3) Offshore seas fishing means fishing areas beyond the coastal seas upto the end of the Thai waters.

This zoning system is determined by the fishermen's fishing capacity and their fishing equipment to avoid conflicts between different fishermen groups due to declining aquatic resources. It also aims at improving efficiency in fisheries management. The law also prohibits any possession of fishing equipments that pose serious harm to aquatic animal. This will protect and improve the fishermen's source of livelihood.

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9.  
**Royal Decree  
on the Organisation**

Royal Decree on the Organisation of the Office of the Royal Development Projects Board, B.E. 2538 (1995).

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10.  
**Ministerial  
Regulation on the  
Organisation of the  
Office of the  
Royal Development  
Projects Board,  
B.E. 2551 (2008)**

Under the Ministerial Regulation on the Organisation of the Office of the Royal Development Projects Board, B.E. 2551 (2008), the Office of the Royal Development Projects Board is a government agency that is not under the Office of the Prime Minister or any other ministry or sub-ministry. Its status is equivalent to a department in a ministry under the Office of the Prime Minister's line of command. Its power and duties include supporting the operation of the Office of the Royal Development Projects Board, regulating, monitoring and evaluating its performance to ensure the projects are in line with royal initiatives and

Laws relating to this project  
Royal Initiated Projects Relating to Agriculture

board policies. The Office of the Royal Development Projects Board also overseas the Royal Development Study Centres which has a privy councillor as chairman.

11.  
Ministerial  
Regulation on the  
Organisation of the  
Land Development  
Department,  
Ministry of  
Agriculture and  
Cooperatives,  
B.E. 2557 (2014)

Under the Ministerial Regulation, the Land Development Department has the powers and duties on setting policies, plans, and regulations on agricultural land uses, land surveys, soil classification, land zoning, land use in areas with activities that cause pollution from hazardous chemicals or the materials, soil and water conservation, soil rehabilitation, map production and land census, services and the transfer of land development technology, soil database, and land utilisation to improve agricultural productivity and sustainable land use.

12.  
Ministerial  
Regulation on the  
Organisation  
of the Fisheries  
Department,  
Ministry of  
Agriculture and  
Cooperatives,  
B.E. 2559 (2016)

Under the Ministerial Regulation, the Fisheries Department has duties and responsibilities on study, research and develop fishery resources for effective fisheries resources management. The department is empowered to regulate fishing operations, the production of aquatic animals and products in accordance with hygienic standards. The department has the responsibility to ensure adequate aquatic animals for domestic consumption and competitive prices in the global markets while maintaining sustainable fishing and managable use of fishery resources.





### Project Outcome

King Bhumibol Adulyadej's Royal Development Study Centres benefit the Thai people and society in many ways.

1. The operations of the Royal Development Study Centres are inter-disciplinary. The projects deal with various fields in agriculture such as land rehabilitation, plant varieties development, irrigation systems, and the promotion of fisheries. To develop plant varieties, the centres covers the whole process from researching, experimenting, to plant breeding and the processing of agricultural products. The centres also promote the New Theory Farming. Their operations have created a valuable body of knowledge consistent with topographies and social conditions in addition to giving the locals new sources of income.

2. The Kung Krabaen Bay Royal Development Study Centre, covering 4,000 rai of land (640 hectares), is part of the forest reserves. Once degraded, now the areas are lush green, boasting one of healthiest and most beautiful mangrove forests in Chanthaburi Province. The centre stands on a 5-kilometre coast which provides a significant habitat for young marine lives to support local fishery. The rehabilitation of mangroves and better coastal fishing management have led to an abundant sea once again. The fishermen around the Kung Krabaen Bay significantly profit from better catches. They also benefit from the

centre's work on sustainable prawn farming. The Kung Krabaen Bay Royal Development Study Centre has created many benefits to the communities. They include:

2.1) Given a healthy sea, people around the Kung Krabaen Bay have easy access to source of protein from aquatic animals. They then have better nutrition, better health, and better quality of life. Prawn farmers also have more income while the more bountiful seas help ease conflicts between different fishermen groups. Through the centre's activities, people have better knowledge about coastal seas conservation, fisheries management, and aquatic animals breeding. Consequently, the locals have become more protective of the coastal and fishery resources and more committed to sustainable use of the seas.

2.2) The centre has made contributions to the farming of prawns, one of Thailand's top products for exports. The centre also helps farmers with the processing of seafoods to add value to their products and to strengthen the economy.

2.3) The centre's operations help protect the diversity of fishery resources in the Thai waters. The balanced marine ecosystem is essential to the people's well-being and the country's economy. It also sustains the country's position as the world's leading seafood exporting country.

3. The royal initiated Cha-ngum Mountain Deteriorated Soil Rehabilitation Project has effectively restored soil quality by strengthening its ability to store water, stabilising water sources, repairing earthen ponds and fixing laterite-ridden soil to make farming possible. The project has also restored forest ecology by allowing forest to grow back naturally. The project has created many benefits to local communities. Among them:

3.1) The farmers nearby and the public have the opportunity to learn about soil management, land rehabilitation and how to prevent environmental degradation.

3.2) People in the area have learned to become more aware of their responsibilities to protect their land, water sources and the forest. When people protect their own environment, the government can save on the budgets to solve environmental problems.

3.3) Land, water, forest, flora and fauna have regained health. There are subsequently more arable land, forest, and sources of food for the people.

#### Recommendations

1. The royal initiated projects on agriculture incorporate King Bhumibol Adulyadej's Sufficiency Economy Philosophy in all their activities. The aim is to make people, including children and youth, aware of the development philosophy which they can apply in their daily life and work. The government should

produce media materials to easily explain the Sufficiency Economy Philosophy so people can understand its true essence.

2. The government should organise activities for local communities to create environmental awareness and encourage them to take part in the management of their own natural resources, to feel protective of their environment, and to be vigilant against destructive uses of their natural resources. Local communities should also take part in environmental rehabilitation which will be more effective than letting state agencies do it alone.

3. The government should give serious and continuous attention to the development of soil and land resources and help people and local organisations to be aware of their roles to conserve their soil and use it efficiently.

4. The government should encourage people to take part in the planning of their natural resources management and conservation in a timely manner to keep up with rapid environmental change. Development will be successful and sustainable only through cooperation of the local people.

5. The law should be strictly enforced to protect economically potential areas from being destroyed. For example, laterite mining should be regulated. There should be measures to rehabilitate the areas when mining is over, such as reforestation in the old mining area, so that the locals will not be affected by environmental degradation.

“...The main principles:

*Farmers should have enough to be  
self-supporting (self-sufficiency).*

*Frugality is the first step.*

*Unity in the community is necessary...*

*Their rice production should be  
enough for year-round consumption.*

*A household with 5 rai  
(0.8 hectare) of paddy fields will have  
enough rice for all year. This is  
a core concept of this theory...”*

*New Theory concept,  
an explanation in writing from  
King Bhumibol Adulyadej  
for the Chaipattana Foundation  
on 5 March B.E. 2537 (1994).*



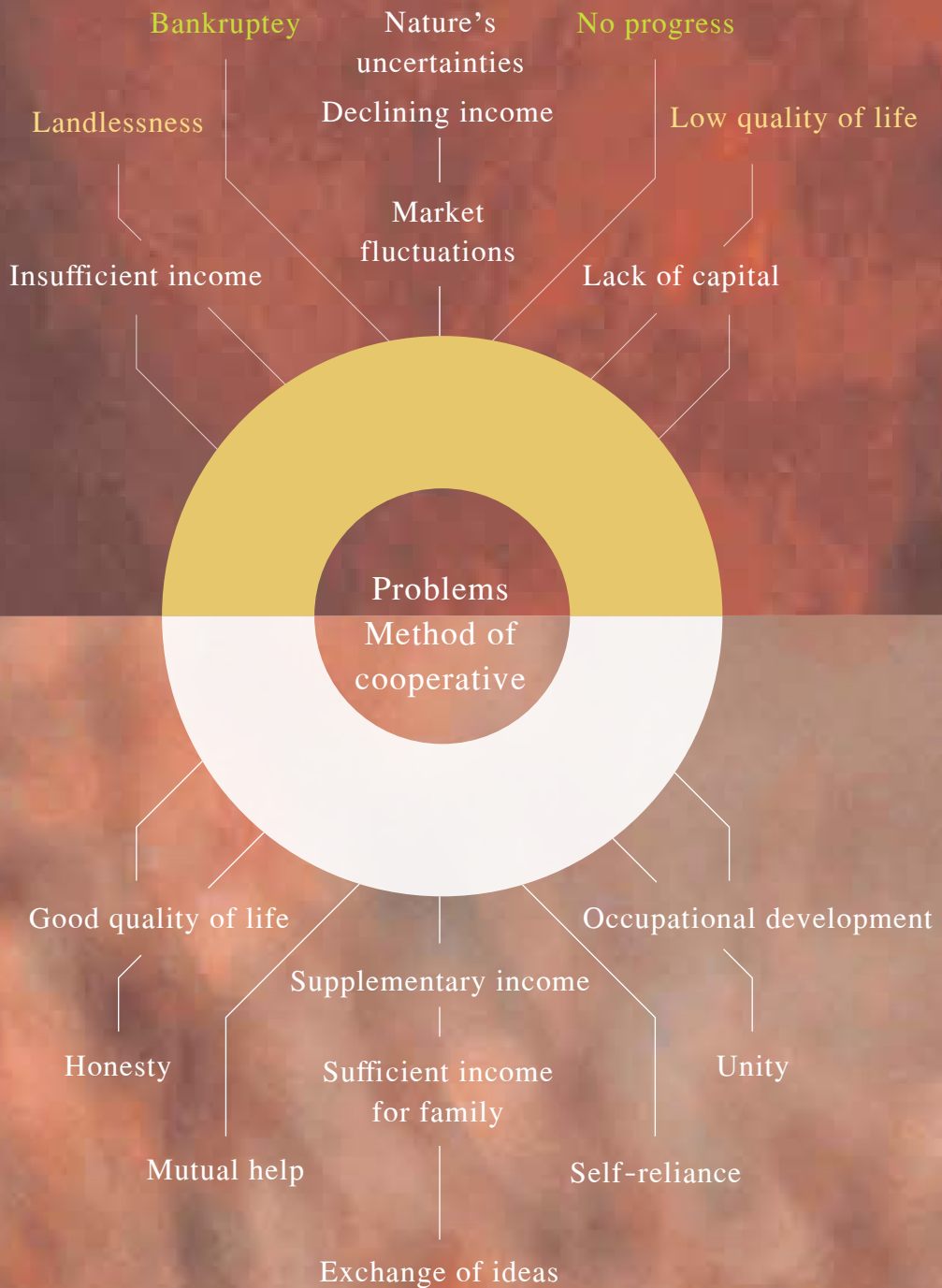






The royal initiated projects on occupation promotion stem from market fluctuations and nature's uncertainties. Farmers should not rely solely on cash crops. The cooperative method aims to empower people to be self-reliant and supportive of each other.

## Royal Initiated Projects Relating to Occupation Promotion





Royal Initiated Projects  
Relating to Occupation Promotion

THE WISDOM  
OF THE  
MONARCH

The cooperative method enable people to form groups based on self-reliance and mutual help.

In operating a cooperative, all members must learn to love one another as well as uphold unity and integrity.

King Bhumibol Adulyadej believed farmers should not rely solely on cash crops because of nature's uncertainties and market fluctuations. Instead, farmers should have supplementary income both from and outside agriculture. The King suggested the use of the "Cooperative Method" to enable villagers to form groups based on self-reliance and mutual assistance. In operating a cooperative, all members must learn to love one another as well as uphold unity and integrity.

“...The word ‘cooperative’ means working together. Working together is a profound activity because we need to cooperate physically, intellectually and willingly. All these are interrelated and indispensable. For the work that is done physically, if all collaborate, this will produce a result. For example, when we grow plants, the plants bear fruits. We can eat those fruits, keep them for other uses, or sell them to earn money. If one operates individually, the result may not be as productive. And this may result in not having enough to earn a living and having to go through suffering. Thus, we must work together. We must help one another from the family level onwards. Every member of the family must work to help support the family. The more people group together, the better and more efficiently they can function. And this will yield better result...”

King Bhumibol Adulyadej's royal address  
to cooperative leaders nationwide  
at Dusidalai Hall, Chitralada Villa,  
on 11 May 1993.

## Royal initiated projects on occupation promotion

### Overview of the project

Rural development and livelihood of farmers were King Bhumibol Adulyadej's concerns. His Majesty deemed it too risky for farmers to depend solely on cash crops farming due to market fluctuations and nature's uncertainties. Instead, they should also have supplementary sources of income from livestock, fisheries, and cottage industry. Hence the King initiated several projects to help farmers become self-supporting. He recommended "The Cooperative Method" to be mode of working in several projects so the farmers could get organised and form groups based on the principles of self-reliance and mutual help.

The King's meaning of "cooperative" appears in the royal address for cooperative leaders across the country at Dusidalai Hall, Chitralada Villa, on 11 May 1993, as follows:

*"...The word 'cooperative' means working together. Working together is a profound*

*activity because we need to cooperate physically, intellectually and willingly. All these are interrelated and indispensable. For the work that is done physically, if all collaborate, this will produce a result. For example, when we grow plants, the plants*

*bear fruits. We can eat those fruits, keep them for other uses, or sell them to earn money. If one operates individually, the result may not be as productive. And this may result in not having enough to earn a living and having to go through suffering. Thus, we must work together. We must help one another from the family level onwards. Every member of the family must work to help*

*support the family. The more people group together, the better and more efficiently they can function. And this will yield better result..."*

His Majesty also gave the main principles of cooperative in a royal address to a group of leaders from agricultural cooperative and settlement cooperative at Dusidalai Hall, Chitralada Villa, on 11 November 1978, as follows:





*"...The main principles of cooperative are honesty, trust, and mutual help. If we are to summarise it, I quite like this summary that people often use--that people working in groups need unity. Unity means doing things in unison. If not, there will be no progress. The operations will not achieve the goals. The operations will fail. We are part of the operations. We will fail too. Therefore, unity is being in unison. This is important in the running of cooperatives..."*

His Majesty also pointed out the significance of ownership in a royal address to the committee members of agricultural and settlement cooperatives on 9 May 1985 at Chitralada Villa, as follows:

*"...Cooperative belongs to farmers. It's up to what the farmers' intentions are. It should not be the intention of the government to tell people to do this and that. Real benefits will fall on the farmers, the members of cooperatives. It's not for the government to give fancy orders to villagers and farmers to do. This is the matter of livelihoods that farmers who are the cooperative's members can make it happen themselves. It's your policy, the farmers' policy. Therefore, the key takeaway from*

*this gathering here today is an exchange of opinions and experiences as well as mutual assistance. This is a very important point in running cooperatives..."*

### Occupation promotion projects

#### Agricultural cooperative

Overall, the cooperative succeeds in generating more income for the members.

Apart from increased capital to invest in their occupations, the cooperative empowers members to unite and solve community problems together, leading to a better quality of life.



*The government at that time then had an agreement with the government of Israel to set up "Thai-Israeli Project for Rural Development (Hub Kapong)." The demonstration site of the project was located at Hub Kapong, Cha-am District, Phetchaburi Province.*

In 1964, during his stay at the Klai Kangwon Palace in Hua Hin District, Prachuap Khiri Khan, where he used as a base to visit villagers in the area, King Bhumibol Adulyadej learned that a group of vegetable farmers

in Cha-am suffered from lack of capitals. His Majesty accepted them under his royal patronage and later learned they were also landless. He then asked M.L. Dej Snidvongs, a privy councillor, who at that time was the Chairman of the National Economic Social and Development Board, to look for land in Phetchaburi and Prachuap Khiri Khan Provinces to distribute to these farmers.

Back then, the Israeli government, through the Israeli ambassador, offered to give assistance in agricultural development by sending specialists to Thailand. The government then signed an agreement with the Israeli government to set up the “Thai-Israeli Project for Rural Development (Hub Kapong).” The area in Hub Kapong, Cha-am District, Phetchaburi Province, was chosen to be the location of the demonstration site. The area was part of national forest reserves. Some villagers had been farming there but the yields were poor due to soil infertility and water scarcity. Farmers then had to resort to slash-and-burn farming method.

His Majesty initiated the idea to have about 10,000 rai (1,600 hectares) of degraded forest set aside for rehabilitation. Afterwards, King Bhumibol Adulyadej did just like commoners by

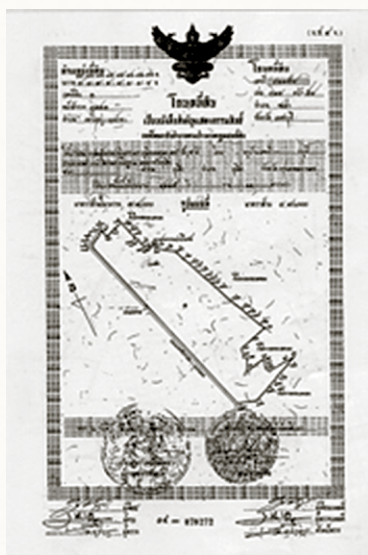
following the rules and regulations under the Forest Law to acquire the degraded land by pre-emption to rehabilitate it. He advised various state agencies to work together to revitalise the land and to allocate it to the Hub Kapong vegetable farmers who were

landless so they could live, farm, and build a community there. The project also helped provide infrastructure, knowledge in community management, and training in the operations of cooperatives. When the villagers were ready, the King supported them to register their organisation as an agricultural cooperative

called “Hub Kapong Agricultural Cooperative Ltd” on 12 August 1971. His Majesty also graciously conferred to them the registration document. He also gave three land title deeds covering a total of 12,079 rai, 1 ngan and 82 square wah (about 1,932 hectares) to the Department of Agricultural Cooperative Promotion and the Hub Kapong Cooperative to be in charge of allocating land to the farmers.

The Hub Kapong Cooperative Ltd initially had 128 members, consisting of the Cha-am vegetables group members

and the landless farmers in Hub Kapong, each family receiving 25 rai of land to work on. The King also graciously granted the cooperative 7,554,885 baht to set up a fund called “The Royal Fund for the Development of Hub Kapong Cooperative Ltd.”



*King Bhumibol Adulyadej acquired the degraded land by pre-emption to rehabilitate it, following the rules and regulations under the Forest Law just like it is required of commoners.*

*On 25 December 1973, the Ratchaburi Dairy Cooperative officially changed its name to Nongpho Ratchaburi Dairy Cooperative Limited.*



As of 2015, the fund increased to 8,388,784 baht and the cooperative members increased to 479. Its main activities are offering savings and lending services as well as bargain merchandise to save costs. In 2015, the cooperative had 36.73 million baht in working capital, 2.67 million baht in registered capital, 5.22 million baht in legal reserve and a net profit of 219,466.52 baht. The Hub Kapong Cooperative Demonstration Centre, Office of Cooperative of Phetchaburi Province, Department of Cooperative Promotion, was in charge of supervising the operations and allocating the farmlands to members. At present, 391 families have received 787 plots of land totalling 7,608 rai (1,217 hectares).

#### Dairy cooperative

In 1959, the officials from the Department of

Livestock Department, Ministry of Agriculture and Cooperatives, discussed artificial insemination of livestock with a group of farmer leaders at Nongpho Sub-district, Photharam District, Ratchaburi Province, leading to the establishment of a livestock insemination centre at Nongpho Sub-district. In 1968, due to the government's support for dairy farmers in Ratchaburi and Nakhon Pathom Provinces, the number of dairy farmers had significantly increased and this made it difficult for dairy farmers to sell raw milk.

In 1969, a group of dairy farmers wrote a letter asking for help from King Bhumibol Adulyadej. It was the same time the King had a milk powder factory built in Chitralada Villa. In 1970, a 50-rai plot of land (8 hectares) and a sum of money were donated to the King





*When the villagers were ready, the King supported them to register their organisation as an agricultural cooperative called “Hub Kapong Agricultural Cooperative Ltd” on 12 August 1971.*



*On 9 March, 1972, Their Majesties King Bhumibol Adulyadej and Queen Sirikit graciously presided over the inauguration ceremony and named the factory “The Nongpho Milk Powder Factory.”*

to be the site of a milk powder factory in Ratchaburi Province.

Afterward, a group of dairy farmers came together to build a milk collecting centre at Nongpho with funding support from the government and the farmers themselves. On 15 April 1971 the dairy farmers registered the milk collecting centre as a cooperative called “Ratchaburi Dairy Cooperative Ltd” under the service category.

The construction of the dairy milk powder factory was completed in 1972. King Bhumibol Adulyadej and Queen Sirikit graciously presided over the inauguration ceremony on 9 March 1972 and named the factory “The Nongpho Milk Powder Factory.” It was run as a company limited under the name “Nongpho Dairy Products Ltd.” As the biggest

shareholder, the King set a rule for the company that its profits must not go back to the shareholders. Instead, part of the profits must go to a scholarship fund to support the education of the children of the cooperative's members who were supplying milk to the factory.

In 1973, the factory produced pasteurised milk for the first time. On 25 December of the same year, the Ratchaburi Dairy Cooperative changed its registered name to “Nongpho Ratchaburi Dairy Cooperative Limited” as an agricultural cooperative. When the cooperative had grown financially secure and attained its objectives while the members already understood well the ideologies and principles of cooperatives and how to run it, the King graciously transferred all the assets of the Nongpho Dairy Products Ltd, including



*The Nongpho Ratchaburi Dairy Cooperative Ltd produces pasteurised and UHT milk products which are sold nationwide. Dairy farmers then no longer have to worry about where to sell their raw milk.*



the milk powder factory, to be the properties of the Nongpho Ratchaburi Dairy Cooperative Ltd under Royal Patronage from 16 October 1975 onwards.

At present, the Nongpho Ratchaburi Dairy Cooperative Ltd has been operating for more than 43 years. Throughout its operations, the cooperative has closely followed the King's guidelines which enable it to produce pasteurised and UHT milk products and make them available nationwide. Its production capacity can accommodate all raw milk from the dairy farmers in Nongpho and nearby areas. They then no longer have to worry about where to sell their raw milk. In addition, the cooperative's profits belong to them as members. It is evident that the Nongpho Ratchaburi Dairy Cooperative Ltd (under

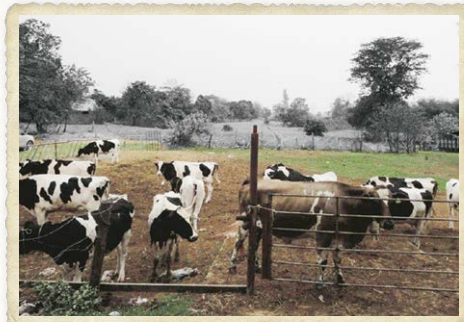
Royal Patronage) has effectively solved the problems of dairy farmers.

#### Cattle banks

Livestock husbandry is one of Thai farmers' important occupations. Livestock development, however, faces many obstacles. One of them is lack of good breeds, particularly the breeds

“The Nongpho Milk Powder Factory” was run as a company limited under the name “Nongpho Dairy Products Ltd.” As the biggest shareholder, the King had set a rule for the company that its profits must not go back to the shareholders. Instead, part of the profits must go to the scholarship fund to support the education of the children of the cooperative's members who were supplying milk to the factory.





*The initials of the royally-initiated Buffalo and Cow Bank is Tor Gor Khor in Thai. In English, the name of the project is “Royal Cattle-Buffalo Bank for Farmers.”*

of cattle which are important for rural farmers. Realising this, King Bhumibol Adulyadej initiated the establishment of cattle banks to collect cows and buffaloes to produce quality breedings and distribute them to farmers.

The Cattle Bank encourages the local farmers to participate in its management and operations as part of the royal efforts to empower local communities.

The Cattle Bank project came about when King Bhumibol Adulyadej was visiting the villagers in a royal initiated valley development project in Prachin Buri Province in June, 1979. He had learned that many poor farmers did not have buffaloes of their own and had to rent them at exorbitant prices. Often they did not have much left after paying for the buffalo rent. The King therefore initiated the cattle bank

for farmers with the Department of Livestock Development as the project operator. The funding came from the King's private money and public donations which was given to the Department of Livestock Development to manage in accordance with the royal objectives.

His Majesty gave a royal address to a gathering of farmers nationwide to mark the Ploughing Day on 14 May 1980 as follows:

*“...The Cattle Bank is the collection of buffaloes and cows with an official account to control, look after, distribute and loan for agricultural uses. The aim is also to increase the number of buffaloes and cows through banking principles. The Cattle Bank is a new thing in this time and age. The need arises because farmers nowadays mostly use machines in farming to reduce the use of their*



labour. But when gasoline is expensive, they cannot use the machines and need to rely on the cattle as before. But when they want to go back, they face many problems because they do not have money to buy buffaloes and cows for their labour."

"...It is possible to liken the Cattle Bank with a commercial bank which deals with money. This is because banks generally deal with things of value and of good use. Setting up the Cattle Bank does not mean erecting a building to keep buffaloes and cows. Only a centre suffices. The Department of Livestock Development may operate as the centre, for example. Whoever wants to donate to the Cattle Bank does not need to donate the buffaloes or cows. They can donate money..."

The Thai initials used by the Department of Livestock Development for the royal initiated Cattle Bank for farmers is Tor Gor Khor. The name of the Cattle Bank in English is "Royal Cattle-Buffalo Bank for Farmers." The Cattle Bank aims at helping poor farmers across the country to have buffaloes and cows plough their land in order to increase yields and

The Cattle Bank is aimed at helping poor farmers across the country to have buffaloes and cows to till their lands in order to increase yields and the farmers' income.

“...The Cattle Bank is the cows with an official account to loan for agricultural uses. The of buffaloes and cows through Bank is a new thing in this time farmers nowadays mostly use use of their labour. But when use the machines and need to rely they want to go back, they face not have money to buy buffaloes “It is possible to liken the Cattle which deals with money. This is things of value and of good use. mean erecting a building to centre suffices. The Department operate as the centre, for example. Cattle Bank does not need to They can donate money...”

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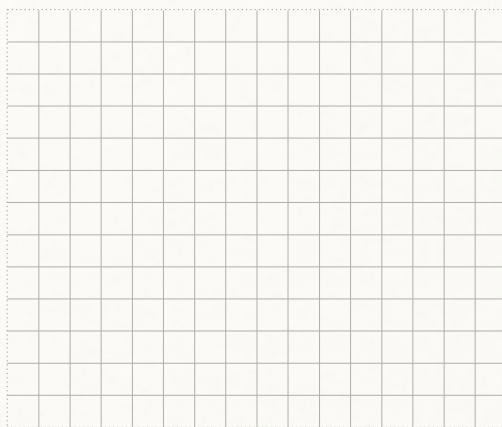
*Bank with a commercial bank because banks generally deal with Setting up the Cattle Bank does not keep buffaloes and cows. Only a of Livestock Development may Whoever wants to donate to the donate the buffaloes or cows.*

the farmers' income. The Cattle Bank offers five services. They are: 1) Lending the cattle for farming; 2) Hire-purchasing services for cattle; 3) Lending the parent breeding stock; 4) Cattle loaning for farm work, and 5) Others.

From 1980 when the project started to 2016, a total of 235,513 farmers have received services from the Cattle Bank. As of August 2016, there are 105,491 farmers under the Cattle Bank's supervision.

The total number of cattle on loan is 106,615 (cows: 74,739, buffaloes: 31,876). According to the contract, the farmers who already gave the first calf aged not exceeding 18 months back to the bank, can own the calf's mother after keeping it for five years. From 1981 to August 2016, 49,580 farmers have been given the parent breeding stock. The value of the first calf's mother, and the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> calves is worth about 766,014,795 baht.

*King Bhumibol Adulyadej's royal address  
to members of agricultural groups to mark  
the Ploughing Day on 14 May 1980.*



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## Laws relating to this project

### Royal Initiated Projects Relating to Occupation Promotion

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Laws relating to and supporting the project are as follows:

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1.  
**Civil and  
Commercial Code**

Under the Civil and Commercial Code, a registered cooperative is a juristic entity with the capability to operate, produce, sell, exchange, and make legal contracts relating to its business and production in conformity with the cooperative's objectives as provided in the Civil and Commercial Code.

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2.  
**Animal Breeding  
Development  
Act, B.E. 2509  
(1966)**

Most farmers take cows on loan from the Cattle Bank to breed calves while the bulls are used as the parent stock in order to increase the cattle population. The Department of Livestock Development then determines qualification requirements for the cattle in the project. The cattle must be in reproductive age, healthy, free of brucellosis, tuberculosis, and already vaccinated against stomatitis and haemorrhagic septicemia. These measures are necessary to ensure that the cattle are healthy and ready for breeding.

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3.  
**Allotment of Land  
for Living Act,  
B.E. 2511 (1968)  
and its amendments**

The Allotment of Land for Living Act, B.E. 2511 (1968) and its amendments empower the government to do allotment of state land for the landless or those with too little land to support themselves so that they have a land for housing and farming. This can be done by establishing the self-help settlements or the cooperative settlements, as the case may be, through the issuance of royal decree with a map demarcating the boundaries of the settlements. A committee appointed by the Minister of Social Development and Human Security shall have the duty to select qualified persons to be settlement members to utilise their land allotments according to the regulations prescribed by this Act.

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4.  
**Cooperatives Act,  
B.E. 2542 (1999)**

The Cooperatives Act, B.E. 2542 (1999) regulates and promotes cooperatives by investing the powers and responsibilities upon the Director-General of the Cooperative Promotion Department in his capacity as a registrar of cooperatives. The Director-General shall appoint an official of the Ministry of Agriculture and Cooperatives to be a deputy registrar of cooperative. The registrar and the deputy



## Laws relating to this project

### Royal Initiated Projects Relating to Occupation Promotion

registrar of cooperatives shall have the powers and duties as stipulated in the Act; for example, to register, promote, assist, advise, regulate and issue rules, regulations and orders in conformity with the provisions of this Act.

The National Cooperative Development Board shall be appointed, having the powers and duties to propose to the Cabinet policies and planning on cooperative development. The board also prescribes guidelines for promoting and supporting the cooperatives' business expansion and activities.

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5.

**Dairy Cow and  
Dairy Product Act,  
B.E. 2551 (2008)**

The Dairy Cow and Dairy Product Committee comprising high-ranking authorities such as Permanent Secretary of the Ministry of Agriculture and Cooperatives, Director-General of the Cooperatives Promotion Department, Director-General of the Department of Livestock Development, Director-General of the Department of Internal Trade, Director-General of the Department of Foreign Trade, and Director-General of the Department of Local Administration shall be appointed by the provisions of this Act. The committee shall have the powers and duties to set policies and planning on the production and distribution of dairy milk and dairy products domestically and internationally. Other duties of the committee include setting the prerequisites and limits on the amount of dairy milk, milk powder, and dairy products for import and export, solving the problems concerning dairy milk and products, setting rules and regulations, and issuing announcements and orders in conformity with the provisions of this Act.

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6.

**Cruelty Prevention and  
Welfare of Animals  
Act, B.E. 2557 (2014)**

Under this Act, the farmers who have made cattle loans with the Cattle Bank must sign a contract, binding themselves to provide appropriate care and welfare to the farm animals both inside and outside farm work.

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7.

**Animal Epidemics  
Act, B.E. 2558 (2015)**

Most cows and buffaloes in the Cattle Bank are donated by charitable people in Bangkok and outlying areas. Since the cattle have to be transported to farmers in the provinces, the Cattle Bank strictly follows the Animal Epidemics Act B.E. 2558. This Act stipulates strict rules

## Laws relating to this project

### Royal Initiated Projects Relating to Occupation Promotion

and regulations on the transport of farm animals. The law also requires the farmers to report to authorities within 12 hours if the animals they receive get sick or die in order to prevent and control the spread of epidemic. These measures make the work of veterinarians, police inspector, and competent officials in controlling the epidemics more effective. These measures also help protect the citizens' lives and properties and subsequently protect national economy.

8.

**Ministerial  
Regulation on the  
Organisation of the  
Cooperative  
Promotion Department,  
B.E. 2557 (2014)**

The Ministerial Regulation empowers the Cooperative Promotion Department to give support, information, and knowledge about the cooperative's ideology, principles and management to cooperative personnel, farmer groups, and the public. Its powers and duties also include supporting, protecting, developing, and strengthening the cooperative system through constant improvements of the operations in accordance with the law on cooperative.

9.

**Regulation of the  
Cooperative  
Promotion  
Department on  
Land Allotment in  
Royally-Initiated  
Hub Kapong  
Cooperative Village,  
B.E. 2524 (1981)**

The Regulation appoints a committee, comprising the representatives from the Hub Kapong Agricultural Cooperative, to screen appropriate farmers to receive land allotments in the Hub Kapong cooperative village. The committee members are appointed by the Cooperative Promotion Department to screen land allotment applicants. Each selected family will receive a plot of farmland not exceeding 25 rai (4 hectares). The general land allotment practices of cooperative settlements shall be applied to the process of applicant selection *mutatis mutandis*. The selected farmers are required to follow land use regulations and avoid the prohibitions as prescribed by the Regulations.

10.

**Regulation of the  
Department of  
Livestock  
Development on the  
Operation of the  
Royal Cattle-Buffalo  
Bank for Farmers,  
B.E. 2556 (2013)**

Under the Regulation, the Department of Livestock Development is responsible for the operations of the Royal Cattle-Buffalo Bank for Farmers from when it started in 1980 until now. The executive committee of the Royal Cattle-Buffalo Bank is chaired by the Director-General of the Department of Livestock Development, operating its duties in conformity with the provisions of this Regulation.

### Project Outcome

The royal initiated projects on occupational development through cooperatives have created many benefits for the people and society as follows:

1. It serves as an agricultural centre to experiment and demonstrate the know-how in livestock raising and plants growing in dry, arid land -- a contribution to agricultural development in areas with infertile soils. The centre offers demonstrations of agricultural technologies to farmers, students and the general public.

2. The Hub Kapong Cooperatives serves as a learning centre where visitors can directly learn about farming from successful farmers' plots and experiences. There are six learning stations for visitors to learn about asparagus farming, beef cattle raising, organic vegetables farming, dairy cow farming, sisal products cottage industry, and the making of household utensils.

3. Landless farmers are given land allotments for farming. However, under the Regulations of Cooperatives Promotion Department on Land Allotments in the Royal Initiated Hub Kapong Cooperative Village B.E. 2524, the farmers do not have legal ownership over the land allotments.

4. The farmers who had received land allotments formed the Hub Kapong Agricultural Cooperative Ltd which enables them to help one another and have a self-supporting system in line with the ideology, principles and management of cooperatives. Subsequently, they can solve agricultural problems from production to market distribution. With the cooperative management committee operating efficiently, the members are equipped with farming know-how to support their families. Their economic self-reliance lessens the government's financial burden to assist them. The economy also benefits.

5. The Nongpho Ratchaburi Dairy Cooperative Limited under Royal Patronage has been closely following King Bhumibol Adulyadej's guidelines since its establishment. The dairy cooperative can now produce pasteurised and UHT milk products which are now on sale nationwide. The cooperative also serves as a centre for students, the general public as well

With the cooperative management committee operating efficiently, the members are equipped with the farming know-how to support their families. Their economic self-reliance lessens the government's financial burden to assist them.



as foreign visitors to study a rural development success story through cooperative operations and marketing.

6. The cooperative members have stable income and a better quality of life. Dairy farmers no longer have to worry about where to sell their raw milk as the Nongpho Ratchaburi Dairy Cooperative looks after their dairy business from production to distribution. The cooperative buys the farmers' raw milk to process and distribute across the country. In addition, the cooperative has provided employment in the rural areas, enabling the locals to have income security. Importantly, the profits from the cooperative go back to its members.

7. The Royal Cattle-Buffalo Bank for Farmers has been in operation for 37 years, offering its services in every province and helping more than 200,000 needy farmers to have their own cattle to increase farm productivity. The soil has also become fertile from cattle manure leading to more crop yields and more income. The Cattle Bank has effectively increased the number of cattle population in the country. Using farm animals' labour reduces the use of fossil fuel and expenses while maintaining the Thai way of life in the countryside and the culture of mutual help.

8. The Cattle Bank gives the public an opportunity to donate the cattle or money to

be part of the charitable cause. The country benefits greatly from the cattle's labour. The donors feel good from saving the lives of cattle from going to the slaughterhouses and help poor farmers at the same time. Importantly, this project fosters the farmers' loyalty to the monarchy. All recipients feel grateful and blessed for receiving assistance from the King.

The cooperative members have stable income and a better quality of life. Dairy farmers no longer have to worry about where to sell their raw milk as the Nongpho Ratchaburi Dairy Cooperative looks after their dairy business from production to distribution. The cooperative buys the farmers' raw milk to process and distribute across the country.

#### Recommendations

1. The projects are in arid areas unfit for farming. Farmers need assistance. Concerning state agencies then need to continually conduct research on sustainable agriculture which fits with specific areas. It is also necessary to provide support right from farming, collecting the produce, processing, distributing, setting quality standard, to doing the public relations for the products.

2. The law should be strictly enforced against those who illegally farm in the Hub Kapong Cooperative Village. The farmers who have legally obtained farm allotments should also strictly observe the Allotment of Land for Living Act B.E. 2511 and the Regulations of the Cooperatives Promotion Department on Land Allotments in Royal Initiated Hub Kapong Cooperative Village B.E. 2524.

3. The cooperative and concerning state agencies should conduct research on new dairy products and increase distribution channels to prevent raw milk surplus especially during school breaks. Efforts should be made to expand milk processing network to areas where dairy farming is non-existent.

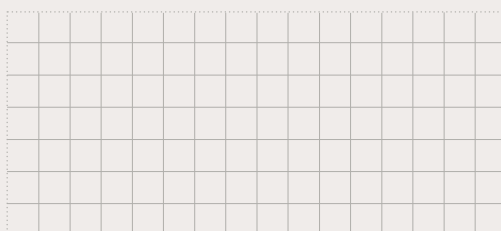
4. Concerned state agencies should work together to give technical know-how to dairy farmers on how to maintain raw milk quality, hygiene, and safety as well as to reduce unnecessary expenses and increase income from raw milk.

5. The Cattle Bank's regulations should be adjusted to increase the number of cattle on loan from one to 3 - 5 for each farmer. The service areas should be suitable for livestock raising to ensure productive returns, create jobs, and make use of infertile land. Farmers should switch from growing mono cash crops to fodder or adopt integrated farming to increase soil fertility.

6. The screening of farmers to join the Cattle Bank should be promoted. The selected farmers should get organised to set up group management and monitoring system to ensure the cattle's proper health and welfare effectively.


7. The operations of the Cattle Bank must follow the rules and regulations over cattle loans. There should be measures to monitor the farmers in the Cattle Bank so they strictly follow the contracts in order to prevent violations. In cases of violations, strict punitive measures must be used indiscriminately to avoid damages to the project.

The cooperative and concerning state agencies should conduct research on new dairy products and increase distribution channels to prevent raw milk surplus especially during school breaks. Efforts should be made to expand milk processing network to areas where dairy farming is non-existent.









The royal initiated projects relating to public health are based on people's public health problems and the King's work principles, which is by "understanding the people's needs." The goal is to make people healthy.

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Royal Initiated Projects  
Relating to Public Health

The King graciously granted his own fund to build an institute for leprosy treatment training.

The Rajpracha Samasai Institute was accepted under royal patronage.

The King graciously initiated training for village doctors.

Village doctors started operating to ease the villagers' health problems.

1955

1956

1960

1961

1965

1969

1969

1974

1993

The King graciously gave the "Vejapha" boat to give medical care to people along the waterways.

The King graciously named the completely-constructed building Rajpracha Samasai Institute, meaning the King and the people depend on each other.

Under a royal initiative, royal doctors started giving medical care to villagers during royal upcountry visits.

The Royal Initiated Royal Mobile Medical Unit was officially established.

The Royal Traffic Police Project for first aid and emergency childbirth started operating.

King Bhumibol Adulyadej deemed the development of people's well-being and good health important for national development. The early royal projects then focused on public healthcare. His Majesty paid much attention to public health because good physical health creates mental well-being, and this will bring about good national economic and social development. His idea was evidenced in a royal address during the graduation ceremony at Mahidol University in October 1979, as follows:

*"...Maintaining good physical health contributes to healthy economy and a stable society because healthy body generally leads to mental well-being. When one's body and mind are healthy, one can do one's best to create economic and social benefits for the country. They will not be the burden of society. They are the ones who create, not the ones who impede progress."*

The King showed concern for the health of particularly the poor who had no access to medical treatment when they fell sick. Hence His Majesty initiated projects to give medical assistance to the rural poor, applying western medicine to local needs. The King also brought into use the principle of self-reliance by training community volunteers or village doctors to provide first-aid and educate the villagers on preventive care. This royal principle on preventive care has become a guideline for sustainable healthcare.



“ When King Bhumibol Adulyadej was in the officials responsible for the routes made a the road where many lepers were waiting to he changed it back to the original route and

*One of the visits by His Majesty King Bhumibol Adulyadej to villagers in the past which eventually led to the establishment of the Ratchapracha Samasai Foundation.*

#### Royal initiated projects on public health

There are several royal initiated projects on public health which attest to King Bhumibol Adulyadej's vision on how to tackle the problems. Among them, five royal initiated projects stand out. They are the Royal Mobile Medical Unit, the Village Doctor or Paramedic Training Project, the Mobile Floating Clinic (The Vejapha Boat), the Royal Traffic Police Project for first aid and emergency childbirth, and the Rajpracha Samasai Institute to treat leprosy patients and conduct research on leprosy.

There are four groups of people who benefit from these royal initiatives. They are: people in remote areas with difficult access to roads, people who live along the river with no access to roads, people who are obstructed by traffic congestion to gain access to hospitals, and people who are stricken with hard-to-cure contagious diseases and ridden with social stigma.

#### 1. Royal Mobile Medical Unit

In early 1965, King Bhumibol Adulyadej started giving medical assistance to sick villagers by the physicians who accompanied the Royal Family during upcountry trips. Each physician worked according to their specialisation. In 1967, His Majesty started to have the patients transported to the hospital in the province where the Royal Family was staying when the physicians saw the need to. The King also graciously sent mobile medical team equipped with doctors, nurses, medical equipment and medicines to treat villagers in remote and rugged areas.

In 1969, His Majesty officially established the Royal Mobile Medical Unit following HSH Prince Bhisadej Rajani's suggestion that there should be mobile medical teams to help the villagers in insurgency areas, otherwise called the red or pink areas. The King graciously

*Narathiwat Province to visit people in the South, change so the royal convoy did not have to pass greet him. When His Majesty learned about this, closely interacted with the lepers. ”*

named it the “Royally-Granted Medical Unit” led by Dr. Danai Snidvongs, the first unit leader. Its first fieldwork was in Chiang Rai which was full of rugged and dangerous terrain back then, hence the need to use helicopters to go to the villages. On 29 January 1965, His Majesty visited a highland development project in Chiang Rai and found that many hill tribes villagers who were there to greet him were stricken with many illnesses. He then had the newly-established royal medical team give treatment to the villagers for the first time officially.

Since then, the mobile medical unit has been expanding its services constantly. A clinic operated in front of the palaces in the provinces

during the Royal Family’s upcountry visits. The mobile medical unit would also treat the patients at the sites where the Royal Family was visiting. Physicians from Bangkok and other provinces take turn joining the mobile medical unit. Provincial authorities would make radio announcements to encourage the locals to get medical assistance from the royal medical team. The number of patients kept rising rapidly. The patients near and far the palaces where the Royal Family was staying would come to get medical assistance from the medical unit in front of the palaces. The team received over 500 patients on average. Often, the number of patients exceeded 1,000 per day.





## 2. Village Doctor or Paramedic Training Project

Since 29 January 1965 when the King's personal physicians started providing medical treatment to local villagers, the King initiated the idea of having healthcare volunteers or paramedics and giving them necessary training so they could help sick villagers in remote areas with no access to public healthcare services.

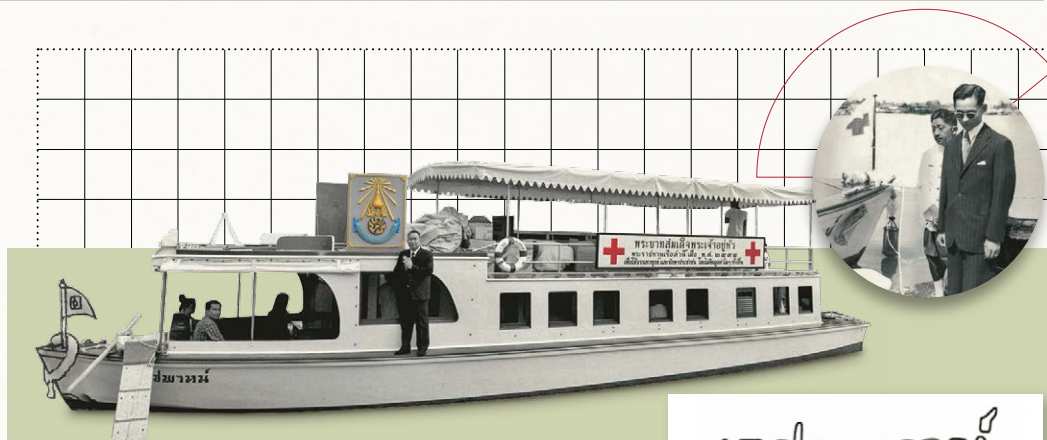
Rural villagers were mostly poor and did not know how to take care of their health properly. Training the village doctors equip them with knowledge in preventive care, first aid treatment, and contacts with officials when the patients' conditions need hospital care. Having the village paramedics in the communities also answers the villagers' long-term needs. Often, the illnesses result from inappropriate treatment and lack of health stations nearby. His Majesty then launched the Village Paramedic Training Project and selected some villagers to get

basic medical training so they can administer simple treatment for people in their villages. In 1974, these health volunteers started their service for the first time at the Southern Development Self-Help Settlement in Waeng District, Narathiwat Province.

## 3. Mobile Floating Clinic (The Vejapha Boat)

The Mobile Floating Clinic Project (the Vejapha Boat) was under the supervision of the Thai Red Cross Society. The project came about when His Majesty had concerns for health problems of people who lived in isolated communities along the rivers with no access to roads. Although they could travel by boat to go the hospitals, they were still living very far from their provincial hospitals. When falling sick, they had to rely on traditional medicine which often did not work. The King then had a boat built by the Bangkok Dock Co Ltd with his own money to give to the Thai Red Cross





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*After being anointed by the King, the Vejapha Boat started its operations immediately in Nonthaburi Province.*

Society as a mobile floating clinic to treat patients along the rivers.

The King graciously named the boat "Vejapha" (read vet-cha-pah) and presided over the ceremony to donate the boat on 19 January 1955 at Tha Wasukri Pier, Bangkok. After being anointed by the King, the Vejapha Boat started its operations immediately in Nonthaburi Province.

Initially, the medical services included simple treatments, small surgeries, dentistry, injections and the dispensing of medicine. Later, given the increased number of patients and expanded services -- such as serving also as a floating library, and health education centre -- medical examinations and treatments were relocated onshore at temples, schools, and piers. Dispensing medicine was still done on the boat. The Vejapha Boat operated in 19 provinces, namely Nonthaburi, Suphan Buri, Nakhon Sawan,

Bangkok, Samut Sakhon, Chachoengsao, Ayutthaya, Prachin Buri, Chai Nat, Sing Buri, Kanchanaburi, Lop Buri, Ang Thong, Ratchaburi, Pathum Thani, Samut Songkhram, Nakhon Pathom, Uthai Thani, and Samut Prakan.

Although there are now hospitals and health stations almost everywhere in the country, the Relief and Community Health Bureau, Thai Red Cross Society, still runs the Vejapha floating clinic to serve people along the river once a year to remind people of the King's compassion for all his people. The Vejapha Boat is the world's first floating clinic that is still operating until today.

In the early days, the Vejapha floating clinic provided basic medical treatment, minor surgeries, dental care, first aid, injections, and pharmaceutical services. Later, as more and more people availed themselves of its service, it began expanding its activities to include health education and a mobile library.

*King Bhumibol Adulyadej graciously donated money from the Ananda Mahidol Fund to construct four buildings at Phra Pradaeng Hospital.*



#### 4. The Royal Traffic Police Project

This project started on 24 August 1993 when the Deputy Chief Aide-de-Camp General to the King, Royal Aide-de-Camp Department, Chitralada Villa, Dusit Palace, informed the Metropolitan Police Commander that King Bhumibol Adulyadej and the Princess Mother each had donated four million baht of their private money to set up emergency traffic police service to ease the traffic and help people in emergencies.

The fund was for the purchase of motorcycles, radio communication, per diem, and other necessary expenses. His Majesty gave five royal guidelines to ease the traffic. They were: (1) Find the ways to make drivers respect the traffic rules and drive with good manners; (2) Use the motorcycles as a fast-moving unit to rush to the problematic sites and untangle the traffic jam so the traffic can flow; (3) Use

these motorcycles when needed to quickly direct the traffic so that cars can move; (4) At bottlenecks, use these motorcycles to solve the problems so the cars can move, like pouring water out of the bottle; and (5) Engage drivers so they cooperate in solving the traffic problems.

The Police Chief and the Metropolitan Police Commander promptly followed the royal initiatives. The Royal Thai Police found that the people who need urgent help were mostly accident victims and pregnant women close to delivery on their way to the hospitals. The traffic police often had to help deliver the baby, therefore the traffic police should receive formal training about first aid and emergency baby delivery. Hence the First Aid and Emergency Childbirth Training for the Traffic Police Project for this special traffic police unit was established.

When the construction was completed, the King wanted the name of the building to show people's participation in creating this institution, so he named it the **Rajpracha Samasai Institute**, meaning the king and the people depend on each other.

#### 5. The Rajpracha Samasai Institute for Leprosy Treatment and Research

When King Bhumibol Adulyadej was in Narathiwat Province to visit people in the South, the officials responsible for the routes made a change so the royal convoy did not have to pass the road where many lepers were waiting to greet him. When His Majesty learned about this, he changed it back to the original route and closely interacted with the lepers.

Afterwards, the King asked the Director-General of the Health Department to brief him about the leprosy situation in Thailand and the state policies to eradicate leprosy within 10 years. The Director-General informed the King that there was a need for an institute to train personnel who work closely with leprosy patients.

Later in 1956, the King graciously granted money from the Ananda Mahidol Fund and



also another 1,000,000 baht from his private money to construct buildings at Phra Pradaeng Hospital to train health personnel on leprosy treatment and also to conduct research on leprosy. The money also came from the fundraising screening of the Royal Family's private royal films as well as from donations from royalties, government officials, businessmen and the general public. When the construction was completed, the King wanted the name of the building to show people's participation in creating this institution, so he named it the Rajpracha Samasai Institute, meaning the king and the people depend on each other. The King





*“Rajpracha Samasai Foundation” is set up to treat and rehabilitate leprosy patients as well as to conduct research on leprosy and give occupational training to the patients.*

graciously presided over the inauguration ceremony of the institute on 16 January 1960.

There was still money left from the construction costs, the King then granted it to set up the “Rajpracha Samasai Fund.” The Ministry of Public Health later received royal permission to register it as the “Rajpracha Samasai Foundation” to treat and rehabilitate leprosy patients as well as to conduct research on leprosy and give occupational training to the patients. His Majesty also graciously granted money from the Ananda Mahidol Fund to build another four buildings at the Phra Pradaeng Hospital for the training of health personnel who work with leprosy patients. The buildings

were operational on 16 January 1960. The King accepted the foundation under his royal patronage in 1961. Anti-leprosy work made much progress from then on.

During 1956 - 1994, efforts to help leprosy patients expanded to cover all provinces. Nearly 170,000 leprosy patients were registered for treatment and 83,993 of them were cured. For those who were already free of the contagious bacteria, they were sent to live in 12 settlements in various parts of the country. The Rajpracha Samasai Foundation supported the revolving fund for their occupations in farming, weaving, and wickerware. They could return the money to the revolving fund after



*King Bhumibol Adulyadej closely followed the progress of the Rajpracha Samasai School. The Rajpracha Samasai Foundation was established to support the school which later became a public school under the Ministry of Education.*

they sold their products. As for their children who were raised separately and did not have educational opportunity, His Majesty set up the Rajpracha Samasai School for them in Bangchak Sub-district, Phra Pradaeng District, Samut Prakan Province, and closely followed the school's progress. The Rajpracha Samasai School Foundation was established to support the school which later became a public school under the Ministry of Education.

Since 1994, leprosy was no longer a public health problem in Thailand. At present, the number of lepers have constantly decreased. In 2015, there were only 180 leprosy patients. The government aims to reduce the leprosy

patients to 100 by 2020. However, the number of migrant workers with leprosy has increased. In 1995, out of the 180 leprosy patients, 40 of them were migrant workers. The problem may become a cause for concern in the future.

In 1997, the King expressed concerns about leprosy in neighbouring countries. Although the number of leprosy patients in Thailand has decreased, given rapid changes that come with globalisation, Thailand should also pay attention to the leprosy situation in the neighbouring countries and provide assistance. At present, the Rajpracha Samasai Institute is trying to make leprosy detection quicker and more efficient.

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## Laws relating to this project

### Royal Initiated Projects Relating to Public Health

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Laws relating to and supporting the project are as follows:

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1.  
**Drugs Act,  
B.E. 2510 (1967)**

The Drugs Act, B.E. 2510 (1967) governs the production, sale and the import and export of drugs into the Kingdom. The law requires dangerous drugs be dispensed by pharmacists. This Act stipulates the officials' scope of authority to regulate the manufacturing of drugs for human use, quality control and the drugs advertising. The law also allows the pharmacies, selling modern drugs, to sell only ready-packed drugs that are not dangerous or specially-controlled drugs in order to protect consumers and to ensure access to public health services as part of self-reliant healthcare. The Drugs Act, B.E. 2510 (1967) is therefore supportive of the royal initiated Village Paramedics' Training Project aiming to foster mutual assistance and self-reliant in rural communities.

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2.  
**Communicable  
Diseases Act,  
B.E. 2523 (1980)**

The Communicable Diseases Act, B.E. 2523 (1980) governs the prevention and control of highly virulent communicable diseases which may spread rapidly and more extensively than normally observed. It covers both emerging and re-emerging infectious diseases. In line with the International Health Regulations (2005) on communicable diseases which was adopted by Thailand, legal measures on prevention, protection, and control in this Act were amended to keep abreast with the situations. This law was enacted during the time when the Rajpracha Samasai Foundation was offering leprosy patients rehabilitation and was conducting research on leprosy, back then a highly dangerous communicable disease in Thailand. This legislation was then supportive of the foundation's mission to eventually eradicate leprosy in Thailand as intended by King Bhumibol Adulyadej.



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## Laws relating to this project

### Royal Initiated Projects Relating to Public Health

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3.  
**Public Health Act,  
B.E. 2535 (1992)**

The Public Health Act, B.E. 2535 (1992) amended the Public Health Act, B.E. 2484 (1941) which no longer kept up with social and political progress, particularly the advent of administrative decentralization. The provisions on control were amended to cover monitoring and follow-up measures, to adjust the powers and duties of officials concerned, and to strengthen punitive measures for more effectiveness. This act expanded the scope of measures for controlling or overseeing activities pertaining to public health so they could be adjusted for timely intervention, and also prescribed public health standards, closely affecting the human living and environment. For effective implementation, particularly on controlling and monitoring environmental health, the provisions on officials' powers to facilitate public health work and punitive measures were prescribed. Competent authorities were authorised to facilitate public health work. This law was therefore principal and supportive of the above mentioned five royal initiated projects on public health.

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4.  
**Medical Facilities  
Act, B.E. 2541  
(1998)**

The Medical Facilities Act, B.E. 2541 (1998) prescribes principle on medical facility business control to ensure consumers protection for those receiving services from medical facility. Permission for medical facility business operation, cessation, relocation, closure of medical facility, licence revocation, and medical facility advertising shall be in accordance with the rules and procedures prescribed in the Act. It stipulates the authorities' power, duties, and responsibilities in regulating medical facilities, the duties of the licensees and the medical facility operators. It specifies the numbers of medical facilities allowed as well as ensures that the medical facilities' operations and services serve people's best interests. This law indirectly supports public health projects. Though not a principal public health law, it is supportive of the royal initiated projects on public health and facilitates public health services to the general public.

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## Laws relating to this project

### Royal Initiated Projects Relating to Public Health

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5.

**National Health  
Security Act,  
B.E. 2545 (2002)**

Under the Constitution of the Kingdom of Thailand, all Thais shall have equal access to standard public health services. The indigent may access public health services provided by the State free of charge. The State shall ensure that the people receive effective universal healthcares, by promoting participation from local government and private sector. Under this Act, the government must provide and promote public access to effective essential healthcare services, ensure standard health services, systemize essential healthcare and set up a regulatory body that undertakes collaborative work between the government and the civic sectors. The management of effective healthcare services system is the main principle in the overall management of standardised healthcare across the country.

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6.

**National Health Act,  
B.E. 2550 (2007)**

The National Health Act, B.E. 2550 (2007) focuses on the system to look after and solve people's health problems. Under this Act, health means the state of human being that is physically, mentally, spiritually, and socially healthy with each dimension interconnected to create a balanced system. Subsequently, it is not enough to look after people's health solely through medical treatment because this will be unnecessarily costly both to the government and the people. It is therefore necessary for the government to set up a system to promote good health and to prevent illnesses as well as to enable the citizenry to be well-informed and proactive to protect their own health. This Act sets the framework, directions, and strategies for the national healthcare system. It also creates an organization and mechanisms to run the system with participation from all stakeholders to achieve health promotion goals and to efficiently and thoroughly look after and solve people's health problems. By not solely focusing on medical treatment but working toward the promotion of good health, this Act marks a legal step forward and provides an important foundation for future advancement in public healthcare.

### Outcome of the Project

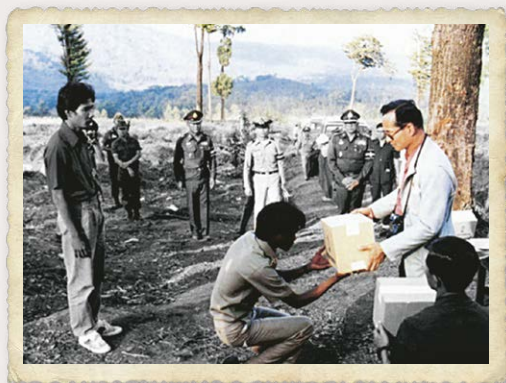
The royal guidelines that can be effectively applied

The five royal initiated projects on public health reflects King Bhumibol Adulyadej's four royal guidelines: 1. Act fast; 2. Shorten the process; 3. Help people to help themselves, and 4. Don't claim credit or Pid Thong Lang Phra in Thai, literally meaning putting gold leaves behind the Buddha's image.

The royal initiated projects on public health target people who live in remote areas far from public roads, people along the riverside inaccessible by roads and depending on boats to commute, the patients who are stuck in the traffic, and the patients of communicable diseases.



These five royal initiated projects reflect His Majesty's principles to foster immunity and strength to the populace in four ways, namely financial immunity, environmental immunity,



cultural immunity, and social immunity (education and morality).

### Proactive public health

When King Bhumibol Adulyadej visited people in remote areas across the country, he found that the majority of people still lacked good health. Initially, he had his personal doctors to promptly give treatment to the sick villagers. When the number of the patients increased until it was beyond the ability of the team of royal physicians to take care of them, His Majesty developed a proactive model of medical service by sending the doctors to treat the patients in remote areas with difficult access to public roads. The King set up a royal mobile medical unit with two locations. One was the royal clinic in front of the palaces where the Royal Family was staying during rural trips to visit the people. The other was the team of physicians who, while accompanying the Royal Family during the trips to the countryside, provided prompt medical treatment to sick villagers.





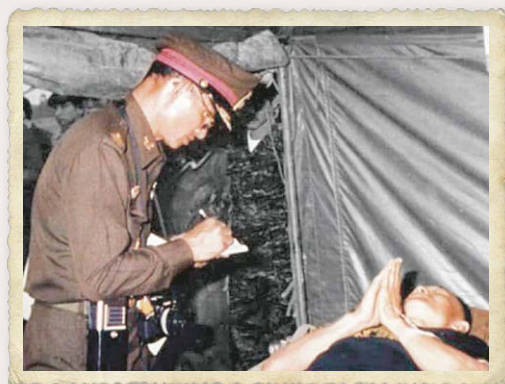
His proactive public health initiatives helped people in all parts of the country to receive medical treatment efficiently and thoroughly. They were in line with his work principles to “understand the needs of the people” and to “help one another.”

*“...In any society, if people help one another to achieve mutual benefit and growth, that society will be full of goodwill, friendship, peace, happiness and comfort...”*

King Bhumibol Adulyadej’s statement for the 36<sup>th</sup> anniversary publication of the Lions Club, Bangkok under Royal Patronage, on 31 March 1995.

King Bhumibol Adulyadej’s proactive public health initiatives are in line with his work principles to “understand the needs of the people” and to “help one another.”

The royal initiated projects on public health came into being from prioritising the villagers’ health problems as the goal to tackle. This is in line with the King’s “understand the people’s needs” work principle. The goal of the projects was to make people healthy and to give them easy, fast, safe and inexpensive access to healthcare services when they were ill. At the same time, these projects did not financially burden the government so the government could use the budgets to develop the country in other areas. The projects were run by volunteers with professional expertise in medicine and healthcare which enabled the projects to run on a long-term basis. The volunteers joined the projects because they deeply admired the King’s devotion to the people. In addition, the projects were



consistent with the social conditions of each different locality.

### Recommendations


1. The royal initiated projects on public health should be integrated with the national public health strategy to improve the citizen's quality of life.
2. The King's royal guidelines on public health should be the principles to run the country's policies on public health.
3. Increase efficiency of health personnel. Continuously promote public health development so that it is up-to-date and has the same standard across the country.
4. There should be measures to facilitate and support the first-aid and emergency baby

delivery training which involve risks in their operations.

5. There should be a clear policy to support the continuity of the royal initiated projects.
6. There should be measures to control the spread of diseases among the migrant workers who have leprosy and other communicable diseases which Thailand has already eradicated. There should be measures to screen leprosy patients before migrant workers enter Thailand.







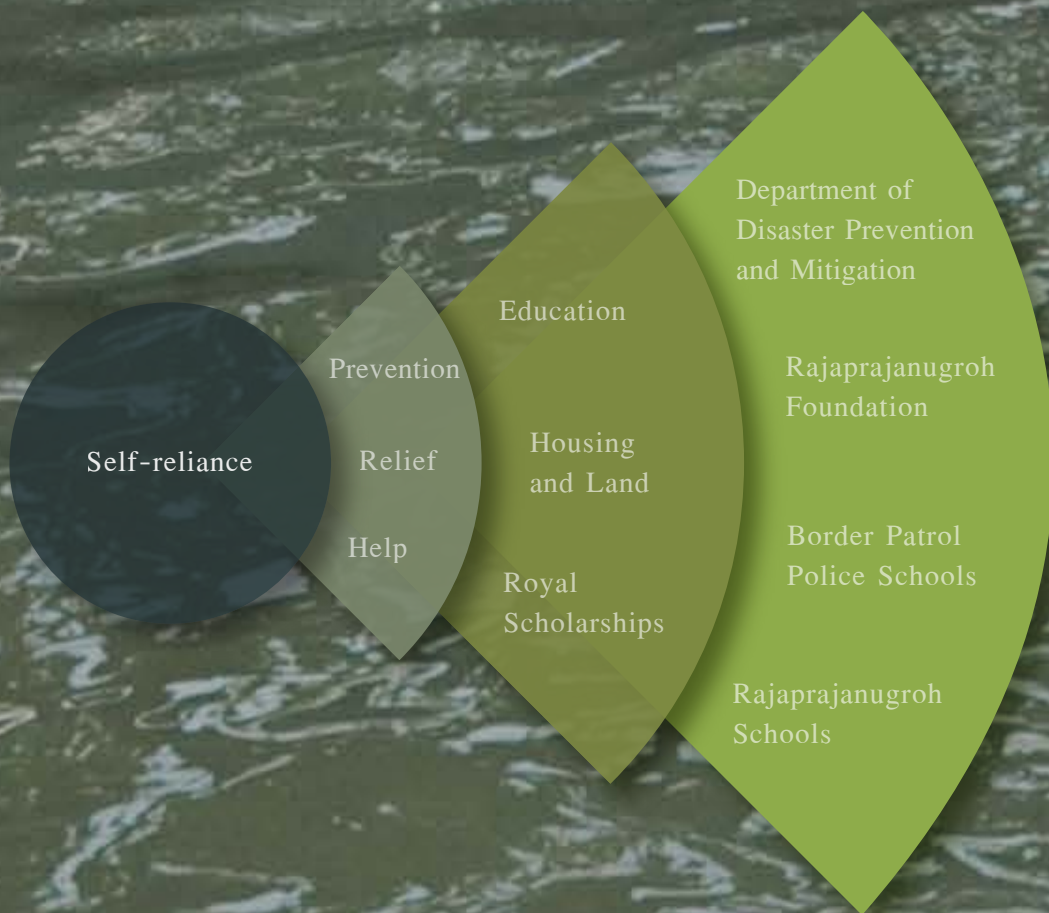
The royal initiated projects on social welfare went back to the disastrous typhoon which destroyed the Laem Talumphuk Cape in 1962. The typhoon killed a large number of people and wrought extensive destruction, causing widespread suffering. King Bhumibol Adulyadej then set up the Rajaprajanugroh Foundation, meaning "the King" and "the people" helping each other.

## Royal Initiated Projects Relating to Social Welfare









Royal Initiated Projects  
Relating to Social Welfare

THE WISDOM  
OF THE  
MONARCH

Rajaprajanugroh means “the King”  
and “the people” helping each other  
The foundation gives sustainable  
assistance through people  
empowerment and self-reliance.

Social welfare involves assisting the needy to have land to till, houses to live in, and access to basic needs. It also involves aid and relief during natural disasters, accidents, and the outbreak of pandemics. When emergencies struck, King Bhumibol Adulyadej always responded by giving prompt assistance to the affected people. His social welfare projects covered both immediate and long-term assistance. His Majesty’s principle was “helping people to help themselves.” Apart from his compassion particularly for people in need, the King was also very tactful in encouraging people not to abandon one another in time of emergencies. For example, the King established the Rajaprajanugroh Foundation under Royal Patronage so people could help one another in time of trouble. The public would have the opportunity to give, to feel compassion for others, to assist, so the affected did not feel abandoned. Rajaprajanugroh means “the King” and “the people” helping each other. The foundation gives sustainable assistance through people empowerment and self-reliance.



*“...Helping victims of natural disaster should first be short-term. This means that in time of emergencies, help must be prompt. Next we should ensure that the assistance continues. Long-term assistance is also necessary...to ensure that the victims continue to be taken care of, including to have an education so they can work decently and efficiently as good citizens of the country...”*

*King Bhumibol Adulyadej's royal address on 23 August, 1963*

*“...Disasters, natural or man-made, can strike anytime unexpectedly, like what happened at Laem Talumphuk in Nakhon Si Thammarat Province and many other provinces in the South...*

*“...Go promptly to give help and warmth to the affected people in suffering. Help the victims so they have the morale to go on...*

*”*

*”*



*The destruction left by Tropical Storm Harriet.  
Photo by Khun Khru Truek Phrueksasri*

**Royal initiated projects relating to social welfare**

On 25 October 1962, a typhoon hit the Laem Talumphuk Cape in Pak Phanang District, Nakhon Si Thammarat Province. A large number of people were killed and displaced. When King Bhumibol Adulyadej learned of the tragedy, he immediately donated his personal money to fund the emergency relief missions. His Majesty also used the Aw Saw Radio Station at Dusit Palace to raise funds from the general public to help the typhoon victims by sending them dried foods, rice and other basic necessities.

On 23 August 1963, His Majesty gave a royal address on natural disasters as follows:

*"...Disasters, natural or man-made, can strike anytime unexpectedly, like what happened*

*at Laem Talumphuk in Nakhon Si Thammarat Province and many other provinces in the South..."*

*"...Go promptly to give help and warmth to the affected people in suffering. Help the victims so they have the morale to go on..."*

*"...Helping victims of natural disaster should first be short-term. This means that in time of emergencies, help must be prompt. Next we should ensure that the assistance continues. Long-term assistance is also necessary...to ensure that the victims continue to be taken care of, including to have an education so they can work decently and efficiently as good citizens of the country..."*

The King set up the Rajaprajanugroh Foundation in 1963.



*King Bhumibol Adulyadej had explained that “Rajaprajanugroh” means “the King and the people helping each other.”*



King Bhumibol Adulyadej had explained that “Rajaprajanugroh” means “the King and the people helping each other.” As a monarch, he did not expect anything in return from the people. All he wanted was to see his people happy, earn a decent living, and be able to help one another. The Rajaprajanugroh Foundation under Royal Patronage of the King has been in operation for 53 years now. The late Khwankeo Vajarodaya was in charge of its policy while Dr. Distorn Vajarodaya served as Chairman of the Foundation.

#### Objectives of the Foundation

- 1) To give relief assistance to disaster victims across the country;
- 2) To support the education by giving scholarships to the orphans and displaced children whose families are affected by natural and man-made

disasters, to give scholarships to students of the Rajaprajanugroh School who perform well academically, and to support the activities of the Rajaprajanugroh School;

- 3) To help prevent disasters in various parts of the country;
- 4) To assist people in need from other causes as deemed appropriate by the executive board, with approval from the Chairman of the Foundation;
- 5) To collaborate with other charitable organisations to serve the public; and
- 6) Not to be involved in political activities.

The Foundation has two missions. They are:

1. Disaster relief. In this mission, the Foundation coordinates with the Ministry of Interior (Department of Disaster Prevention and Mitigation) with the Governor acting as





*When the typhoon died down, the two-storey school building was reduced to only one storey. Photo by a teacher, Ms Wilai Phruet sasri, in the morning of 26 October 1962.*



*A group of boy scouts camping at Laem Talumphuk on 7 September 1962, a month before it was hit by the devastating typhoon.*

Chairman of disaster relief work at the provincial level, the Deputy Governor as secretary, and the provincial representatives from the Ministry of Social Development and Human Security and from the Department of Disaster Prevention and Mitigation as committee members. The Foundation can also appoint provincial representative from other state agencies to be members of the Foundation's committee at the provincial level.

When disaster strikes, there should be a screening process from local authorities for the Foundation first. After receiving local information, the Foundation will then send royal aids to the disaster victims. Before the distribution of relief items, information about the situation should be presented to the chairman for his approval. The Chairman then informs

King Bhumibol Adulyadej explained that “Rajaprajanugroh” means “the King and the people helping each other.”

As a monarch, he did not expect anything in return from the people.

All he wanted was to see his people happy, earn a decent living, and be able to help one another.

the King about the disaster situation and seeks royal permission to give royal emergency bags to the disaster victims. In the provinces, the Foundation's disaster relief mission is carried out in conjunction with the governors. Before distributing the royal relief bags, the Foundation will inform the affected people about the King's concerns and compassion for them.

2. Education. The Foundation's education division works with state agencies concerning education such as Ministry of Education.



At present, the Foundation looks after 62 schools. They are:

2.1) The Rajaprajanugroh Schools which were founded and named by the King himself. The first one was the Ban Plai Laem Rajaprajanugroh School at the Talumphuk Cape. There are 58 Rajaprajanugroh Schools now all together. Later, other schools were established to help children in hardship. There are both day schools and boarding schools to fit their needs. Now, the Foundation is also taking care of the Suksasongkroh Schools which were set up for children in difficult situations such as hill tribe children, children with HIV/Aids or other diseases with social stigma, children at risk of human trafficking, and children in the restive South.

2.2) The Border Patrol Police Schools which carry the names of HRH Princess Srinagarindra, the Princess Mother, and HRH Princess Galyani Vadhana, such as the Sangwanwit School and the Galyani Vadhana School. These schools are under the supervision of the Office of the Basic Education Commission and the Special Education Bureau under the Ministry of Education. The Foundation provides school supplies, uniforms, and supports for various school projects including the Good Teachers, Good Students Programme and the Rajaprajanugroh Boy Scout Programme.

In addition, the Foundation also gives scholarships to the Rajaprajanugroh students who have good grades and good behavior so they can pursue a higher education.





*King Bhumibol Adulyadej graciously presided over the inauguration ceremony of the Rajaprajanugroh School at Ban Taeng Bang Kok and Ban Lao Kang Pla, in Wapi Pathum District, Maha Sarakham Province on 24 October 1971. During the ceremony, the King also gave school supplies and uniforms to the students.*



*The devastation left behind by Tropical Storm Harriet on 25 October 1962.*

The King also graciously granted a number of scholarships for students outside the Rajaprajanugroh Schools. In later years, the Foundation also gives scholarships to children whose families suffer from disasters. In helping them, the Foundation's social work division will send its social workers to work alongside with their counterparts from the social workers from the Ministry of Social Development and Social Security in that province to take care of the children affected by the disaster.

At present, all schools under the Foundation's supervision are regulated by the Ministry of Education. The Foundation, however, support



*A large number of villagers were killed and displaced when Typhoon Harriet hit Laem Talumphuk.*

the schools' various projects to improve their educational quality and environment. The Foundation also assists the local communities nearby.

The Foundation's budget comes from His Majesty's private money and public donations.



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## Laws relating to this project

### Royal Initiated Projects Relating to Social Welfare

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Laws relating to and supporting the project are as follows:

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1.

**Constitution of the  
Kingdom of Thailand,  
B.E. 2550 (2007)**

The Rajaprajanugroh Foundation under Royal Patronage focuses on educational development for children and youths by offering free education for children and youngsters in difficult situations. The Foundation set up schools namely the Rajaprajanugroh and Suksasongkroh Schools and continuously provides scholarships to needy students to help create equity in education. This is in line with the Section 49 of the Constitution which stipulates that all persons shall have equal rights to access public education provided by the State, efficiently and thoroughly.

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2.

**Civil and  
Commercial Code**

The details and procedures on the establishment, operation, and the dissolution of foundations are specified in the Civil and Commercial Code. Since the Rajaprajanugroh Foundation under Royal Patronage is a form of juristic entity, its operations have to comply with the Civil and Commercial Code.

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3.

**National  
Education Act,  
B.E. 2542 (1999)**

Under Section 10 of the National Education Act B.E. 2542, the State shall provide education to ensure that all persons have equal rights and opportunities to receive basic education, particularly vulnerable groups of children who lack access to education. This law clearly states that persons with physical, mental, intellectual, emotional, social, communicational and learning deficiencies, or with disability or infirmity or persons who cannot rely on themselves or have no one to take care of or underprivileged persons be specially provided with the rights and access to basic education.

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## Laws relating to this project

### Royal Initiated Projects Relating to Social Welfare

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4.  
**Act on Compensation  
for Persons Affected  
resulting from state  
and National  
Missions or from  
Humanitarian  
Act, B.E. 2543  
(2000)**

The Rajaprajanugroh Foundation under Royal Patronage providing education to disadvantaged children who need special assistance to receive educational opportunity shall be in line with provisions of the National Education Act B.E. 2542 (1999) to attain equity in education.

This law aims to provide assistance and moral support for persons who assist state or national missions either out of official responsibilities or out of good citizenship for humanitarian reasons so that when they are injured, as specified by law, they have the right to receive compensation in accordance with the rules and regulations.

The Rajaprajanugroh Foundation under Royal Patronage has received much assistance from volunteers in its relief missions for disaster victims. If the volunteers are injured, they are entitled to receive assistance from the government as specified in this legislation which is supportive of the foundation's operations.

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5.  
**Compulsory  
Education Act,  
B.E. 2545 (2002)**

The scholarship programme of the Rajaprajanugroh Foundation under Royal Patronage is in line with Section 12 of the Compulsory Education Act, B.E. 2545 (2002) which requires the State to provide special compulsory education for children with physical, mental, intellectual, emotional, social, communicational and learning deficiencies or physical disability, or infirmity, or children unable to rely on themselves or have no one to take care of, or children who are underprivileged, and talented children with appropriate contents and approaches. This law also requires the State to support these vulnerable groups of children with facilitating equipment, media, services, and other necessary assistance to ensure that they equally receive compulsory education.

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## Laws relating to this project

### Royal Initiated Projects Relating to Social Welfare

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**6. Social Welfare  
Promotion Act,  
B.E. 2546 (2003)**

This principal legislation governs the provision of social welfare services by both the public and private sectors. It also supports individuals, families, communities, local administrative organisations, and other organisations to take part in providing social welfare services.

The Rajaprajanugroh Foundation under Royal Patronage was established to give relief assistance to disaster victims across the country as well as providing assistance to people in distress from other causes. The operation of the foundation is therefore in line with the Social Welfare Promotion Act, B.E. 2546 (2003).

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**7.  
Public Disaster  
Prevention and  
Mitigation Act,  
B.E. 2550 (2007)**

Public Disaster Prevention and Mitigation Act, B.E. 2550 (2007) specifies the uniform framework for concerned agencies under this act. One of the objectives of the Rajaprajanugroh Foundation under Royal Patronage is to provide disaster relief, prevention and mitigation to the victims of various forms of disasters. The operations in disaster relief, prevention and mitigation of the Rajaprajanugroh Foundation and other disaster relief agencies should therefore be in accordance with this law to ensure that their works for the victims are well-coordinated.

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**8.  
National Child and  
Youth Development  
Promotion Act,  
B.E. 2550 (2007)**

Under the National Child and Youth Development Promotion Act B.E. 2550, all children and youths in Thailand have the right to education and basic education of the highest quality as specified in the Constitution. Children and youths also have the right to receive healthcare services of the highest quality available. The operations of the Rajaprajanugroh Foundation under Royal Patronage are in accordance with this law.



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## Laws relating to this project

### Royal Initiated Projects Relating to Social Welfare

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9.  
**Ministerial  
Regulation of  
Registration,  
Operation and  
Foundations  
Registry  
B.E. 2545 (2002)**

The provisions on Foundations as prescribed in the Civil and Commercial Code had been amended to keep abreast with current situation by the Act promulgating the Revised Provisions of Book 1 of the Civil and Commercial Code. The concerned ministerial regulations then needed to be amended in conformity with such revision since the Section 136 (1) (4) and (5) of the Civil and Commercial Code demand the ministerial regulations on (regulations), operation, and registration of foundations must be amended accordingly. Hence Ministerial Regulation on Registration, Operation and Foundations Registry B.E. 2545 (2002) had been issued and applied to all foundations including the Rajaprajanugroh Foundation.

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10.  
**Orders of the  
Ministry of Finance  
on Fund Advances  
for Disaster Relief  
and Emergency  
Assistance  
B.E. 2556 (2013)  
and its amendments**

The Orders on Fund Advances for Disaster Relief and Emergency Assistance, B.E. 2556 (2013) and its amendments specify the rules and procedures concerning the provision of disaster relief and emergency assistance to the victims. They also cover the assistance for people who are affected by other plights, which is one of the objectives of the Rajaprajanugroh Foundation under Royal Patronage. The operations of the foundation are therefore governed by these orders as well.

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11.  
**Regulation of the  
Rajaprachanugroh  
Foundation under  
Royal Patronage**

The frameworks, rules and regulations of the Rajaprajanugroh Foundation order Royal Patronage shall be in conformity with the Regulation. The Regulation specify the procedures concerning the establishment of the foundation, its objectives, capital, assets, finance, accounting, management and other specific details on the operations that the foundation must uphold.

### Project Outcome

King Bhumibol Adulyadej graciously granted his personal funds to the Ministry of Education to build 12 primary schools in six southern provinces after the devastation wrought by Tropical Storm Harriet. The King named these schools “Rajaprajanugroh School.” Since the establishment of the Rajaprajanugroh Foundation on 23 August 1963, there are now 58 Rajaprajanugroh Schools and four Border Patrol Police Schools under the Foundation.

Initially, His Majesty donated his personal money as seed money to build the schools. Later, the schools received financial support from the government and the public both in cash and in kind. Notably and worth remembering, the King spoke to the public himself through the Aw Saw Radio Station asking people to help raise funds for disaster victims. The public response was overwhelming.

His Majesty emphasised prompt operations by cutting the red tape and making help reach the victims the fastest possible. The royal approach was to help people in ways that they can help themselves later on. The King’s assistance was timely and ongoing. For short-term measures, the royal guideline was on prompt disaster relief assistance to provide the disaster victims with food, medicine, clothes, and other basic necessities because quick assistance would boost morale of the

victims, enabling them to stand up again. For long-term measures after emergency assistance, His Majesty took care of the victims by giving education to the children affected by the disaster until they could work as the country’s productive citizens.

King Bhumibol Adulyadej had laid an important groundwork for disaster relief work and had expanded its scope by using the principles of collective good and social engagement for public well-being. In 2002, the Ministry of Interior finally set up the Department of Disaster Prevention and Mitigation.

Notably and worth remembering,  
the King spoke to the public himself  
through the Aw Saw Radio Station  
asking people to help raise funds  
for disaster victims. The public  
response was overwhelming.

The establishment and the registration of the Rajaprajanugroh Foundation under Royal Patronage comply with the Interior Ministry’s rules and regulations. The Foundation’s framework, operation procedures and reports are also in accordance with the laws. The budgeting and management is also transparent as required by law. At present, the Foundation’s main source of financial support is the Ministry of Social Development and Human Security (formerly the Department of Social Welfare).

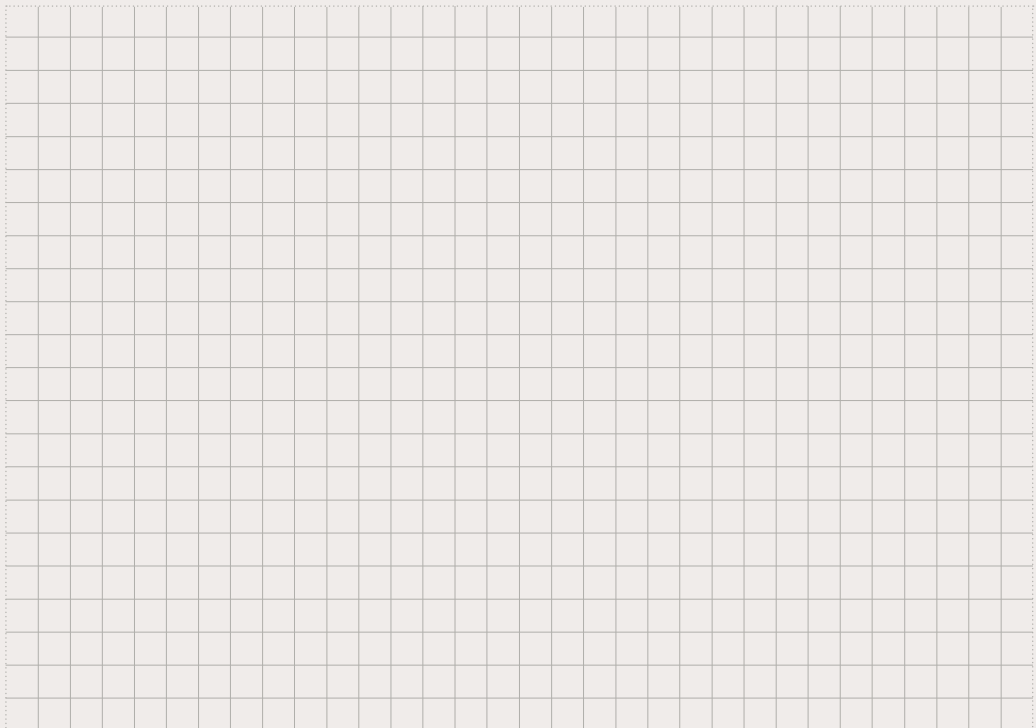
The Foundation operates under the rules and regulations of the Interior Ministry on the establishment of foundations, the Ministry of Social Development and Human Security which supports the Foundation financially, and the Education Ministry which runs the schools founded and supported by the Foundation. Until now, the Foundation has not run into any obstacles.

The Foundation's success stems from His Majesty's principles in providing disaster relief assistance by focusing on the victims' needs. Equally important, the King stressed the need

to create public awareness and participation to help the victims and to help one another.

### Recommendations


Although the government has put in place the disaster warning system along the coasts as well as on the Internet, concerned state agencies should still give training to local residents in high-risk areas to be vigilant and observant of changes in nature that are indicative of possible disaster, as well as to have emergency plans to help one another when disaster strikes.









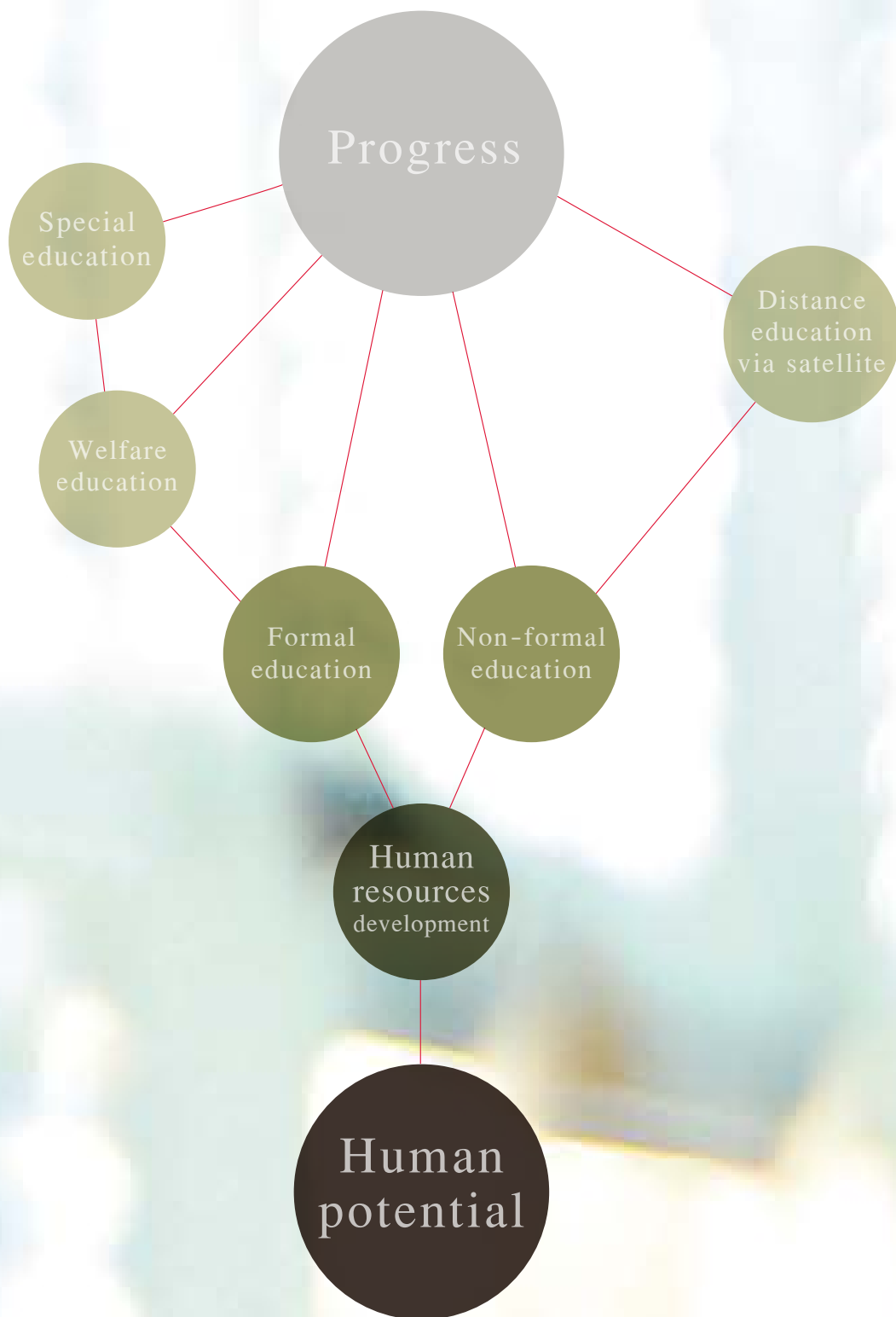


The royal initiated projects relating to education stem from the scarcity of teachers and educational equipment in rural areas.

Distance education via satellite helps create quality teaching of the same standard, reduce educational disparity, and provide students opportunities for self study.

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## Royal Initiated Projects Relating to Education





King Bhumibol Adulyadej deemed education as fundamental to human development and growth and as an important tool to help develop the country, as in his royal address at the commencement ceremony of Prasarnmit College on 12 December 1969:

*“...Education is an important tool to develop people to be valuable resources of the country...Education is one of the most important missions of the country because the country’s prosperity or decline depends primarily on education of the people...”*

His Majesty was a teacher and educator, who realised the significance of education in many different forms. In his view, distance education via satellite is one form of education to address inaccessibility to education as well as lack of teachers and teaching equipment in the rural areas. Distance education via satellite would help create quality teaching of the same teaching standard create, reduce educational disparity, help and provide students opportunities for self study. The King gave guidelines on distance learning via satellite that is, easy to teach, easy to understand, and easy to write down. Also, the technology must be uncomplicated, user-friendly, inexpensive, but effective. Most importantly, teachers must have the teacher’s spirit; they should love students as their own children, serving students as “Kru Tu,” meaning the teachers in the television set, the royal sponsored teachers who come to the students via satellite signals transmitted in the sky.



### Royally-initiated projects relating to education

#### Distance education via satellite

King Bhumibol Adulyadej supported all forms of education, be they formal or non-formal education, special education for children with special needs, welfare education for disadvantaged children, human resources development, as well as academic development and research. His Majesty also supported students through various royal scholarship programmes. His commitment shows his profound understanding and far-sightedness in the roles of education for human and national development.

The Wang Klai Kangwon School in Hua Hin District, Prachuap Khiri Khan Province, was set up under the royal permission of King Ananda Mahidol, Rama VIII, on 22 June 1938 to teach the children of the officials at the

Klai Kangwon Palace. It now provides education from kindergarten to Mathayom 6 along with many short courses. In 1954, the school operated under the royal patronage of King Bhumibol Adulyadej. His Majesty graciously gave the royal guards' building to be the new school building, replacing the old run-down wooden school building. The King also ordered the construction of more school buildings. The Wang Klai Kangwon School is run by a committee comprising experts in school and education management from the Education Ministry and the Bureau of the Royal Household.

The Wang Klai Kangwon School is the premise of three educational institutes. They are the Wang Klai Kangwon School, the Wang Klai Kangwon Vocational College, and the Rajamangala University of Technology Rattanakosin Wang



*King Bhumibol Adulyadej explained a simulation model while teaching a group of Wang Klai Kangwon School students.*

Klai Kangwon Campus. The three institutes offer integrated educational system through distance education via satellite to meet the King's policy to educate the youngsters so after their graduation they can use their knowledge to work and support themselves.

The royally-sponsored distance education via satellite has tackled the scarcity of teachers while standardising the quality of education both in urban or rural areas.

On 7 March 1995, the Education Minister sent an urgent memorandum to the Director General of the Department of General Education on distance education via satellite. The memorandum urged the Department to consider budgetary support for the distance education via satellite project as proposed by Mr Kwankeo Vajarodaya, Deputy Secretary General of the Bureau of the

Royal Household, Special Affairs Department, to celebrate the 50<sup>th</sup> anniversary of His Majesty the King's Accession to the Throne in 1996 and to honour HRH the Princess Mother's dedication to improve the standard of education and the quality of life of people in rural areas. The Department of General Education agreed with the proposal and started using the Wang Klai Kangwon School as the base to broadcast via satellite the teaching of formal education from Mathayom 1 to Mathayom 6 across the country. This was a royally-initiated education project with the state of the art technology available in that period, enabling students to access quality education whether they are rich or poor or wherever they live.

The distance education via satellite system is consistent with the King's Sufficiency



The Distance Learning Foundation started operating on **5 December 1995** to commemorate the **50<sup>th</sup>** Anniversary of His Majesty the King's Accession to the Throne. The King graciously granted **50** million baht to the foundation as the seed money to set up the broadcasting station for distance education via satellite at the Wang Klai Kangwon School, Hua Hin District, Prachuap Khiri Khan Province.

Economy Philosophy and life-long learning. Through modern technology, the students -- wherever they live -- can fulfil their learning potential and use their knowledge foundation to pursue higher education or work to support themselves and their families. Thanks to the King's vision, their education and their gratitude to the King's compassion strengthen the country's unity and stability and enable them to be the country's productive citizens.

The cabinet resolution dated 1 December 1995 approved in principle the distance education via satellite project to be applied to formal education. A collaboration between the Department of General Education and the Bureau of Royal Household's Special Affairs Department, the project run by the Distance Learning Foundation started operating on 5 December 1995 to commemorate the 50<sup>th</sup>

Anniversary of His Majesty the King's Accession to the Throne.

The King graciously granted 50 million baht which was donated by the Telephone Organisation of Thailand, together with another 20-million-baht donation from the Shinawatra Satellite Public Company Limited, to the foundation as the seed money to set up the broadcasting station for distance education via satellite at the Wang Klai Kangwon School, Hua Hin District, Prachuap Khiri Khan Province. The government allocated 125 million baht from the contingency fund under the Central Budget for the foundation's operation during the 1995 budget year. In 1996, the project received an annual budget support. From 1995 to 2001, the Distance Learning Foundation received all together 1,340,083,900 baht for the installation of satellite dishes and receivers at all 2,668

schools under the Department of General Education to commemorate the auspicious occasion of King Bhumibol Adulyadej's 6<sup>th</sup> Cycle Birthday Anniversary.

King Bhumibol Adulyadej graciously gave the permission to set up a television station for distance education via satellite at the Wang Klai Kangwon School, Hua Hin District, Prachuap

Khiri Khan Province. As the broadcasting centre, the TV station at Wang Klai Kangwon School sends satellite signals to all member schools. This use of modern technology which was unprecedented in Thailand has increased the efficiency of the school system to reach students in remote areas. It has given equal opportunities for urban and rural schools to receive quality education of the same standard, thus reducing the problem of teacher scarcity in both special and general subjects in rural schools. Under royal initiative, the Distance Education via Satellite Foundation was subsequently set up to run this project.

At present, there are now over 24,000 schools under the Distance Education via Satellite programme, including the traditional ponoh

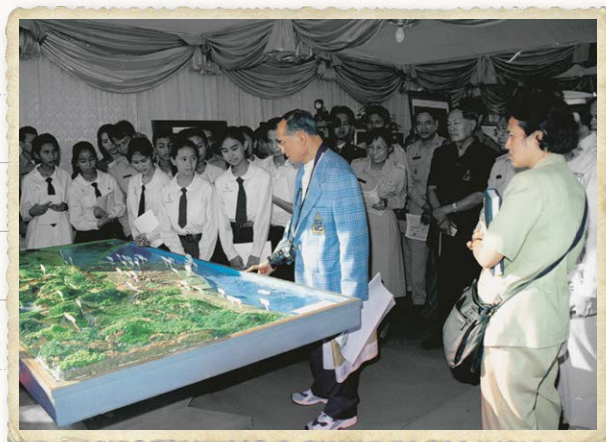
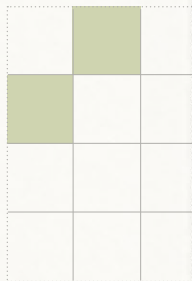
schools in the southernmost provinces.

The subjects taught cover general education from primary to high school levels. This distance education via satellite programme also benefits students in other countries, namely Laos, Myanmar, Vietnam, China, Singapore, Cambodia, and 15 Thai temples in the state of Kelantan in Malaysia which offers the teaching of Thai languages, Buddhism, and Thai culture to the Malaysians of Thai descent.

#### **The Establishment and Operation of the Distance Education via Satellite Foundation**

To streamline the operation of the Distance Education via Satellite Project as well as to increase its speed and flexibility, the Administrative Committee which runs the programme deemed it appropriate to set up the Distance Education via Satellite Foundation. His Majesty graciously granted the Foundation the seed money of 50 million baht and closely followed the progress of the project. The King also granted the committee chairman the royal permission to use the royal ceremonial emblem of the 50<sup>th</sup> Anniversary of His Majesty the King's Accession to the Throne to be the emblem of the Foundation. On behalf





of His Majesty the King, Her Royal Highness Princess Maha Chakri Sirindhorn graciously presided over the inauguration ceremony of the broadcasting station at the Wang Klai Kangwon School on 5 September 1996.

The Finance Ministry issued an announcement dated 24 September 1996 making the Distance Education via Satellite Foundation the 302<sup>nd</sup> charitable organisation in Thailand, which makes donations to the foundation tax deductible. The Education Ministry allocated 125 million baht to support the Foundation in its first year of operation followed by an annual budget for the Foundation from then on. The Telephone Organisation of Thailand assisted by setting up fibre optics linking the broadcasting station at the Wang Klai Kangwon in Hua Hin with the satellite station in Nonthaburi.

#### Cooperation with the Office of the Basic Education Commission (OBEC)

The Distance Education via Satellite Foundation collaborated with the then Department of General Education to offer general education via satellite broadcasting in 1996. In 2002, the then Office of the National Primary Education Commission in collaboration with the Distance Education via Satellite Foundation started broadcasting via satellite the subjects for primary students from Prathom 1 to Prathom 6, which continues until today. Some 30,000 state primary schools similarly lack teachers and equipment resulting in substandard education. To mark His Majesty's birthday anniversary on 5 December 2014, the government approved the budget of 1,300,624,760 baht to urgently solve the problem of teacher scarcity in rural areas and to create equal





*His Majesty leading the Wang Klai Kangwon School students and teachers on field study trips to learn about local wisdom in science, geography, history, culture, tourist attractions and arts. The King also taught in some distance learning programmes such as “Khao Tao Reservoir Project,” “Royal Rain,” “Water Management,” and “Laem Phak Bia Environmental Research and Development Project.”*

educational opportunity by developing the system that connects primary schools of all sizes throughout the country through distance education via satellite.

King Bhumibol Adulyadej teaching Wang Klai Kangwon School students in “Quest for Knowledge” distance learning TV programme King Bhumibol Adulyadej initiated a distance learning TV programme called “Suksatas” in Thai or “Quest for Knowledge” in English. The programme featured His Majesty leading the Wang Klai Kangwon School students and teachers in field study trips to learn about local wisdom in science, geography, history, culture, tourist attractions and arts. In some programmes, the King even acted as a teacher himself. For example, the programmes entitled “Khao Tao Reservoir Project” on

6 October 2001 about soil rehabilitation, “Royal Rain” on 30 October 2001 at the Bo Fai Airport, Hua Hin District, Prachuap Khiri Khan, “Water Management” and “Laem Phak Bia Environmental Research and Development Project” on 15 July 2004 in Phetchaburi Province.

King Bhumibol Adulyadej was the world’s only monarch who did this kind of teaching. As an educator, the King’s teaching was holistic, inter-disciplinary, thought-provoking and spiced with royal humour. The King used graphics, drawings and photographs he took himself as teaching tools. The King also did the demonstrations himself as part of teaching. The King’s teaching reflected his expertise in various academic fields ranging from science to arts. His Majesty was the source of inspiration to all students and teachers at Wang Klai Kangwon School.

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## Laws relating to this project

### Royal Initiated Projects Relating to Education

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Laws relating to and supporting the project are as follows:

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1.  
**Constitution of  
the Kingdom of  
Thailand,  
B.E. 2550 (2007)**

The Constitution of the kingdom of thailand, B.E. 2550 specifies that persons shall have equal right to receive education of no less than 12 years. The distance learning via satellite is one form of alternative education which enables children and youths in remote areas to have equal access to education in accordance with the provisions of the Constitution.

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2.  
**Civil and  
Commercial Code**

The Civil and Commercial Code specifies the details and procedures on the management of foundations, starting from the establishment, operations, to the dissolution of foundations. The Distance Learning Foundation was established as a juristic entity to run the Distance Education via Satellite Project. The operations of the foundation therefore need to comply with the Civil and Commercial Code.

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3.  
**Institute for the  
Promotion of  
Teaching Science  
and Technology  
Act, B.E. 2541  
(1998) and its  
amendments**

Under this legislation, the Institute for the Promotion of Teaching Science and Technology shall be responsible for promoting the study of science teaching, curriculum research, teaching methods, and the evaluation of science teaching in primary education level. The institute is also responsible for developing human resources in science teaching by organising training for the teachers who are keen in science and mathematics. In addition, the institute provides consultation on the study and research on science, mathematics and technology to support distance education to which satellite technology is applied to improve teaching efficiency.

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4.  
**Compulsory  
Education Act,  
B.E. 2545 (2002)**

The distance education via satellite is one form of educational service which equally expands educational opportunities to children and youths in remote areas to have access to compulsory education. Distance learning is therefore in line with the provisions of the Compulsory

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## Laws relating to this project

### Royal Initiated Projects Relating to Education

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Education Act which aims at the right of children and youths to education. Under this Act, all children have the right to receive compulsory education according to the curriculum prescribed by the Ministry of Education. The parents or guardians shall have legal responsibility to send their children to schools. In the case where the children have no parents or guardians, competent official shall send the children to schools. There are punitive measures for negligence causing children to be unable to study in the school. This law fully protects and promotes the children's right to education.

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5.  
**Teachers and  
Educational  
Personnel Council  
Act, B.E. 2546  
(2003)**

The Teachers and Educational Personnel Council Act, B.E. 2546 (2003) specifies the rules and regulations on professional standards, the issuance and revocation of licenses, the policy-making and planning on professional standard development, and the promotion of education and research relating to the profession of teachers and educational personnel. Teachers and educational personnel are important drivers of effective distance education via satellite.

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6.  
**Ministry of  
Education  
Regulatory Act,  
B.E. 2546 (2003)**

Teachers and educational personnel form an important component of the distance education via satellite project. The schools in the distance education network are regulated and monitored by the Ministry of Education. The administrative management of these schools in each locality are governed by the Ministry of Education Regulatory Act.

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7.  
**Government  
Teacher and  
Educational  
Personnel Act,  
B.E. 2547 (2004)  
and its amendments**

This legislation specifies the rules and procedures of personnel administration and management for government teachers and education personnel in all education areas. It determines the regulations on positions, academic standing, accreditation, recruitment and appointment. The teachers and education personnel in the distance education system are governed by this law.



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## Laws relating to this project

### Royal Initiated Projects Relating to Education

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8.

**Child and Youth  
Development  
Promotion Act,  
B.E. 2550 (2007)**

This law specifies that all children and youths have the right to basic education of the highest quality as prescribed by the Constitution. All children and youths are also guaranteed the right to receive public health services of the highest standard available. Distance education via satellite, as a form of education which gives children and youth in remote areas equal access to education across the board, also needs to comply with this legislation.

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9.

**Vocational  
Education Act,  
B.E. 2551 (2008)**

The Distance Education via Satellite Project, as a form of education which gives children and youths in remote areas equal access to education across the board, also offers courses in vocational and training education in line with the principles of the Vocational Education Act. Under this law, the Office of the Vocational Education Commission is in charge of regulating vocational education as well as vocational training so that their operations are in line with the Vocational Education Act. Vocational Education and occupational training are part of the country's human resources development to increase national and economic productivity while raising technological development to meet international standards. It also empowers people to work independently and become self-reliant.

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10.

**Promotion of  
Non-Formal and  
Informal Education  
Act, B.E. 2551  
(2008)**

This legislation promotes an education that fosters lifelong learning for all people. It also supports people's participation in education management and allows education establishments to offer formal, non-formal and informal education. Distance education via satellite is a form of education which provides rural children and youths equal access to education across the board. By promoting the right of children and youths to different forms of education as appropriate for their living conditions, distance education is in line with the Promotion of Non-Formal and Informal Education Act.

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## Laws relating to this project

### Royal Initiated Projects Relating to Education

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11.  
National Science,  
Technology and  
Innovation Act,  
B.E. 2551 (2008)

This legislation prescribes the frameworks for state agencies' systematic cooperation with the private sector in the development of science, technology and innovation in order to foster coordination between human resources development, research and development and infrastructure technology transfer as well as to promote public awareness on the importance of science, technology and innovation. Distance education via satellite uses modern technology to improve teaching efficiency and gives opportunities for children and youths in remote areas to have equal access to education across the board.

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12.  
Broadcasting  
and Television  
Businesses Act,  
B.E. 2551 (2008)

The Broadcasting and Television Businesses Act prescribes rules and regulations to regulate broadcasting and television businesses for public interest and educational benefits. Broadcasting frequency and telecommunication technology are applied to the distance learning via satellite as a channel to effectively reach students in remote areas.

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13.  
National  
Education Act,  
B.E. 2542 (1999)  
as amended by the  
National Education  
Act (No. 3),  
B.E. 2553 (2010)

This is the principal legislation governing the administration and provision of education to make it in line with the provisions of the Constitution. Under the Constitution, the government shall provide education services to the populace and support the private sector to do so with the aim to foster an education that embodies moral principles.

The National Education Act prescribes rules and regulations governing education providers to observe education goals, principles, standard quality, resources allocation, and education technology. This legislation recognises the use of technology in learning. It is therefore considered a principal law which supports distance education via satellite.

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## Laws relating to this project

### Royal Initiated Projects Relating to Education

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14.  
**Organisation to  
Assign Frequency  
Waves and to  
Regulate the Radio  
Broadcasting, Radio  
Television and  
Telecommunications  
Services Act,  
B.E. 2553 (2010)**

This law designates the establishment of an independent state organisation in charge of allocating frequency waves and regulating broadcasting and telecommunication services for maximum public interest nationally and locally in different aspects, including distance learning via satellite which uses radio broadcasting, frequency waves, and radio television and telecommunication services as a new teaching medium.

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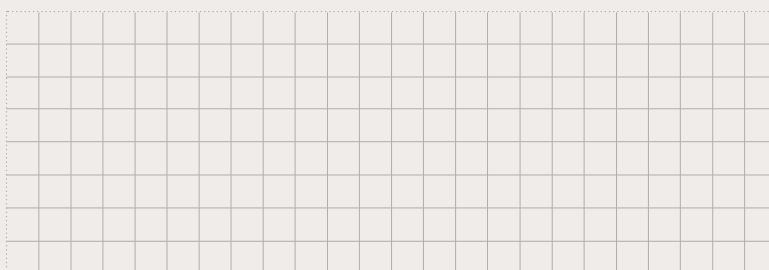
15.  
**Ministerial  
Regulation on  
Registration,  
Operation and  
Foundation Registry,  
B.E. 2545 (2002)**

The provisions on Foundations as prescribed in the Civil and Commercial Code had been amended to keep abreast with current situation by the Act promulgating the Revised Provisions of Book 1 of the Civil and Commercial Code. The Regulation was issued to be in conformity with the law amendment. The operations of the Distance Learning Foundation, be they on registration request, foundation operations, registration and other foundation activities, shall be in conformity with the rules and regulations prescribed by these ministerial regulations.

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16.  
**Regulation on  
Distance Learning  
Foundation**

Since the Distance Learning Foundation is a juristic entity, it is governed by the foundation's by-laws. The foundation operations shall comply with its own rules and by-laws.





### Project Outcome

The distance education via satellite shares classroom teaching from the teachers at the Wang Klai Kangwon School which serves as broadcasting centre. It beams the image and sound signals directly to the classrooms in remote, rural, and rugged areas. These rural students can learn and do class activities simultaneously with the Wang Klai Kangwon School. Distance learning is consistent with formal, non-formal, and informal education. The principle of distance education is “easy to teach, easy to follow, easy to write down, and easy to understand.” The use of telecommunications technology is consistent with this royal guideline; the chosen technology must be uncomplicated, user-friendly, inexpensive yet effective.

The distance education via satellite from the Wang Klai Kangwon School helps tackle the lack of teachers across the country, be they

the teachers for general or specific subjects.

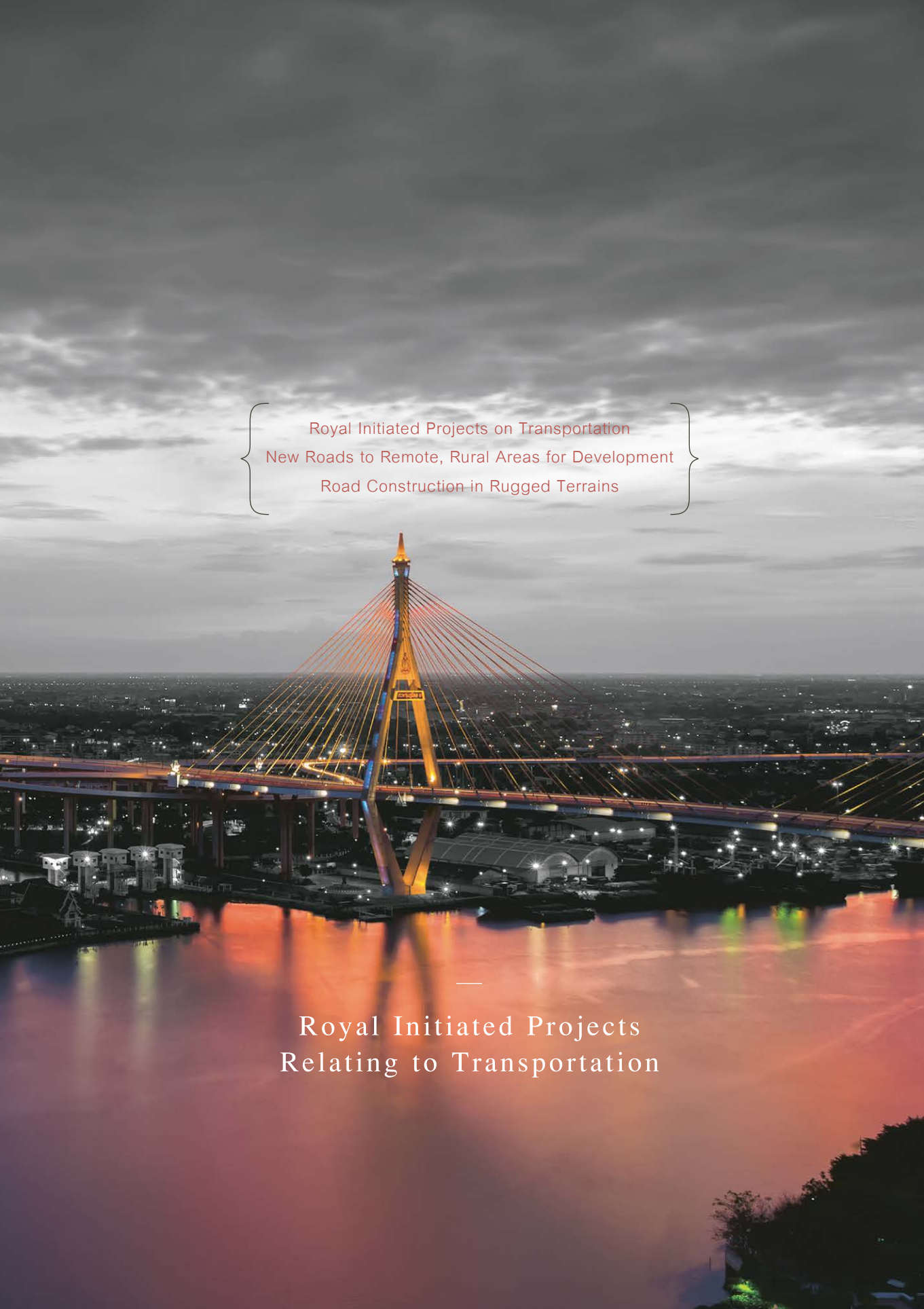
The students, no matter where they live, have access to quality teaching of the same standard as the Wang Klai Kangwon School. A large number of schools therefore want to be part of the distance learning network to improve education quality and equity as intended by His Majesty.

### Recommendations

1. There should be an integration of cooperation of all sectors concerned, namely state agencies, local administrative bodies, the private sector, civil society, and local communities to co-manage distance education, using the Wang Klai Kangwon School as a model.
2. To enhance the efficiency of the royal initiated distance education, there should be studies to train and develop the teachers at the receiving end to equip them with needed skills and knowledge so they can initiate classroom activities consistent with the teachers at Wang Klai Kangwon School.
3. The schools in the distance education network should conduct studies to monitor learning effectiveness and the students' performance and use the findings to further improve their distance education system.

The principle of distance education is “easy to teach, easy to follow, easy to write down, and easy to understand.”





Royal Initiated Projects on Transportation  
New Roads to Remote, Rural Areas for Development  
Road Construction in Rugged Terrains

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Royal Initiated Projects  
Relating to Transportation





Royal Initiated Projects  
Relating to Transportation

THE WISDOM  
OF THE  
MONARCH

Solve immediate problems promptly.  
Solve traffic problems by transportation  
network. Solve the problems sustainably  
by raising public awareness and  
adopting people-centred approach.  
Focus on creating awareness of traffic  
rules and regulation. Make everyone  
obey traffic rules.

Most royal initiated projects on transportation involved the construction of new roads in remote and rugged areas to serve the villagers who did not have access to public roads. As for traffic in the Bangkok Metropolis and vicinity, King Bhumibol Adulyadej's royal guidelines included tackling immediate problems promptly, tackling problems by transportation networks, and creating public awareness which is a sustainable solution. His Majesty once said in one of his royal addresses that sustainable solution to traffic problems lay with the "people." Everyone must obey rules and regulations and must share traffic space in a compromising manner. This will help ease traffic congestion in a sustainable way.



*One of the royal projects was the expansion of traffic surface and transportation networks. The heavy traffic in Bangkok is caused by the rapidly increasing number of cars.*

### Royal initiated projects on transportation

#### Overview

King Bhumibol Adulyadej had initiated several road projects to reach people in rural areas in order to improve their quality of life. Back then, it was still difficult for rural villagers to commute and transport their farm produces to the markets. Good roads that make transportation convenient for rural people is a basic factor to bring progress to rural areas.

Apart from developing road networks in rural areas, the King also gave royal guidelines on how to solve traffic problems in Bangkok. One of the royal projects was the expansion of traffic surface and road networks. The heavy traffic in Bangkok is caused by the rapidly increasing number of cars. The King therefore initiated both short-term, urgent measures for the areas with immediate, critical traffic problems and the long-term measures involving the development of road networks. For example, the construction of a road in parallel with the Southern railways from the Bangkok Noi Station

to the Charansanitwong Road. The King named it the "Sutthawas Road."

The royal initiated projects involving the expansion of road surface included the Yot Nam Road, the traffic surface expansion around the Democracy Monument, the road along the Bueng Makkasan Lake from the Si Ayutthaya Road to the Asoke-Din Daeng Junction, and the expansion of traffic surface without affecting old cultural landscape, for instance, the Phan Fa Lilat Bridge and the Makkhawan Rangsang Parallel Bridges.

Another important royal initiative was the project to tackle traffic congestion systematically through building a web of transportation networks. Bangkok is the hub of cargo transportation for import and export to and from the industrial centres in different parts of the country. Bangkok is therefore plagued by paralysing traffic.

His Majesty initiated the idea of building new roads that are connected to one another and



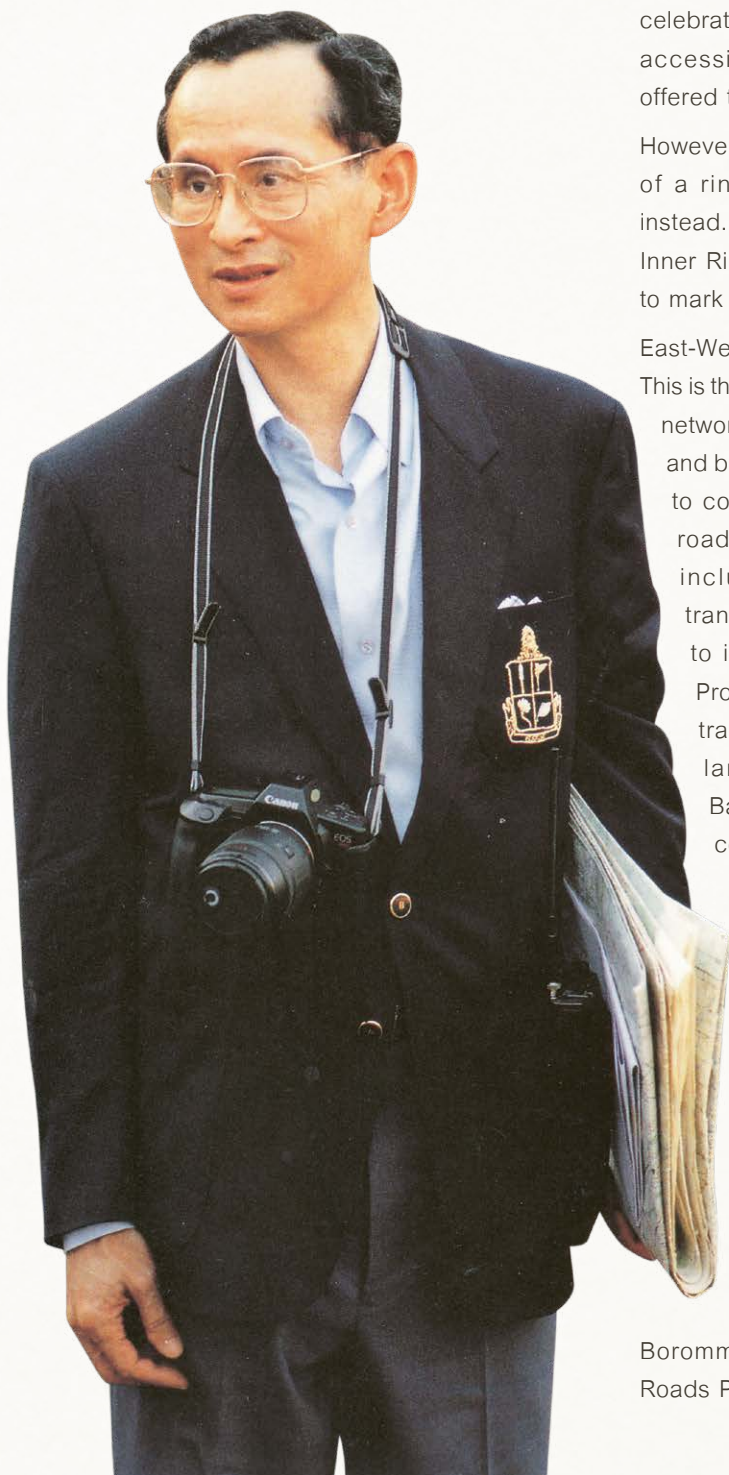
building ring roads outside the city centre to ease traffic congestion.

Ratchadaphisek Inner Ring Road. In 1971 to celebrate the 25<sup>th</sup> anniversary of His Majesty's accession to the throne, the government offered to build a monument.

However, the King preferred the construction of a ring road to ease the heavy traffic instead. The King gave this Ratchadaphisek Inner Ring Road as a present to the people to mark this auspicious occasion.

East-West, North-South Chaturathit Network. This is the royal initiative to create transportation networks by building new connecting roads and bridges while renovating existing roads to connect with new ones to form a ring road. The transportation networks also include the Industrial Ring Road to transport cargo from the Bangkok Port to industrial estates in Samut Prakan Province and other regions. This web of transportation networks also prevents large trucks from passing through Bangkok which has long caused traffic congestion in and around Bangkok.

King Bhumibol Adulyadej gave royal guidelines to tackle traffic congestion in Bangkok and other provinces. His Majesty realised that the problems should be tackled immediately and systematically to avoid negative impacts on national economy and the people's quality of life. The King had initiated several projects to tackle traffic congestion and increase traffic surface. Among these are Rama VIII Bridge Project and Borommaratchachonnani Parallel Elevated Roads Project.



# สะพาน พระราม ๘ พ.ศ. ๒๕๔๕

*The name "Rama VIII Bridge" was bestowed by His Majesty King Bhumibol Adulyadej as a tribute to King Ananda Mahidol, Rama VIII.*

## Rama VIII Bridge Project

One of King Bhumibol Adulyadej's initiatives to solve traffic problems, the Rama VIII Bridge, opens a new route linking both sides of the Chao Phraya River as well as alleviates traffic congestion on the Pinklao and Krung Thon Bridges. The Rama VIII Bridge also forms a key component of the East-West Chaturathit Network, an extensive web of roads designed to relieve traffic congestion between the western and eastern zones of Bangkok.

Concerned about the plight of Bangkok commuters facing traffic bottlenecks when crossing the Chao Phraya River, His Majesty offered the Bangkok Metropolitan Authority (BMA) his personal drawing of the route for what would become the Rama VIII Bridge. The agency answered the royal initiative by commissioning a consultant company to

undertake a preliminary survey and design of the project. A preliminary environmental impact study was also carried out. With approval by the Cabinet, BMA issued operating guidelines and initiated the bidding process for the design and construction, which began in 1995 and was completed in 2002. The King presided over the opening ceremony of the bridge on 20 September 2002.

Crossing the Chao Phraya River, the Rama VIII Bridge connects Wisut Kasat Road in Phra Nakhon District with Arun Amarin Road in Bang Phlat District where it joins the Borommaratchachonnani Elevated Road. A cable-stayed bridge of asymmetrical design, it has a single tower located on the Thon Buri bank of the River, and an anchor on the Phra Nakhon bank, but without any of the structure being in the water. Twenty-eight pairs of cables





fanning out in two arrays extend from the main tower to support the 300-metre-long main span, while another twenty-eight cables arranged in a single medial fan extend from the other side of the tower to the anchor block below the anchor span on the Thon Buri side (175-metre-long). At a total length of 475 metres, the bridge was the world's longest asymmetric three fan cable-stayed bridge. The main-span bridge deck carries two carriageways of two lanes each, with a gradient of less than three percent, while the back-span decks on both Phra Nakhon and Thon Buri sides each have access ramps from ground-level road as entrance and exit in addition to the connection to the elevated road on Thon Buri end.

The Rama VIII Bridge's outstanding asymmetrical cable-stayed design, with no concrete structure

in the Chao Phraya River, also means it will not pose additional obstacles to the riverine traffic, thus it contributes to flood mitigation and preservation of the marine ecology. Any organization of the Royal Barge Procession will not be affected either. To support the weight of the bridge, twenty-eight pairs of cables are arranged in twin arrays from the Phra Nakhon side of the tower, while a single set of eighteen cables connects the tower to the anchor span on the Thon Buri side. Since each cable contains from eleven to sixty-five wire bundles, whenever there is a problem, it can be easily tightened or loosened up, without having to close traffic on the entire bridge. Moreover, the stay cables have a yellow gold finish, the personal colour of King Bhumibol Adulyadej, which nicely reflects the bridge lighting, especially at night time.





*The Bangkok Metropolitan Authority has drawn inspiration for the bridge's design from the royal emblem of King Ananda Mahidol.*

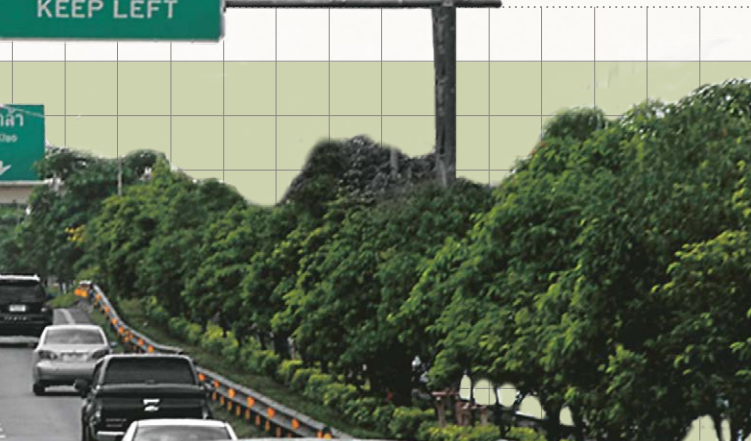
The Rama VIII Bridge not only displays the state-of-the-art engineering technology but also the distinct aesthetics of Thai-styled architecture. Thanks to the pooling of resources and collaboration of various agencies with expertise in fine arts, history, culture and environment, the final work is a perfect blend of elegance, modernity, robustness and unique Thai identity.

His Majesty King Bhumibol Adulyadej bestowed the name 'Rama VIII Bridge' as a memorial to King Ananda Mahidol Rama VIII. The bridge's design is marked by two underlying themes: to build a memorial in honour of King Rama VIII and to integrate the forms of structural engineering and architecture with the surrounding landscape of Bangkok. The BMA drew inspiration for the conceptual design from King Ananda Mahidol's royal emblem -



the figure of a Bodhisattva sitting on a lotus-shaped throne, with the left foot folded under and the right foot resting atop a blooming lotus signifying the realm while his left hand holds a lotus bud. Surrounding his upper body is a frame instead of the customary halo representing celestial abode. The meaning of this royal emblem fits well with King Rama VIII's official name of "Ananda Mahidol," or the joy of the land as if the Bodhisattva has descended to bestow bliss and peacefulness upon all the subjects.

The bridge's design serves two underlying themes: to build a memorial in honour of King Rama VIII and to integrate the format of structural engineering and architecture with the surrounding landscape of Bangkok.



*“The Parallel Elevated Roads”  
extend from the foot of Pinklao Bridge  
to the new Southern Bus Terminal,  
linking the Arun Amarin Intersection  
Bridge and Charansanitwong  
Intersection Bridge, thus smoothing  
the flow of traffic.*

### Borommaratchachonnani Parallel Elevated Roads Project

Having witnessed severe traffic congestion all the way from the Pinklao Bridge to Borommaratchachonnani Road, King Bhumibol Adulyadej came up with a sketch outline and the idea of “parallel elevated roads” which His Majesty conceived and presented to the BMA to study further. The route would start from the foot of Pinklao Bridge and continue until the then-new Southern Bus Terminal, in between linking the two bridges that stretch across the Arun Amarin and Charansanitwong Intersections. The project aimed at facilitating traffic, especially the outbound flow, thereby easing the congestion that backed up along Ratchadamnoen Avenue and Lan Luang Road as well.

In response to the royal initiative, the BMA and the Department of Highways took joint

responsibility of constructing the parallel elevated roads from the Arun Amarin Intersection to the Phuthamonthon Sai 2 Intersection. To speed up traffic there are no traffic lights between Pinklao Bridge and the Taling Chan Intersection for both-in and out-bound travelers, and vehicles travelling long distances can use separate lanes from shorter-distance commuters.

The project began in mid 1993 when the King paid visits to HRH Princess Srinagarindra, the Princess Mother, then undergoing treatment at Siriraj Hospital. Personally seeing the interminable traffic jams around the hospital that caused great inconvenience to local commuters, in particular patients seeking treatment, His Majesty studied the area extensively. On 23 June 1995, the King shared his insight on how to solve the traffic problems

“...The ramp of the Arun Amarin Bridge is too close to Charansanitwong Road. When some of the cars coming down the bridge want to turn left while other cars from below want to turn right, chaos arises immediately. There should be a link. So building an elevated road for the outbound traffic that stretches beyond the southern bus terminal would be very useful...”

*Royal initiative on traffic solution  
(speech on 23 June 1995)*

there: “...The ramp of the Arun Amarin Bridge is too close to Charansanitwong Road. When some of the cars coming down the bridge want to turn left while other cars from below want to turn right, chaos arises immediately. There should be a link. So building an elevated road for the outbound traffic that stretches beyond the southern bus terminal would be very useful...”

The Department of Highways and BMA carried out the royal initiative by constructing the Borommaratchachonnani Parallel Elevated

Roads. The elevated roads are 15 metres high and 19.50 metres wide, consisting of four lanes (two lanes in each direction) each of which is 3.50 metres wide, as well as two entrance-exit ramps. The ground-level road has also been expanded from eight to twelve lanes, of which six lanes are designated express lanes, each of which is 3.50 metres wide, and flanked on both sides with three parallel lanes, each of which is 3.00 metres wide. Two u-turn overpasses were also installed.



## Laws relating to this project

### Royal Initiated Projects Relating to Transportation

Laws relating to and supporting the project are as follows:

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1.  
**Bangkok Metropolitan  
Administration Act,  
B.E. 2528 (1985)**

This law stipulates the powers and duties relating to public works of state agencies under the Bangkok Metropolitan Administration (BMA).

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2.  
**Immovable Property  
Expropriation Act,  
B.E. 2530 (1987)**

This law shall be applied to the beginning of a state-run project in preparing land for construction. The government may have to expropriate certain private landholdings. By virtue of law, government officers are empowered to survey private properties to be expropriated.

One example is the Industrial Ring Road Royal Project in Yan Nawa District of Bangkok and Phra Pradaeng District of Samut Prakan Province, of which the key component was the construction of “Bhumibol 1” and “Bhumibol 2” Bridges. While the design was being studied, it was found some land had to be expropriated for the construction of the bridges. The Royal Decree on Demarcation of Areas for Expropriation in the districts of Khlong Toei, Phra Khanong, Yan Nawa, Bang Na, Rat Burana, and Thung Khru of Bangkok and in the districts of Phra Pradaeng and Mueang of Samut Prakan Province, B.E. 2541 (1998), was subsequently issued by virtue of the Act. The total area to be expropriated would amount to 347 rai and 92 square wah (55.67 hectares).

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3.  
**Highway Act,  
B.E. 2535 (1992)  
and its amendments**

The laws designate the Director-General of the Department of Highways as an officer in charge of regulating, inspecting, and overseeing highways and road works related to special highways, national highways and concession highways. The laws have been supportive of the BMA’s schemes to solve traffic problems and in line with missions of the Department of Highways to look after roads and ensure safety and convenience for commuters.

According to Highway Act, B.E. 2535 (1992) and its amendments, as well as the Ministerial Regulation on the Organisation of the Department of Rural Roads under the Ministry of Transportation, B.E. 2558 (2015),

## Laws relating to this project

### Royal Initiated Projects Relating to Transportation

the Department of Rural Roads is not authorised to directly carry out the Royal Projects. However, the latter Organisation grants the Department of Rural Roads authority to collaborate with other domestic and international agencies and organisations. Upon request by such agencies directly in charge of the Royal Projects as the office of His Majesty's Principal Private Secretary, the Department of Rural Roads can lend support for the implementation of the Royal Projects.

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**4.  
Enhancement and  
Conservation  
of the National  
Environmental  
Quality Act,  
B.E. 2535 (1992)**

The law stipulates there must be an environmental impact assessment study if the construction site is situated in national parks or watershed areas. According to the Notification of the Ministry of Natural Resources and Environment prescribing categories and sizes of projects or activities that requires an environmental impact assessment, and criteria, methods, operating regulations, and guidelines on how to produce the environmental impact assessment report, any project located on the coast within 50 metres of the naturally occurring highest tidal level must produce an environmental impact assessment report.

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**5.  
Royal Decree on  
Demarcation of  
Areas for  
Expropriation to  
build a Municipal  
Highway Linking  
Wisut Kasat Road  
and Arun Amarin  
Road, B.E. 2541  
(1998)**

The law designates the boundaries of land to be expropriated in order to build a municipal highway linking Wisut Kasat Road and Arun Amarin Road.

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**6.  
Ministerial  
Regulation on  
the Organisation of  
the Department of  
Highways, Ministry  
of Transportation,  
B.E. 2558 (2015)**

Under this law, the mission of the Department of Highways includes building and maintaining highways as part of basic infrastructure, in order to ensure there are extensive highway networks throughout the country that also link with the neighbouring countries, thus providing the public's convenience, safety and speed when travelling.

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## Laws relating to this project

### Royal Initiated Projects Relating to Transportation

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7.  
**Regulation of  
the Office of  
the Prime Minister  
on Procurement,  
B.E. 2535 (1992)  
and its amendments**

Organisations in charge of implementing the Royal Projects shall comply with the Regulations of the Office of the Prime Minister on Procurement, B.E. 2535 (1992) and its amendments when commissioning consultant companies to undertake design and supervision of the construction work, as well as construction companies that have skills, engineering technology and expertise that meet the world-class standards in order to ensure they can carry out the Royal Projects successfully within the required timeframe.

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8.  
**Notification of  
the Office of  
the Prime Minister  
on Immovable Property  
Expropriation to  
build a Municipality  
Highway Linking  
Wisut Kasat Road and  
Arun Amarin Road  
in case of urgent need**

Notification of the Office of the Prime Minister on Immovable Property Expropriation to build a Municipality Highway Linking Wisut Kasat Road and Arun Amarin Road in case of urgent need.

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9.  
**Bangkok Metropolitan  
Administration ordinance on  
Prohibited Zones  
for construction,  
modification, use  
or change of uses of  
certain buildings or  
types of buildings  
around the Rama  
VIII Bridge in Bang  
Yi Khan Sub-district  
of Bang Phlat, and  
the Sub-districts of  
Arun Amarin, Siriraj,  
and Ban Chang Lo in  
Bangkok Noi District  
of Bangkok,  
B.E. 2547 (2004)**

Bangkok Metropolitan Administration ordinance on Prohibited Zones for construction, modification, use or change of uses of certain buildings or types of buildings around the Rama VIII Bridge in Bang Yi Khan Sub-district of Bang Phlat, and the Sub-districts of Arun Amarin, Siriraj, and Ban Chang Lo in Bangkok Noi District of Bangkok, B.E. 2547 (2004).



### Project Outcome

The Rama VIII Bridge is a product of “seeking common ground amidst differences” in which the BMA solicited input from various agencies as well as from the people affected by the project. There were concerns over traffic management and structural engineering issues as well as the design itself that must take into account the existing historic-cultural landmarks and heritage of the areas, notably the Bang Khun Phrom Palace, and age-old communities like Ban Poon. The success of this project stemmed from the BMA's following the initiatives of His Majesty who always emphasised that “every development programme must be grounded in fairness and cause minimum trouble to the public,” and that every stakeholder must show “unity and friendship” to one another.

Every development programme  
must be grounded in  
fairness and cause minimum  
troubles to the public.

One unique feature of the Rama VIII Bridge is the observation deck at the top of the tower. At a height of 165 metres above ground or the equivalent of a sixty-floor building, the deck is made of steel and glass, shaped like a lotus, and at 35 square metres, can accommodate almost fifty persons at a time.

Construction of this section began at the same time as the elevators for the disabled people on both ends of the bridge. Since the tower is of an inverted-Y shape, to reach the top deck requires taking an elevator in a diagonal direction for eighty metres and another elevator in a vertical direction for 155 metres. The elevators can take about five people at a time, for about 2 - 3 minutes each way. There is also another elevator on the other side for maintenance staff.

The Rama VIII Bridge is the world's longest asymmetric three fan cable-stayed bridge. It won the Eugene C. Figg Jr. Medal for Signature Bridges from the International Bridge Conference in the United States in 2003 for the creative and visionary design that contributed to the identity of the surrounding communities.

The Rama VIII Bridge has numerous benefits, as follows:

- 1) Quality of People's Life. It is a key link in the Royal Project's Chaturathit Network that smooths commuting between the Phra Nakhon and Thon Buri sides, and relieves the congestion on Pinklao Bridge by 30 percent and on Krung Thon Bridge by 20 percent, as well as reduces air pollution in the inner city.
- 2) National Development. The Bridge helps improve commuting within Bangkok by cutting

down the commuting time and expenses for both household and macroeconomic sectors.

3) With no obstructing structure in the Chao Phraya River, the bridge poses no obstacle to the water flow or the Royal Procession Barge, as well as the tourist boats; the ingenious design does not overshadow the existing government office buildings and historic and cultural landmarks on Rattanakosin Island.

4) Communal Relations and Historic and Cultural Preservation. There were efforts to minimize the impact of expropriation on surrounding communities and to enhance the conservation of historic and cultural landmarks in the area.

The Borommaratchachonnani Parallel Elevated Roads are a tangible outcome of the implementation of a royal initiative that sought cooperation from various government agencies to solve traffic problems, namely the Ministry of Transportation, the Ministry of Interior, the Department of Highways, the Bangkok Metropolitan Authority, and the Royal Thai Police, which bring the following benefits:

1) Solution to traffic congestion in the inner city areas of Bangkok, offering convenience to commuters and facilitating those travelling further to the suburbs of Bangkok or to the southern, western, and lower central regions, and also as backup routes during floods.

2) Open up new routes for travelling and transporting goods from Bangkok to other regions and reduce waste of energy resulting from traffic congestion.

Recommendations

1. There should be further development of the areas that have already been expropriated, beyond those used for construction, in order to maximize the benefit for the public.

2. In order to speed up a project and minimize impact on the people, the processes of land expropriation and environmental impact assessment should be shortened.


3. The Borommaratchachonnani Parallel Elevated Roads have been opened for almost 20 years, and thus, there is a need for short-term and long-term maintenance plans. This is to ensure the structure remains in good condition, prevents accidents and provides safety for the lives and property of the people.

4. In every stage of a project, be it a survey, design, expropriation or construction, public participation and opinions are needed in order to minimize the impact on stakeholders.









The royal initiated projects on communication stem from efforts to alleviate the country's shortage of quality equipment. Communication is vital to business operation. It is the heart of national security and national development.

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## Royal Initiated Projects Relating to Communication

Communication

Royal  
Initiatives

Study

Research

Experiment

Implement by himself

Royal Initiated Projects  
Relating to Communication

THE WISDOM  
OF THE  
MONARCH

The primary goals of communication technologies are to serve the public in time of emergency and to support various national development programmes.

King Bhumibol Adulyadej's interest in communication technologies covered a wide variety of communication forms. For several decades, the monarch tried his hand at a variety of communication equipment, from portable telephones or walkie-talkies to ham radios, computers, long-distance satellite transmission, wireless internet networks and even setting up a radio broadcasting station. For every type of communication, His Majesty studied and experimented until he developed expertise with the equipment. At the same time, he followed communication regulations strictly and cautioned those who violated the rules. His Majesty encouraged Thai people in up-to-date and in-depth study and research in the fields of communications and technology. His primary goal in using communications technology was to render help to people in times of emergency. Subsequently he advised applying communications technology to develop the country in various aspects as well as in his own royal initiated projects programmes including His Majesty's Royal Initiatives.



*King Bhumibol Adulyadej's thank-you message via telegram  
to the Prime Minister, government officers and the public  
for their well wishes on the New Year celebration of 1949*

“  
...His Majesty would like to thank  
the Prime Minister, military officers,  
civil officers, and Thai people.  
May everyone be blessed with  
happiness and good health...  
”

### Project Overview

Communication is a good index of national progress. The more a country develops, the better and more extensive its communication systems will be. In contrast, underdeveloped countries usually experience poor quality, if not shortage of services. Considering how communication is a key factor in running business and strengthening national security and development, Thailand has been blessed in this regard by King Bhumibol Adulyadej's vision and constant support of the field. For decades, His Majesty used various forms of technology to communicate with his people. In 1949, while pursuing his studies in Lausanne,

Switzerland, the monarch sent a telegram to express appreciation for the New Year greetings he received from the Prime Minister, government officers and Thai people as follows:

*“...His Majesty would like to thank the Prime Minister, military officers, civil officers, and all Thai people. May everyone be blessed with happiness and good health...”*

In fact, His Majesty showed an interest in the subject of electricity from a young age. The subsequent years witnessed his enthusiasm expanding to radio transmission as well. Before the onslaught of tube radios, the young prince successfully assembled a crystal radio set



with which he could tune in to a number of radio stations in Europe.

In 1952, King Bhumibol Adulyadej founded a radio broadcasting station on which he graciously bestowed a name “Aw Saw Radio Station Dusit Palace.” The acronym “Aw Saw” stands for the “Ambara Sathan” Royal Hall, his residence at the time. The primary objectives of the Aw Saw Radio Station were to offer a channel for the common people to have access to His Majesty without having to go through complicated procedures according to royal tradition and protocol as in the past, and



to inform the public on important occasions or when natural disasters took place. For example, when a tropical storm wreaked havoc at Talumphuk Cape in Nakorn Si Thammarat Province in 1962, the monarch personally assigned the Aw Saw Radio Station to help in coordinating assistance for the victims. One by-product from the public relief works from that time was the establishment of various charity organizations, including the Rajaprajanugroh Foundation under Royal Patronage.

Seeing how Thailand still suffered from a shortage of quality and efficient telecommunication



*The committees of the Radio Amateur Society of Thailand and Voluntary Radio Association presented the Advance Amateur Radio Operator license and the call sign HS1A to King Bhumibol Adulyadej.*



*King Bhumibol Adulyadej had two call signs, namely HS1A and VR009.*

equipment, in 1967 King Bhumibol Adulyadej proposed pooling staff from various state agencies to work together on improving the radio broadcasting system. His Majesty foresaw how better communication networks could link and serve his people from different corners of the country. The monarch even began researching antennae, radio transmitters and signal relay stations, conducting various experiments on his own.

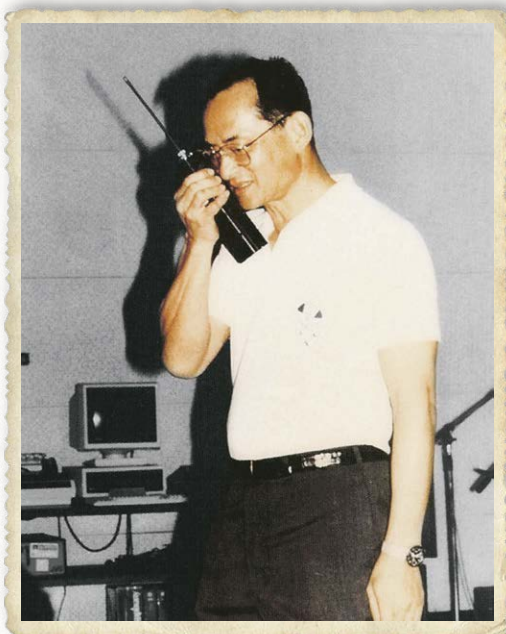
When the preliminary results were satisfactory, His Majesty then shared them with people in charge and encouraged them to continue developing the devices further. On numerous occasions, government offices and state enterprises in charge of communication services also benefited from His Majesty's advice and insights.

Throughout the years, King Bhumibol Adulyadej pursued his keen interest in communications,

usually through hands-on experiments with a variety of equipment. Besides building his own radio set and running a broadcasting station, His Majesty used a portable radio transmitter and receiver or walkie-talkie on a regular basis. The device was essential especially during the monarch's frequent field trips to remote or difficult terrains where regular telephone signals were either poor or even unavailable. It enabled His Majesty to keep himself abreast of the myriad events around the country, and in particular, of any disasters so he could provide assistance to his people in a timely manner.

In 1970, the king assigned Dr. Suthee Aksornkit, a telecom expert, to design and build a Very High Frequency (VHF) antenna that was linked to His Majesty's private radio transmitter. The series of high functioning antennae developed by Dr. Suthee (Dean of the Faculty of Engineering at King Mongkut's University of Technology





*"...Communication is vital for national development, security and safety. At present, with constant change in world affairs, quick and timely communication is essential. Every unit and organization involved in national communications should thus work closely together and in harmony. Most importantly, we should try to study modern knowledge and technology extensively, so we can select what has been proven to work efficiently and fit situations in our country. This will enable the national communication service to develop fully and thereby benefit the economy, society, and security of the country..."*

*Speech on the centenary of the establishment of the Department of Post and Telegraph, also known as the National Communication Day on August 4<sup>th</sup>, 1983*

North Bangkok) were subsequently shared with various state agencies. They reaffirmed His Majesty's vision that such sophisticated communications technology could also be developed locally instead of relying on foreign products and know-how all the time.

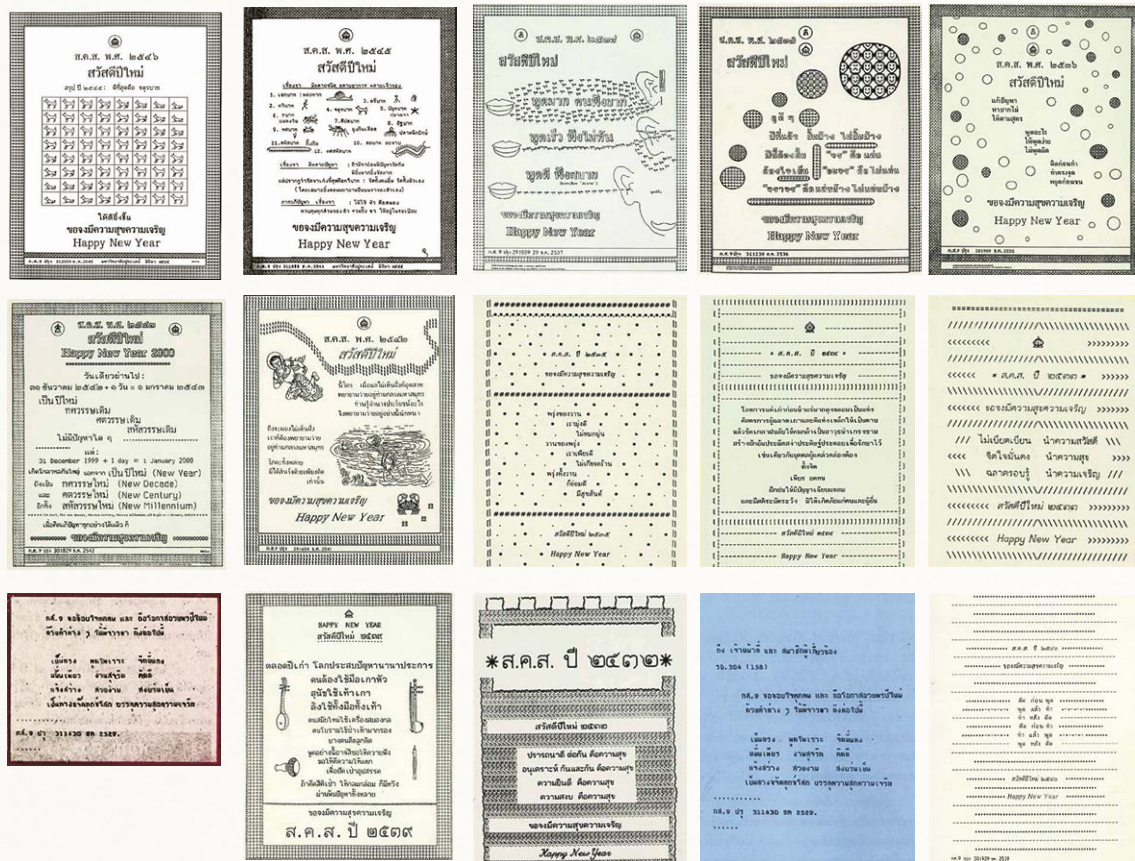
King Bhumibol Adulyadej's farsightedness was evident in one of his speeches on the centenary of the establishment of the Department of Post and Telegraph, also known as the National Communication Day on 4 August 1983:

*"...Communication is vital for national development, security and safety. At present, with constant change in world affairs, quick and timely*

*communication is essential. Every unit and organization involved in national communications should thus work closely together and in harmony. Most importantly, we should try to study modern knowledge and technology extensively, so we can select what has been proven to work efficiently and fit situations in our country. This will enable the national communication service to develop fully and thereby benefit the economy, society, and security of the country..."*

The monarch's vision for better communications remained vibrant through subsequent years. In 1985, His Majesty proposed there be further studies and experiments to develop various communication devices, such as ultra-high

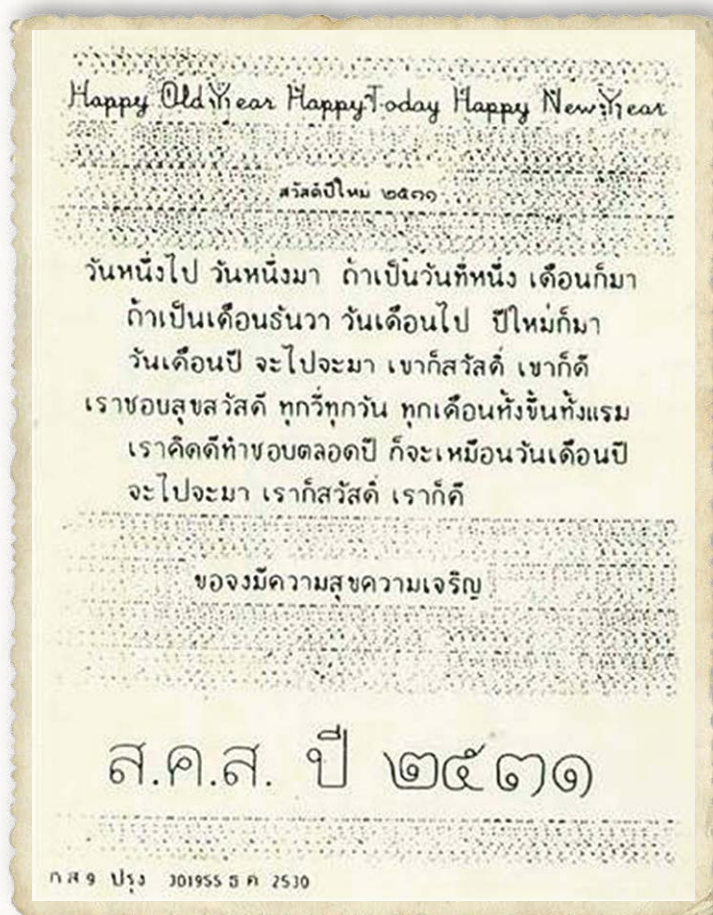




*In 1987, His Majesty started posting his annual New Year greeting messages to Thai public, using his personally designed computer fonts, instead of telex format as before.*

frequency relay transmission systems and portable antennae that could receive signals even in mountainous areas or deep forests. Such royal initiatives served practical purposes. The king often communicated with the Royal Rainmaking Aviation unit, dispensing advice via long-distance radio transmission. Through the Aw Saw Radio Station, His Majesty could reach out to his people, fostering their understanding and education as well as coordinating public assistance when in need.

King Bhumibol Adulyadej's genius in this regard was well reflected in his speech delivered to the committee members of the National Radio Frequency Band Organizing and Management Commission, the Radio Amateur Society of Thailand and the Voluntary Radio Association who presented him with the Advanced Amateur Radio Operator license and the call sign HS1A on 17 August 1989 at the Chitralada Villa. Below is an excerpt:

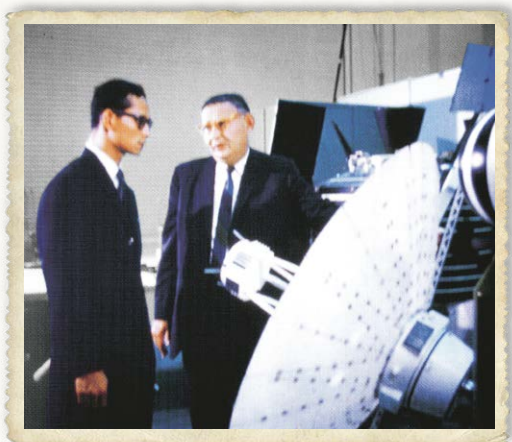


*His Majesty's New Year greetings for 1988*

"Amateur and volunteer radio operators have spent a lot of time doing this, so they should understand the device and how to use it well. Besides knowing the principles and technology, they should also be aware of the benefits of communications for the society and country. ...What I have learned makes me sympathize with the officers in charge of regulating frequencies for there have been a lot of radio frequency interferences be they intentional or not. According to the nature of

radio transmission, interferences between frequencies are possible. It would be good if we learn from one another and seek ways to alleviate the problems. So those in charge of regulating frequencies have a high responsibility. Those interferences are natural, some of which are impossible to solve. But some can be alleviated by tuning the equipment, maintaining the proper frequencies and the output power of the transmitter so it can keep frequencies in the proper ranges and work reliably..."





*His Majesty visited NASA's Goddard Space Flight Center, State of Maryland in USA in 1967.*



*A commemorative coin in honour of His Majesty's contributions to communication development was issued by the Department of Post and Telegraph in 1996.*

In 1987, the king changed his annual New Year greetings to the public from telex format to computer font. Below is an example from His Majesty's 1988 message:

*"One day comes, one day goes. If this is the first day, then the new month has arrived. When all the days of December have gone, here arrives the new year. Whichever day-month-year comes or goes, let it be good, let it be joyful. May every day and month, for both waxing and waning moons, be blessed with joy and happiness. When we think and do good all year round, whichever day-month-year comes or goes, we will do well; we will be happy. May all be blessed with happiness and prosperity."*

Over time, these computerized new year greeting cards, designed by His Majesty, became more and more elaborate, each containing his words of wisdom for the benefit of the general public and government officers.

His Majesty issued the uplifting messages every year until 2016.

In retrospect, King Bhumibol Adulyadej's contributions to the development of communications in Thailand primarily stemmed from his farsightedness. When His Majesty thought up an idea, he would try to test it by personally conducting experiments until he fully understood the principles. The monarch then imparted his insights and advice to government officers in charge of communication systems so they could undertake more in-depth research to develop or improve the devices. Past successes included the ultra-high-frequency relay radio transmission and the various series of antennae, to name a few.

In light of His Majesty's genius in the use of telecommunications to serve the public for many decades, especially in backwater regions, on 4 April 1996, the Telecommunications





*His Majesty King Bhumibol Adulyadej visited an IBM plant on 14 July 1960. This visit inspired Thai Technology industry to realise the groundbreaking use of computers for national economic and social development to be on par with developed countries like in western countries.*

Association of Thailand presented him with the honorary title of “Telecom Man of the Nation.”

In recent years, communication technology has become a lot more sophisticated, with numerous choices of platforms and greatly improved speed. In particular, the rise of the internet has transformed the world into a borderless society. Its potential to shape people’s behavior and attitudes is tremendous, be they political, social, or economic expressions as well as personal opinions on various issues. King Bhumibol Adulyadej was well aware of the growing significance of the internet as a channel for the public to access knowledge and learn about new technologies. Under His Majesty’s guidance, a project to improve communications service was initiated with the aim to support various Royal Initiative Programmes (see details below).

Project to implement wireless internet networks at Royal Development Study Centres

The establishment of the Royal Development Study Centres in different regions of Thailand reflected His Majesty’s concern for the well-being of his people especially at the grassroots level. Thus the location of almost every branch is in areas formerly considered backward, far from the cities or large communities. Understandably, basic telecommunication systems in such areas are inadequate. The Royal Development Study Centres have been facing a similar problem. Although some branches have already installed internet systems, the service is limited to a few locations and the daily operation of the staff only, while visitors have no access. Considering that the Royal Development Study Centres are to serve as an educational forum for the general public, improvement of the internet system there is thus necessary, for it will facilitate



1

{ Huai Hong Khrai Royal Development  
Study Centre, Chiang Mai Province }

2

{ Puparn Royal Development Study Centre,  
Sakon Nakhon Province }

3

{ Khao Hin Sorn Royal Development  
Study Centre, Chachoengsao Province }

4

{ Pikun Thong Royal Development  
Study Centre, Narathiwat Province }

5

{ Huai Sai Royal Development  
Study Centre, Phetchaburi Province }

6

{ Kung Krabaen Bay Royal Development  
Study Centre, Chantaburi Province }

exchange of information among students and other groups of visitors as well as between the different branches of the Royal Development Study Centres themselves.

Accordingly, there is an ongoing project to install wireless internet networks at the following Royal Development Study Centres:

- 1) Huai Hong Khrai Royal Development Study Centre, Chiang Mai Province
- 2) Puparn Royal Development Study Centre, Sakon Nakhon Province
- 3) Khao Hin Sorn Royal Development Study Centre, Chachoengsao Province
- 4) Pikun Thong Royal Development Study Centre, Narathiwat Province
- 5) Huai Sai Royal Development Study Centre, Phetchaburi Province

- 6) Kung Krabaen Bay Royal Development Study Centre, Chantaburi Province

In 2015, the Funds Management Committee received approval from the National Broadcasting and Telecommunications Commission (NBTC) to set up a policy framework and directions on how to allocate funds to provide telecommunication service to the public. The focus was to address existing problems and reduce obstacles in communications for people in remote areas. Under this scheme, the project to set up wireless internet networks at every Royal Development Study Centre was introduced. It also provided opportunities for those interested in seeking financial and other supports to submit proposals to the Fund.

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## Laws relating to this project

### Royal Initiated Projects Relating to Communication

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Laws relating to and supporting the project are as follows:

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1.  
**Telecommunication  
Business Act,  
B.E. 2544 (2001)**

The Act on Organisation to Assign Radio Frequency and to Regulate the Broadcasting, Television Broadcasting and Telecommunication Services, B.E. 2543 (2000), enacted in accordance with Article 40 of the Constitution of the Kingdom of Thailand, stipulated the establishment of the National Broadcasting and Television Commission and the National Telecommunication Regulation Commission as independent public organizations in charge of allocating radio frequencies and regulating radio and television broadcasting and telecommunication businesses. The National Telecommunication Regulation Commission has the authority to issue licenses, regulate telecommunication businesses, and enforce the law relating to telecommunication operations. To be in compliance with the law, it is thus deemed necessary to repeal the previous Telegraph and Telephone Act and replace with the present law.

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2.  
**Broadcasting  
and Television  
Business Act,  
B.E. 2551 (2008)**

The government's key policy in communication is to ensure all medias, be they run by the state, private sector or local communities, be truly public service broadcasting. Any use of communication tools by the state must therefore serve the public and provide education on politics for people. Accordingly, the Act on Organisation to Assign Radio Frequency and to Regulate the Broadcasting, Television Broadcasting and Telecommunication Services B.E. 2543 (2000) stipulates establishment of the National Broadcasting and Television Commission to be in charge of regulating radio and television broadcasting and the National Telecommunication Regulation Commission to be in charge of regulating telecommunication businesses. However, the promulgation of the Constitution of the



## Laws relating to this project

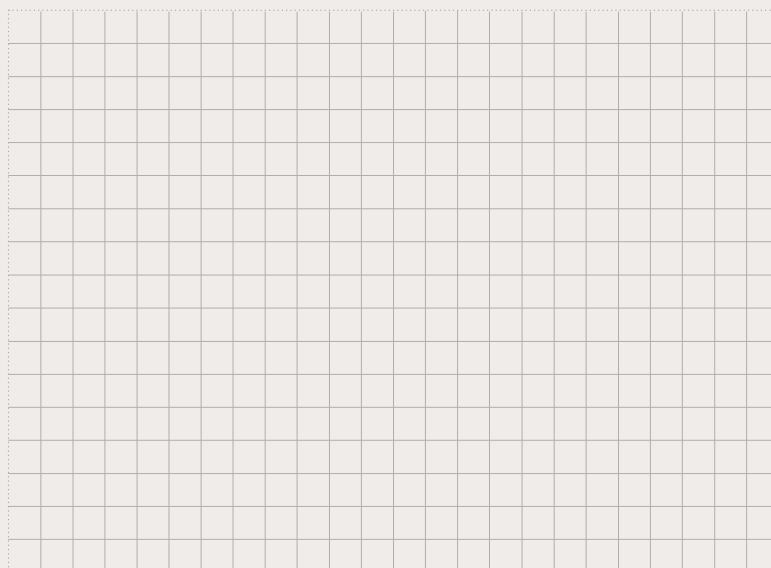
### Royal Initiated Projects Relating to Communication

Kingdom of Thailand, B.E. 2550 (2007) introduced a major change in that there be only one independent public organization tasked with both allocation of frequencies and regulation of all broadcasting businesses. There have been efforts to push for a law relating to radio and television broadcasting businesses that ensures all medias, be they run by the state, the private sector and local communities, be truly public service broadcasting. This law was thus enacted so as to support work by such an independent public organization for regulation of radio and television broadcasting.

3.

**Organization to  
Assign Frequency  
Waves and to  
Regulate the Radio  
Broadcasting,  
Radio Television and  
Telecommunications  
Service Act,  
B.E. 2553 (2010)**

According to Section 52 of the Act, there shall be a fund established within the Office of the National Broadcasting and Television Commission with the main objective of providing the public with universal access to sound broadcasting, television, and telecommunication services.

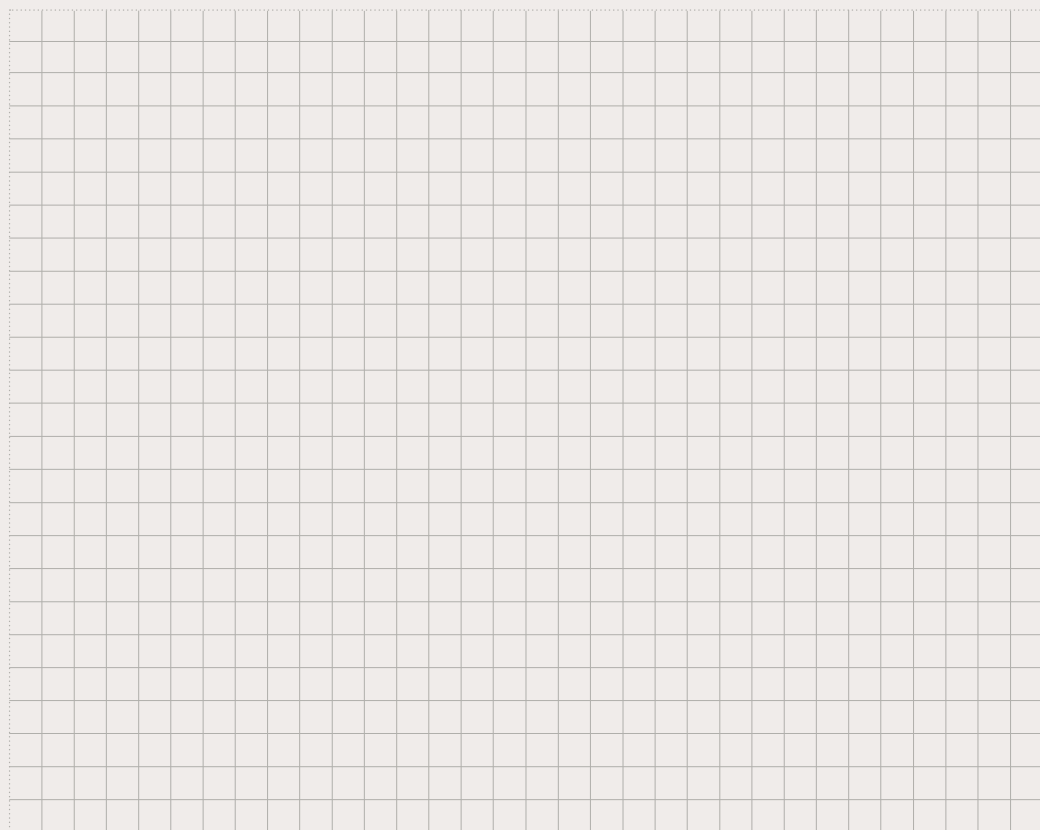


### Project Outcome

Introduction of high-speed wireless internet systems at the Royal Development Study Centres has facilitated the process of information retrieval, sharing and dissemination for farmers, students and the general public who visit the Centres, thus adding value and appeal of the six Centres as an easy-to-access centre of modern learning.

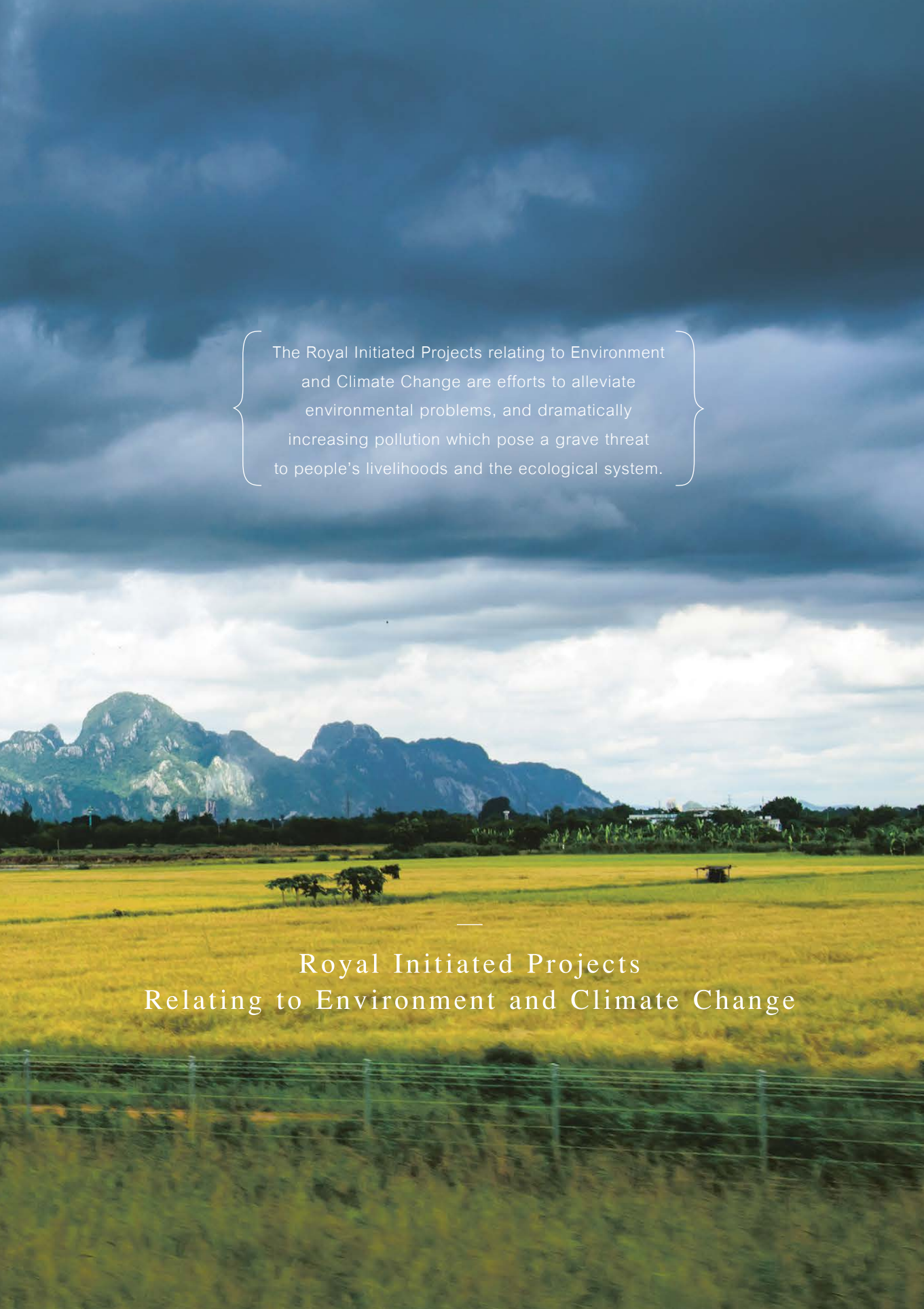
### Recommendations

1. There should be integration and expansion of high-speed internet networks especially in remote areas, which can be joint collaborations between public and private organizations.
2. In order to maximise the use of telecommunication networks, there should be continuous support for staff training in new bodies of knowledge and promotion of information exchange and sharing among the staff.





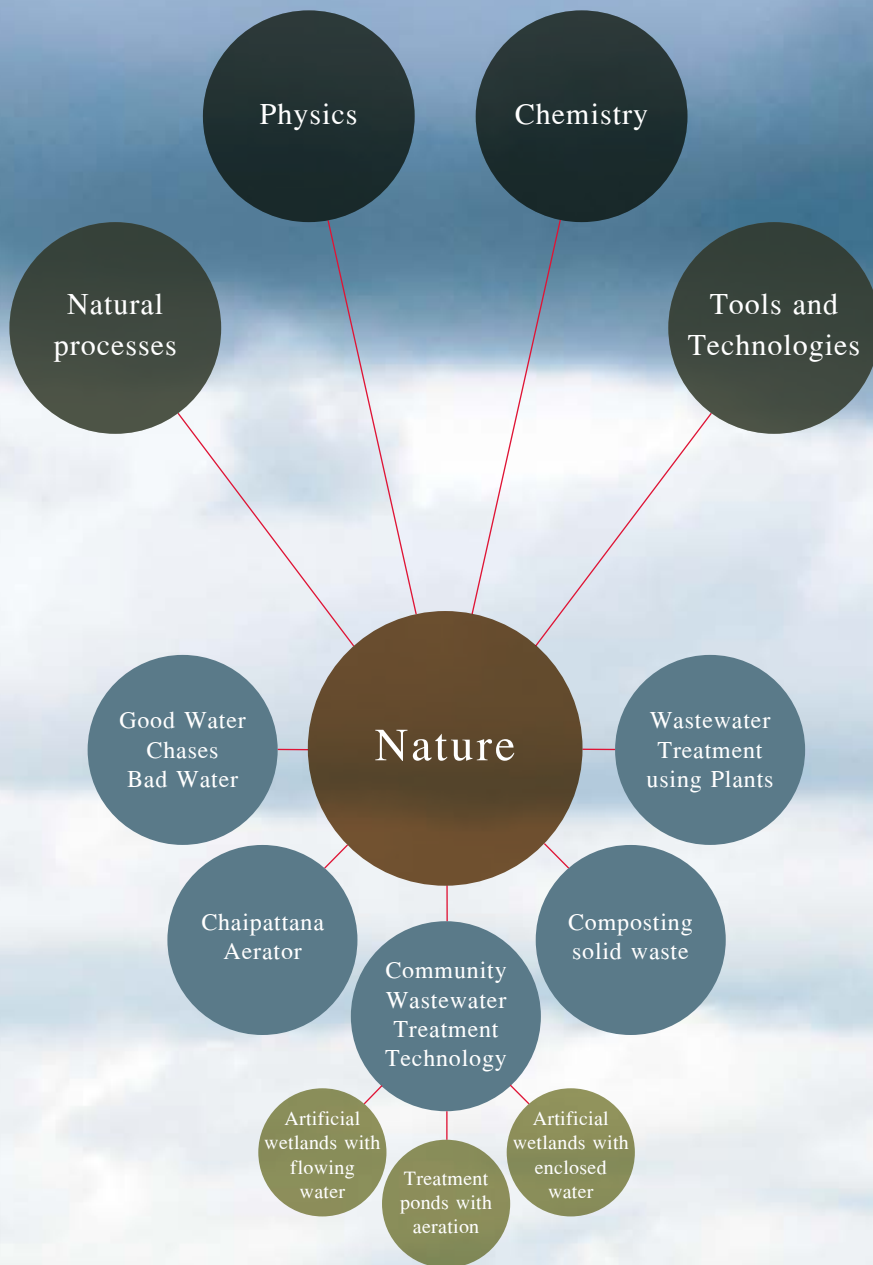




The Royal Initiated Projects relating to Environment and Climate Change are efforts to alleviate environmental problems, and dramatically increasing pollution which pose a grave threat to people's livelihoods and the ecological system.

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Royal Initiated Projects  
Relating to Environment and Climate Change



Royal Initiated Projects  
Relating to Environment  
and Climate Change

THE WISDOM  
OF THE  
MONARCH

His Majesty advocated environmental management that incorporates the “nature cures nature” principle, simple methods that anyone can do at a low cost, and unsophisticated technology that is inexpensive but efficient.

King Bhumibol Adulyadej’s initiatives on environmental management are based on systematic and integrated research and experiments that combine the understanding of natural processes, physics and chemistry. By advocating a simple “nature cures nature” approach, His Majesty proposed development of tools and technology that his people can put to use easily, are inexpensive but efficient, as well as addressing concerns of specific locales.



“...Water levels and drainage in Bangkok I suggest two plans for such management: The first is to be adopted in the monsoon season to prevent flooding, while the second plan is designed to deal with water pollution in the dry season by flushing it out from the canals. Both plans should be based on the force of gravity to reduce expenses spent on the control of water levels in the canals.”

#### Royal Initiated Projects Relating to Environment and Climate Change

Environmental problems have become a pressing global concern; paradoxically the more a country develops economically, the worse become the levels of pollution and environmental degradation. Thailand has witnessed alarming environmental deterioration, due to past decades of unregulated economic development that has recklessly plundered natural resources, wreaking havoc on people's livelihoods and the ecological system as a whole. Several of His Majesty's initiatives thus aimed at restoring the ecology while seeking practical solutions to the issues, particularly regarding water pollution.

“Good Water Chasing Bad Water” Royal Project  
On 4 April 1995, King Bhumibol Adulyadej

and HRH Princess Maha Chakri Sirindhorn undertook an inspection survey of water pollution in three major Bangkok canals, namely, Khlong Thewet, Khlong Saen Saeb and Khlong Lat Phrao. Subsequently, His Majesty came up with a practical two-in-one solution as described in one of his speeches:

*“Water levels and drainage in Bangkok should be managed according to local conditions. I suggest two plans for such management: The first is to be adopted in the monsoon season to prevent flooding, while the second plan is designed to deal with water pollution in the dry season by flushing it out from the canals. Both plans should be based on the force of gravity to reduce expenses spent on the control of water levels in the canals.”*

*should be managed according to local conditions.  
first is to be adopted in the monsoon season to  
designed to deal with water pollution in the dry  
plans should be based on the force of gravity  
in the canals...”*

*His Majesty's initiative on “Good Water  
Chasing Bad Water” on 4 April 1985*

To improve the quality of canal water, the “Good Water Chasing Bad Water” principle shrewdly uses a simple natural method: using gravity flow, the good quality water would be successively channelled into downstream waterways thereby gradually diluting and improving the quality of existing water.

#### **“Bueng Makkasan Wastewater Treatment” Royal Project**

On 15 and 20 April 1995, King Bhumibol Adulyadej discussed with government officers how to improve Bueng Makkasan which would help improve the drainage and alleviate water pollution in Khlong Samsen as well. His Majesty proposed the idea of a “natural water filter” in the following speech:

*“The Bueng Makkasan Project will be done cheaply. We simply use water hyacinths which*

*are readily available to absorb pollutants and clean the water. They are natural filters, powered by energy from the sunlight, and the natural growth processes of a plant ...”*

Thus the Bueng Makkasan model of wastewater treatment was put in place. His Majesty's initiative involved experimenting with the water hyacinth, a weed that should be eliminated, by cleverly turning it into a “filter” of pollutants in the surrounding area. The project, the king advised, must be done at a low cost and must not cause problems to the local residents who live along the reservoir.

The model was later expanded into the “wastewater treatment by using aquatic plants and aeration” programme to solve water pollution in Mueang Municipality District,

*“...With global warming, more sea ice would melt leading to higher seawater levels...The main causes of higher carbon gases in the air are fuel burning and combustion...”*

*“...What prompted me to talk about carbon gases, global warming or cooling and possibility of flooding, is because if we study the issues with patience and understanding, we may be able to find solutions, or at least try to do so...”*

*King Bhumibol Adulyadej's birthday speech delivered at Dusidalai Hall, Chitralada Villa, Dusit Palace on 4 December 1989*

Sakon Nakhon Province. For years, the Nong Han Lagoon, the largest natural lagoon in the Northeastern region, has served as a dumping ground for household wastewater. In the expanded model, His Majesty proposed a combination of natural methods with low-cost technology. The contaminated water would be channelled through a series of sedimentation ponds to separate or filter out high Biochemical Oxygen Demand [BOD] materials, and then through a sizable area of constructed wetlands where aquatic plants grow, like Egyptian papyrus and water hyacinths, to remove the foul odour and absorb heavy metals and other pollutants from the water. The Chaipattana Aerator was also employed together with a series of aeration panels to improve the oxygen level until it reached a satisfactory level before

releasing it into Nong Sanom, another natural lagoon. A by-product from this project was the application of water hyacinths to various uses, from compost to fuel and raw materials for making woven mats.

#### *“Chaipattana Aerator” Royal Initiative*

King Bhumibol Adulyadej was interested in seeking ways to mitigate water pollution from household and industrial sources, in particular by increasing oxygen content in the water. Under His Majesty's initiative, the Chaipattana Foundation carried out research and experimentation on water wheels. Following the first prototype in 1989, the “Chaipattana Aerator” received a patent from the Department of Intellectual Property on 2 February 1993. It was also the very first patent issued to a monarch in Thailand and the world.





*The Chaipattana Foundation*

**"Turning Community Garbage into Compost"**  
Royal Initiative

On 12 September 1990, King Bhumibol Adulyadej delivered a speech during which he shared his ideas on waste management: *"The main issues concern the environment. I have studied wastewater and garbage problems, and found them not so difficult to manage. Technologically, it is possible. We can do it too in Thailand."*

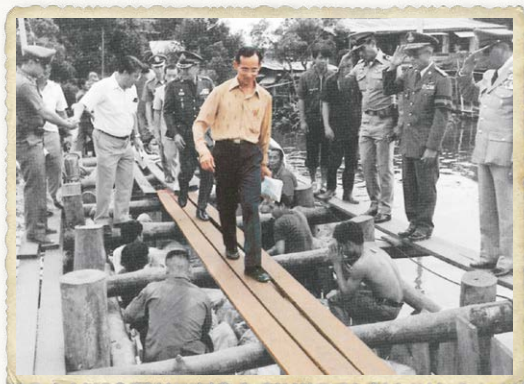
Thus His Majesty initiated a research programme by various government agencies to develop appropriate technologies in waste management.

The basic principle behind transforming garbage into compost is, again, the idea of "nature cures nature" -- an unsophisticated and low or zero-cost technique that makes use of existing local resources in compliance

with His Majesty's initiative on "air pollution and climate change."

His Majesty's farsightedness was reflected in one of his annual birthday speeches delivered on 4 December 1989 at Dusidalai Hall, Chitralada Villa, Dusit Palace: *"With global warming, more sea ice would melt leading to higher seawater level ... The main causes of higher carbon gases in the air are fuel burning and combustion..."* and *"What prompted me to talk about carbon gases, global warming or cooling and possibility of flooding, is because if we study the issues with patience and understanding, we may be able to find solutions, or at least try to do so."*

Throughout his reign, King Bhumibol Adulyadej imparted his vision and insight, which could



provide guidelines on how to counter climate change efficiently. His Majesty's initiatives and guidelines covered a wide range of subjects, including forest conservation and reforestation, development of water supplies (from small-scale to medium-sized and large-scale projects), prevention and treatment of wastewater, waste management and applicability of its by-products, promotion of alternative energy and biomass fuel, solutions to traffic problems in Bangkok and other major cities, use of "clean air-conditioners," all so that his people could achieve sustainability in their livelihoods.

#### "Laem Phak Bia Environmental Research and Development Project" Royal Initiative

On 12 September 1990, His Majesty delivered the following speech: *"The main issues concern*

*the environment. I have studied wastewater and garbage problems, and found them not too difficult to manage. Technologically, it is possible. We can do it too in Thailand. We can import overseas technology and do it here, or else hire a foreign company to do the work. It's the same problem. I have been thinking about it, but have to find the place to implement the project."*

Aware of the growing severity of environmental problems, in particular water pollution and overflowing garbage, the monarch advocated solutions that combine simple technology with the "nature cures nature" principle and use of low-cost local materials to implement.

During his stay at the Thaksin Rajaniwet Palace, the Monarch paid a visit to Laem Phak Bia Sub-district in Ban Laem District, Phetchaburi



*Examples of technology to treat wastewater and solid waste in the community.*



*King Bhumibol Adulyadej's guideline for solving environmental problems is to use unsophisticated technology based on the "nature cures nature" principle and local materials which requires little or no cost to undertake.*

Province. Then public lands of degraded mangrove forest, His Majesty deemed the area could be used for multiple functions: first as a site for solid waste disposal wherein a "concrete box" composting system was set up to generate fertilizer that also nourishes the mangrove trees, and second for constructing artificial wetlands to treat wastewater and thus prevent it from contaminating the waterways and destroying the ecology and livelihoods of local people. Through His Majesty's initiative, the Chaipattana Foundation, the Office of the Royal Development Projects Board, Royal Irrigation Department, Phetchaburi Municipality, and Kasetsart University carried out a collaborative project which has been running since 12 September 1990 until the present. The primary mandates of the programme are research and development,

public service and dissemination of results at both national and international levels.

Contamination of water takes place due to the presence of physiological, chemical and biological pollutants within and between the molecules of water. Treatment of contaminated water requires removal of those pollutants by using biological and natural processes until the levels of pollutants meet natural standards. Typically, sewage from households contains organic materials that in a natural process, would be gradually decomposed by bacteria and turned into inorganic materials that feed the plants. To perform the decomposition process, these bacteria require energy from oxygen which is usually available in the air. However, in anaerobic conditions, the bacteria have to withdraw oxygen instead from chemicals or from the molecules of water, resulting in



chemical reactions between hydrogen and primary elements in animal bodies and plants (namely carbon, sulphur and nitrogen), and thus the emission of methane, nitrous oxide, ammonia and sulphur dioxide, as well as heat due to the transformation of bonds between the molecules of the organic pollutants.

Likewise, the organic materials in solid waste are composites of carbohydrates, proteins, and cellulose fibre, a product of photosynthesis in plants wherein the light energy is transformed into chemical energy and stored by the plants as cellulose. In nature, multi-molecular organic waste cellulose materials will be decomposed by aerobic or anaerobic processes of the bacteria and broken down into successively smaller molecules until they yield heat and elemental ions in the form of electron receptors like iron or manganese, which are chemical elements found in soil.

King Bhumibol Adulyadej had profound knowledge and understanding of the above principles, which are keys to treatment of wastewater and solid waste using natural decomposition processes. Importantly, there must be enough oxygen for the bacteria so they can decompose organic materials into inorganic ones. Through intensive experimentation, the royal initiative led to successful development of wastewater treatment and solid waste disposal technology as follows:



# 1

## { Wastewater Treatment Technology consisting of three types }

1. Wastewater Treatment Technology consisting of three types:

Type 1: Artificial/Constructed wetlands with water run-off, has two sub-types: (i) with aquatic plants such as Elephant grass (*Typha angustifolia* Linn.) and Umbrella grass (*Cyperus Corymbosus* Rottb.), and (ii) with grasses that can be used as animal feed like Coastal grass (*Sporobolus virginicus*), *Leptochloa fusca*, and *Cynodon plectostachyus*.

Type 2: Artificial/Constructed wetlands with water storage has two sub-types: (i) allowing all water to run through at times with Elephant



*The Laem Phak Bia Environmental Research and Development Project Royal Initiative has served as a study site for His Majesty's wastewater and solid waste treatment techniques, attracting over 70,000 visitors per year.*

## 2

{ Solid Waste Disposal Technology  
using concrete boxes }

grass (*Typha angustifolia* Linn.) and Umbrella grass (*Cyperus Corymbosus* Rottb.), and (ii) storing water at high tides and releasing it at low tides (with mangrove forests).

Type 3: Treatment ponds with aeration.

2. Solid Waste Disposal Technology Use of large concrete composting boxes that can be applied under any conditions to turn solid waste into fertilisers for farmers.

Prior to the establishment of the Laem Phak Bia Environmental Research and Development Royal Initiative Project, the area was a rural

community of fishing folks, many of whom were driven by poverty to seek new occupations elsewhere. After ten years of the project, the mangrove forest became fertile again, witnessing greater abundance of marine animals like shellfish, crabs, squid, and fish. Better job prospects led to improvement of the local economy and the livelihoods of people as well as a surge in migration back to the area. Moreover, the project witnessed an increasing diversity of migratory and resident birds. The Laem Phak Bia Environmental Research and Development Royal Initiative Project is now a major destination for eco-tourism, especially for bird watchers from in and out of the country. The community has thus seen a growing number of hotels, resorts, homestay services, and souvenir shops to accommodate tourists and provide additional income to the locals.

The Laem Phak Bia Environmental Research and Development Royal Initiative Project has been a breeding ground for generating knowledge on environmental subjects. Until now there have been over 400 research projects on either novel topics or applications to specific locales. The project has also contributed to the work of a number of university graduates from bachelor to master and doctoral levels who are applying what they have learned here to their developmental work in various parts of the country. The Laem Phak Bia Environmental Research and Development Royal Initiative

*“...The main issues concern the environment. I have studied wastewater and garbage problems, and found them not too difficult to manage. Technologically, it is possible. We can do it too in Thailand. We can import overseas technology and do it here, or else hire a foreign company to do the work. It’s the same problem. I have been thinking about it, but have to find the place to implement the project...”*

*King Bhumibol Adulyadej’s speech on 12 September 1990*

Project serves as a study site for His Majesty’s wastewater and solid waste treatment techniques, attracting per year over 70,000 visitors, most of whom are students, academics, administrators, and local politicians, including over 3,000 foreign researchers and administrators.

In sum, His Majesty’s initiative on wastewater and solid waste treatment can be applied anywhere and in any social geography.

Implementations in other tropical countries have also yielded good results. Considering that public lands as waste disposal sites and good quality water have become increasingly scarce, it is possible that His Majesty’s initiative in waste management will be promoted widely. This is a scheme that requires relatively small land area and provides usable water after treatment. This is indeed a timely technology that can be put to use right away.



## Laws relating to this project

### Royal Initiated Projects Relating to Environment and Climate Change

Laws relating to and supporting the project are as follows:

- 
1.  
**Factory Act,  
B.E. 2535 (1992)**  
  
**Hazardous  
Substance Act,  
B.E. 2535 (1992)**  
  
**Public Health Act,  
B.E. 2535 (1992)  
and its amendments**

Laws regarding solid waste management have been scattered across various acts, each under the charge of different departments depending on the type of waste in question. The Factory Act, B.E. 2535 (1992) applies to industrial waste while the Hazardous Substance Act, B.E. 2535 (1992) covers toxic or dangerous waste, both of which are under responsibility of the Ministry of Industry. In general, the Public Health Act, B.E. 2535 (1992) with its amendments covers solid waste from household use which is the responsibility of the Ministry of Public Health, but since the laws on establishment of local administrative units also authorise individual local administrations to be responsible for collection, transportation and disposal of the solid waste in their respective areas, in effect the tasks fall under both the Ministry of Public Health and the Ministry of Interior as the latter has jurisdiction over every local administration unit in the country.

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2.  
**Enhancement and  
Conservation of the  
National Environmental  
Quality Act,  
B.E. 2535 (1992)**

In a case that waste causes pollution or affects the environment, such case shall be subject to the Enhancement and Conservation of the National Environment Quality Act, B.E. 2535 (1992), under the Ministry of Natural Resources and Environment.

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3.  
**Enhancement and  
Conservation of the  
National Environmental  
Quality Act,  
B.E. 2535 (1992)**

According to the Enhancement and Conservation of the National Environment Quality Act, B.E. 2535 (1992), the National Environment Board, chaired by the Prime Minister, has authority to issue approval on relevant matters (Section 12), and environmental quality management plans with which other agencies must comply (Section 35), promote participation by the public and non-government organizations in environmental enhancement and conservation (Section 7 - 8), and ensure the environmental management system follows the principles of environmental quality control, such as by setting up a Pollution Control Committee (Sections 52 - 54) which is in charge of issuing pollution control regulations for air and water pollution treatment to waste

## Laws relating to this project

### Royal Initiated Projects Relating to Environment and Climate Change

disposal, providing tools or equipment to mitigate pollution as well as classification of pollution types, namely air and noise pollution, water pollution and other types as well as hazardous waste.

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4.  
**Factory Act,  
B.E. 2535 (1992)**  
**Hazardous  
Substance Act,  
B.E. 2535 (1992)**  
**Public Health Act,  
B.E. 2535 (1992)  
and its amendments**  
**Enhancement and  
Conservation of the  
National Environmental  
Quality Act,  
B.E. 2535 (1992)**  
**Royal Decree on  
Establishment of  
Wastewater  
Management  
Authority,  
B.E. 2538 (1995),  
and amendments in  
1997, 2005 and 2015**

Laws relating to wastewater include the Factory Act, B.E. 2535 (1992) which covers wastewater from industrial process; the Hazardous Substance Act, B.E. 2535 (1992) for toxic or hazardous wastewater; Public Health Act, B.E. 2535 (1992) with its amendments for sewage from household use; and the Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992), and the Royal Decree on Establishment of the Wastewater Management Authority, B.E. 2538 (1995), with amendments in 1997, 2005 and 2015 that set up the Wastewater Management Authority (WMA) as a state enterprise under the Ministry of Natural Resources and Environment. The objectives of the WMA are providing service and management of wastewater treatment with economic efficiency. It has authority in conducting surveys, planning, implementation, designing, construction, administration, management, and maintenance of wastewater treatment schemes run by the WMA itself and by other organizations, as well as to follow up results of implementation within and outside the wastewater treatment zones. The WMA is also in charge of recycling wastewater and producing energy from treated sewage, collecting fees and service charges for wastewater treatment as well as coordinating with various government offices involved in wastewater treatment.

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5.  
**Act on Promotion  
of Marine and  
Coastal Resources  
Management,  
B.E. 2558 (2015)**

In the past, there was no law that directly covered mangrove forests, except general forestry-related laws. The Act on Promotion of Marine and Coastal Resources Management Act, B.E. 2558 (2015) has introduced specific clauses on management of marine and coastal resources including mangrove forests. Administrations under this act are to be streamlined, integrated and promoting participation by the public and local communities. The law stipulates criteria for management, conservation and maintenance, revival of marine and coastal resources as well as prevention of coastal erosion. The public

## Laws relating to this project

### Royal Initiated Projects Relating to Environment and Climate Change

and local communities are encouraged to participate in planting trees, caring for, conserving and restoring marine and coastal resources in order to maintain ecological balance and sustainability. According to the law, the cabinet with approval from the board has authority to issue ministerial regulations to designate any mangrove forests as conservation or protected zones in order to ensure the protection, conservation and restoration of mangrove forests and maintain their pristine natural conditions and the ecological system as a whole.

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6.  
**Royal Decree on  
Establishment of  
Thailand Greenhouse  
Gas Management  
Organization (Public  
Organization),  
B.E. 2550 (2007)**

The Royal Decree on Establishment of Thailand Greenhouse Gas Management Organization (Public Organization), B.E. 2550 (2007) has the following objectives: (1) to analyse, scrutinise, and collect views and opinions in relation to the approval of projects to reduce greenhouse gas emission, as well as to pursue and appraise the authorised projects; (2) to promote the project advancement and the marketing and trading of greenhouse gas as approved; (3) to serve as an information centre regarding greenhouse gas operations; (4) to develop an information base about authorised projects and the approved trading of greenhouse gases; all in accordance with the policy determined by the National Committee on Climate Change Policy and the Committee on Thailand Greenhouse Gas Management Organization; (5) to promote and enhance efficiency of as well as to give consultations to public agencies and private bodies in operations relating to greenhouse gases; (6) to disseminate information and carry out public relations campaigns on greenhouse gas management; and (7) to promote and support climate change operations (Section 7).

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7.  
**Regulation of  
the Office of  
the Prime Minister  
on Climate Change  
Administration,  
B.E. 2550 (2007)**

The Regulation of the Office of the Prime Minister on Climate Change Administration, B.E. 2550 (2007) established a National Committee on Climate Change Policy chaired by the Prime Minister and vested with the following powers and duties (section 3): (1) to issue policies and strategies on prevention and alleviation of climate change issues in Thailand, storage and discharge of greenhouse gases and, research and development on climate change; (2) to issue policies, guidelines, criteria and mechanisms for collaboration with the international community



## Laws relating to this project

### Royal Initiated Projects Relating to Environment and Climate Change

on climate change management that are in accordance with the economic and social benefits of the country and with the relevant international agreements; (3) to propose amendments or improvements to relevant laws that are necessary or useful for carrying out operations according to agreements in the conventions or protocols that Thailand has ratified and must comply with, as well as carry out any other activities/operations necessary in promoting and supporting the principles and objectives of those conventions or protocols. This must be in accordance with the economic and social conditions and the benefits of the country and with the international agreements; (4) to issue guidelines and directions in negotiations on conventions and protocols which must be in accordance with the economic and social conditions and the benefits to the country and with the international agreements; (5) to monitor operations of government agencies to ensure they follow the policies, strategies, guidelines, criteria and mechanisms as stipulated by the regulations; (6) to review and support allocation of budgets to government agencies for operations relating to climate change; (7) to issue measures to promote collaboration and coordination between public and private sectors on climate change operations/activities; (8) to make recommendations to the cabinet on appointment of members of the Committee on Thailand Greenhouse Gas Management Organization; (9) to appoint sub-committees or working groups to carry out operations in accordance with the present regulations or as assigned by the Committee; and (10) to carry out any other operations in accordance with the present regulations or any other laws or as assigned by the cabinet or the Prime Minister (Section 8).

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8.  
**Regulations of  
the Office of the  
Prime Minister on  
Streamlining Solid  
Waste Administration,  
B.E. 2557 (2014)**

The Regulations of the Office of the Prime Minister on Streamlining Solid Waste Administration, B.E. 2557 (2014) designates operational steps vis-à-vis solid waste management that systematically and efficiently integrate plans and guidelines of central and local administrations, wherein the Ministry of Natural Resources and Environment acts as a centre for issuing operating guidelines, making decisions, and solving problems in a systematic, timely and efficient manner.

### Project Outcome

On 27 March 2012, the Laem Phak Bia Environmental Research and Development Centre launched the Educational Service Centre with the following objectives: 1) to act as a venue for training, seminars and lectures on environmental development programmes at the centre; 2) to act as a venue for exhibitions and displays of state-of-the-art academic research on environment that benefit the youths, students and general public; 3) to be a model of know-how on waste disposal and sewage treatment based on the “nature cures nature” principle as advocated by His Majesty. Each year the centre attracts an increasingly large number of visitors and students.

Thanks to His Majesty’s initiative and emphasis on the “nature cures nature” principle, there has been research and development in waste treatment which results in a know-how that can be applied across the country. The wastewater treatment technology consists of the following steps:

## 1

{ Treatment Ponds system }

The sewage will be channeled through five treatment ponds, namely one for sedimentation, three for oxidation and one for polishing

processes. Each of the three stages requires seven days.

## 2

{ Aquatic Plants and Grass Filtration system }

The water will be channeled through the fields where different varieties of grass grow. Examples are African Star Grass (*Cynodon plectostachyus*), Kallar Grass (*Leptochloa fusca*), and Coastal Grass (*Sporobolus virginicus*), and aquatic plants such as Elephant Grass (*Typha angustifolia* Linn.), Umbrella Grass (*Cyperus Corymbosus* Rottb.), and vetiver, both groups serving as filters; the water will run through the fields for five days, and the fields left to dry for two days to allow the microorganisms in the soil to reestablish; harvesting of the grass/plants will be done at the blooming time on an average interval of every 45 days.

## 3

{ Constructed Wetland system }

Similar to the second step, but using certain aquatic plant varieties that will be harvested at the blooming time, every 45 days for Umbrella Grass (*Cyperus Corymbosus* Rottb.) and 90 days for Elephant Grass (*Typha angustifolia* Linn.).

## 4

## Mangrove Forest system

At high tide seawater will be let into the mangrove areas, where it is mixed with the wastewater at a ratio of 1:1, thus diluting and hastening the sedimentation process. Meanwhile, the tree roots absorb nutrients from organic decomposition by bacteria in the soil, thus His Majesty's principle that "nature cures nature."

The solid waste disposal makes use of concrete composting boxes. At the bottom of each box is a 20-centimetre foundation layer of fine sand, on top of which are 660 kilogrammes of waste, a five-centimetre layer of fertile soil or animal manure, another layer of 670-kg waste, and finally a 15-cm layer of soil. Every seven days, sixty litres of water are poured into the boxes to add moisture. After about 20 days, the compost can be separated and left to dry out in the sun for 15 days.

The programme has contributed to further qualitative and quantitative research, so far in nine discipline areas, numbering at least 245 topics. From 2005 to the present, there have been 137 articles published in both local and international journals, 170 presentations in both national and international conferences, and 223 theses.

The programme has so far seen 530 graduates at masters' and doctoral levels. These university scholars have done research on a wide range of subjects from waste management to sewage treatment with ponds and plants, recycling of wastewater, environmental quality monitoring, mangrove forests, environmental and social economics, and environmental study, to name a few.

Dissemination of knowledge and know-how on waste management by using natural methods as advocated by His Majesty has been done with school and university students as well as the general public in and outside the country. According to records, over 60,000 visitors have come to visit the Laem Phak Bia Environmental Research and Development Centre every year.

Another by-product from the programme is treatment of about 5,000 - 6,000 square metres of wastewater per day from the nearby Phetchaburi Municipality (80 percent of the daily amount) as well as proper disposal of solid waste from the same area.

The principle of "nature cures nature" also provides many other benefits beyond the waste treatment itself. Fish in the treatment lagoons can feed on aquatic plants, thus keeping the treatment system in balance, and when they mature, can be caught as food for people. The treated water also contains nutrients



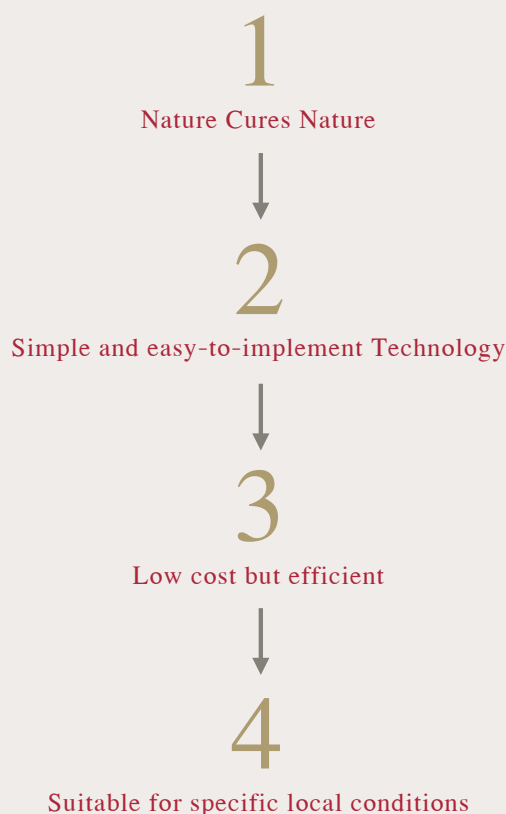
needed by plants, thus has been used by the local farmers. Meanwhile, the plants from the artificial wetlands can be harvested and used as raw materials for wicker works, handicrafts and pulp. Last but not least, the fertiliser from the composting of waste has been in demand among farmers in the area.


As the sewage has been treated before being discharged into the natural waterways, over time, the quality of Phetchaburi River has improved tremendously. The mangrove ecology has become more fertile, attracting

a larger number of birds and fish to the area. The programme site has proper physiological features for serving as a breeding ground of marine and other animals and also as wind barriers.

In an interview, Professor Dr. Sanit Aksornkaew said the project first started as qualitative research that went through trials and errors in an effort to understand the mechanisms involved. It took the team three to four years, with about 45 - 50 research projects, to find solutions to sewage treatment and waste disposal that fit His Majesty's three principles, namely 1) nature cures nature; 2) simple technology that anyone can undertake, and 3) low cost using local resources. At present, the team is working on more in-depth quantitative research in order to arrive at more precise knowledge, which usually needs expensive equipment and high budgets.

The key factor to the success of the Laem Phak Bia Environmental Research and Development Project is the firm belief of the staff members in their King. They have been inspired by the royal leadership to continue their research and collaboration so that they too can develop further knowledge in waste management and ecological conservation for sustainability of the environment.





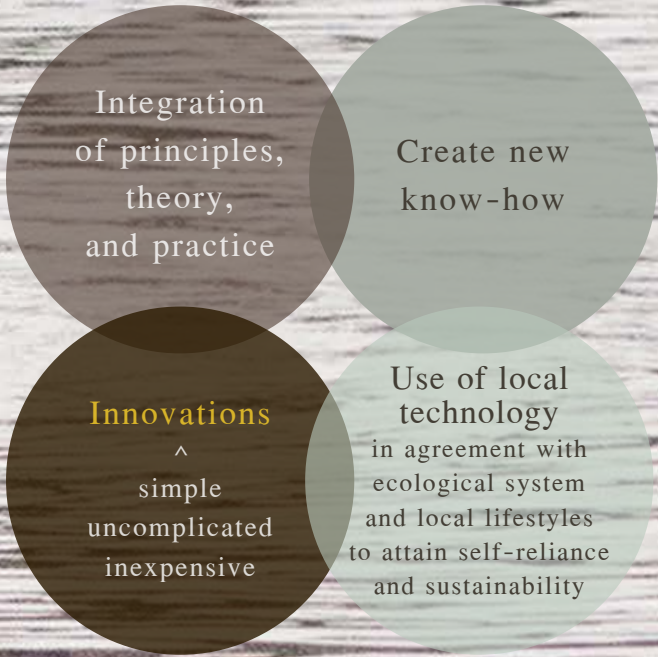
King Bhumibol Adulyadej was presented with honourable designations as the "Father of World Invention" and "Father of Thai Innovation" thanks to his numerous initiatives such as the development of the Chaipattana Aerator to treat water pollution and the Klaeng Din (tricking the soil) theory to solve soil acidity problems for farmers.

**Royal Initiated Projects  
Relating to Innovations**









Integration  
of principles,  
theory,  
and practice

Create new  
know-how

**Innovations**

^  
simple  
uncomplicated  
inexpensive

Use of local  
technology  
in agreement with  
ecological system  
and local lifestyles  
to attain self-reliance  
and sustainability



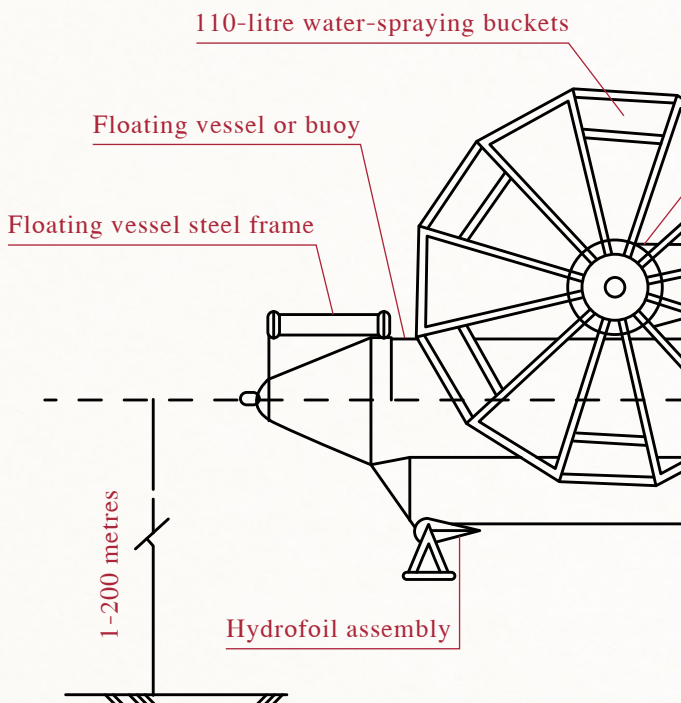


### Royal Initiated Projects Relating to Innovations “Father of World Invention” and “Father of Thai Innovation”

In 2008, King Bhumibol Adulyadej was presented with the title “Father of World Invention” by the International Federation of Inventors’ Associations (IFIA). And the second of February was designated “International Inventor’s Day” in remembrance of the day His Majesty received the patent for the Chaipattana Aerator. In celebration of His Majesty’s eightieth birthday anniversary and in honor of his inventive genius, the president of IFIA presented him with the IFIA Cup, a certificate of honour and the Genius Prize medal. In addition, the Director of the Korea Invention Promotion Association (KIPA) presented His Majesty with a Special Prize Cup together with a Certificate.

On 20 June 2006, the cabinet issued a resolution to carry out a project to pay tribute to King Bhumibol Adulyadej as the “Father of Thai Innovation,” on the occasion of the sixtieth anniversary of his accession to the throne and in honour of his ingenuity as an innovator. The fifth of October was also declared to be “National Innovation Day” in remembrance of the day in 1992 when His Majesty visited the Pikun Thong Royal Development Study Centre where he discussed the idea of “Klaeng Din” (tricking the soil) formally for the first time.

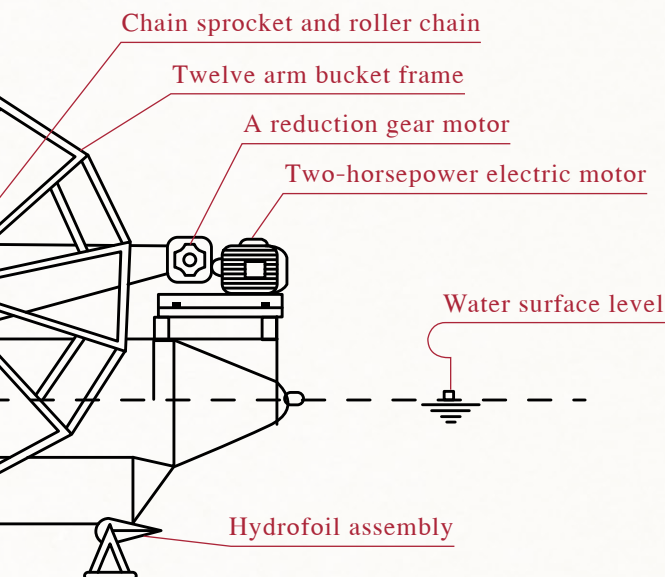
## Components of the Chaipattana Aerator



This chapter will focus on two of His Majesty’s initiatives, namely the Chaipattana Aerator and the Klaeng Din theory, as follows:

### 1. The Chaipattana Aerator

Aware of the severity of water pollution in big cities, King Bhumibol Adulyadej expressed his concern and made several inspection tours to various sites in Bangkok Metropolis and other provinces. During the first stage, from 1984 to 1987, the monarch suggested using good



*\* During Brussels Eureka 2000, an exhibition of new scientific inventions held in Brussels, Belgium, the “Chaipattana Aerator” won a gold medal from the Belgian Chamber of Inventors.*

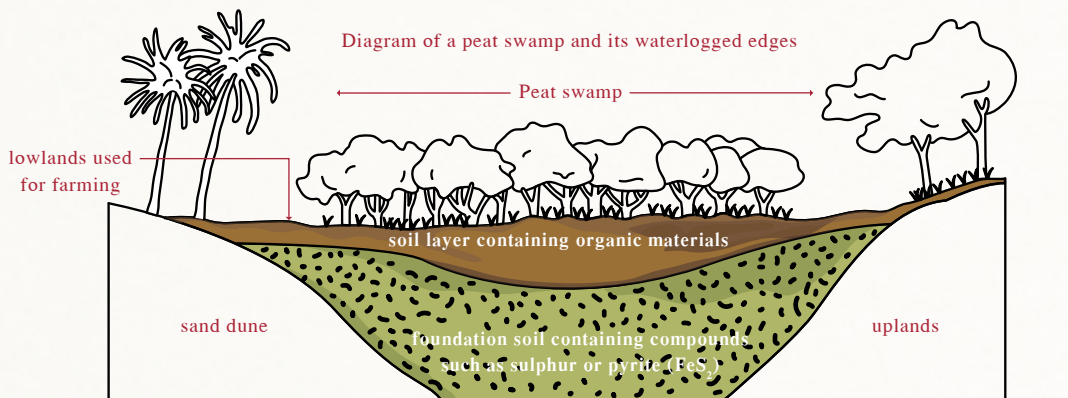
quality water to dilute polluted water (“Good Water Chases Bad”) with water hyacinth and other aquatic plants as natural water filters. These natural methods could alleviate the problem to a certain extent, but from 1988 onwards, the levels of water pollution became so much more alarming that such natural methods were inadequate. His Majesty thus proposed building a low-cost aerator, for which he borrowed an idea from a traditional Thai farming tool called “Luk” used by farmers

to scoop water into paddy fields. Under the monarch’s auspices, the Chaipattana Foundation provided financial support for researching the new device to treat wastewater, in collaboration with the Royal Irrigation Department. After years of experimentation, the Chaipattana Aerator was finally born, a genuine “Thai-made for Thai use” brainchild of His Majesty.

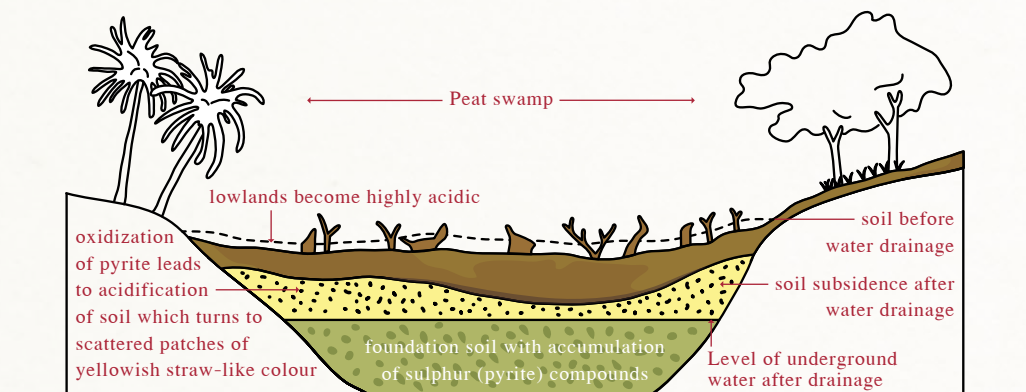
A paddle-wheel machine attached to a floating buoy, the Chaipattana Aerator adds oxygen to the wastewater through a series of steps: rotation of water spraying buckets scooping up water, exposing it to air, and then releasing it, in the process creating air bubbles which carry oxygen below the water surface. The aerator has been found to improve the quality of polluted water from household use as well as from industrial and agricultural sources.

The Chaipattana Aerator has been granted two patents. The first, number 3127, for the slow-speed surface aerator was presented to His Majesty on 2 February 1993, the first of its kind issued to a monarch in Thai history and in the entire world. The second patent, number 10304, was for the model that compresses air into the main pipe and expels it through diffuser tubes, thus adding oxygen to water below the surface, and presented to His Majesty on 19 April 2001. Moreover, the Chaipattana Aerator was awarded the gold medal by the Belgian Chamber of Inventors during the Brussels

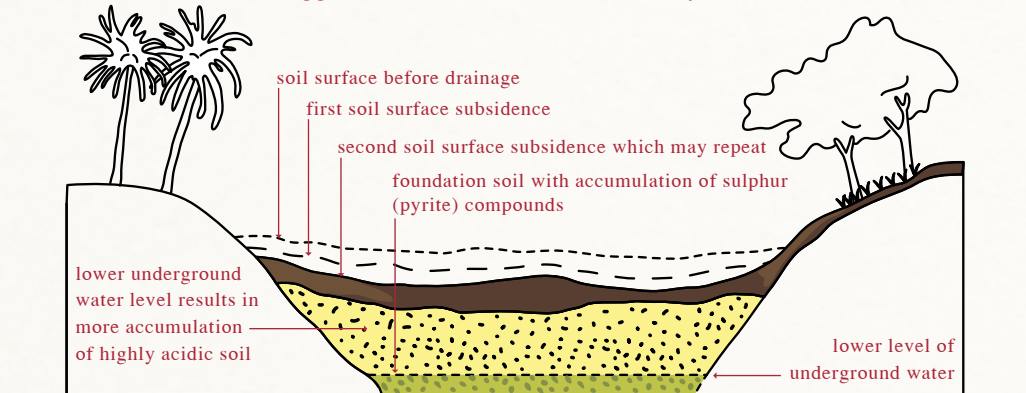
### Stages of soil acidification in peat swamp forest and surrounding low-lying areas in Narathiwat Province



#### Peat swamp in its natural waterlogged state



#### Peat swamp after drainage of water, foundation soil level remains waterlogged but the top level becomes dry and acidic



Increase in water evaporation leads to more build-up of soil acidity and erosion of organic material from the top level



“...I have been talking about the Klaeng Din [tricking the soil] project for three or four years because we need water for the soil to work properly. When the soil is working, it will no longer get upset. Nobody believed this. So I implemented the project here, and it works. Our work here is thus of utmost importance. I believe that any foreigners who come to see our work will be impressed. For they have problems too and they cannot find solutions in any textbooks...”

*King Bhumibol Adulyadej's speech on 5 October 1992,  
at the Pikun Thong Royal Development Study Centre*

Eureka 2000, an international exhibition of new scientific inventions held in Brussels, Belgium.

## 2. Klaeng Din Theory

Many areas in southern Thailand have long suffered from acidic soil due to a high level of sulphur, making it unsuitable for farming. King Bhumibol Adulyadej's initiative known as “Klaeng Din” (tricking the soil) was an unprecedented achievement in transforming the previous wasteland into arable land again. The underlying principle of the monarch's technique is to alternately dry out and wet the land to accelerate the soil's chemical

reactions and raise the acidity to the maximum. The soil is then de-acidified through various techniques such as controlling the groundwater level to prevent the release of sulphuric acid, applying lime materials at 1 - 4 tonnes per rai, and washing away acidity with water. Selected crops are then introduced to the area, followed by further research on improvement of the acidic soil and how to maximize the use of the land.

Such innovative techniques were first discussed during His Majesty's visit to the Pikun Thong Royal Development Study Centre



*"Klaeng Din" Project was His Majesty's innovation that transformed acidic soil, a common problem in tropical peat swamp forests, into arable land again, an unprecedented success in the world.*

on 5 October 1992: "...I have been talking about the Klaeng Din (tricking the soil) project for three or four years because we need water for the soil to work properly. When the soil is working, it will no longer get upset. Nobody believed this. So I implemented the project here, and it works. Our work here is thus of utmost importance. I believe that any foreigners who come to see our work will be impressed. For they have problems too and they cannot find solutions in any textbooks..."

The Klaeng Din project is the first successful treatment of acidic soil in peat swamp forests, a common problem in tropical countries. It displays the monarch's ingenuity in applying technological and management innovations that arrive at a workable solution.

The Klaeng Din project was financed in part by the government's regular budget and also by the Office of the Royal Development Projects Board. An affiliated project in Nakhon Nayok Province also received funding from the Chaipattana Foundation.

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## Laws relating to this project

### Royal Initiated Projects Relating to Innovation

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Laws relating to and supporting the project are as follows:

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1.  
**Land Development  
Act, B.E. 2551  
(2008)**

The Land Development Act, B.E. 2551 (2008) stipulates principles for mitigating soil erosion; in the absence of soil and water conservation, resulting in soil erosion and economic and social losses, state agencies are directed to intervene to protect areas under risk of landslides or severe soil erosion; to ensure efficient and maximum benefits of land use, legal regulations are thus issued with regard to building natural fertility of soil, appropriate land use, conservation of soil and water, analysis of soil samples, and improvement of soil or land, which are important factors in land development schemes. The “Klaeng Din” project which turns wasteland into arable land is thus supported by the legislation.

Below are definitions of some key terms relating to land management in the Land Development Act, B.E. 2551 (2008)

“Land development” means any act done to soil or land in order to increase the efficiency and quality of soil or land, or to increase agricultural productivity, and shall also mean an improvement of soil or land which is infertile either by natural cause or utilization, and the conservation of soil and water for maintaining balance of nature or suitability in utilization of land for agriculture.

“Soil and water conservation” means any action aimed at preventing the soil and land from deterioration and loss, including any act for maintaining and improving soil fertility to preserve groundwater and surface water to maintain balance of nature and to suit agricultural use of the land.

Based on the two legal definitions above, the “Klaeng Din” project can be considered as simultaneously developing and conserving the land, turning poor into fertile soil.

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## Laws relating to this project

### Royal Initiated Projects Relating to Innovation

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2.

**Patent Act,  
B.E. 2522 (1979)**

The primary objectives of the Patent Act, B.E. 2522 (1979) are to promote research into and invention of new products, processes, and designs that are deemed useful and display technical advancement be it in agriculture, industry, and commerce in the country; and to protect inventors and designers by prohibiting anyone from imitating the inventions or designs without giving due remunerations. In order to benefit and further scientific and technological advancement, the act also covers protection of “petty patents,” i.e., any inventions that would qualify for invention patents except that they have no strong, technical innovative step thus are not yet granted full patents. The Chaipattana Aerator is an innovation that has been issued two patents.

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3.

**Enhancement  
and Conservation  
of the National  
Environmental  
Quality Act,  
B.E. 2535 (1992)**

The primary goals of the Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992) are to enhance and conserve environmental quality by laying out guidelines for environmental control and mitigation and by encouraging public participation in enhancement and conservation of the environmental quality; to streamline environmental administration according to the principles of environmental quality management; to stipulate powers and duties of relevant government agencies, state enterprises, and local administrations so there are coordination and collaboration in enhancement and conservation of the environment as well as to provide guidelines for areas that do not come under direct jurisdiction of any agencies; to issue pollution control measures by arranging systems to mitigate air and water pollution, waste disposal and by providing tools or equipment to mitigate the pollution; to designate clear duties and responsibilities of relevant stakeholders regarding pollution; and to designate measures to promote fundraising and any other assistance as incentives for performing duties vis-à-vis environmental conservation.



### Project Outcome

King Bhumibol Adulyadej's two projects show how important it is to apply scientific know-how, technological advancement and innovation to solve public problems. Such intellectual advancement is indeed a key factor in boosting Thailand's competitiveness in the international community, in fostering economic growth and stability and maintaining its resilience to fluctuations due to globalisation.

In retrospect, the two royal initiatives reveal the monarch's personal penchant for research and experiment until he could obtain results, which he readily shared so they could be further applied to solve problems of his people. His Majesty tirelessly worked on searching for the right development path that would fit with conditions in Thai society and in specific locales.

On 5 October 1992, during his visit to the Pikun Thong Royal Development Study Centre King Bhumibol Adulyadej said *"...This experiment is like writing a textbook. It should be made into a manual to be used in other areas facing acidic soil problems. In other areas, we may not have to divide the land into smaller lots like here. The building of dykes to block water could also form irrigation canals, or a road or bridge. Education should be like this..."*

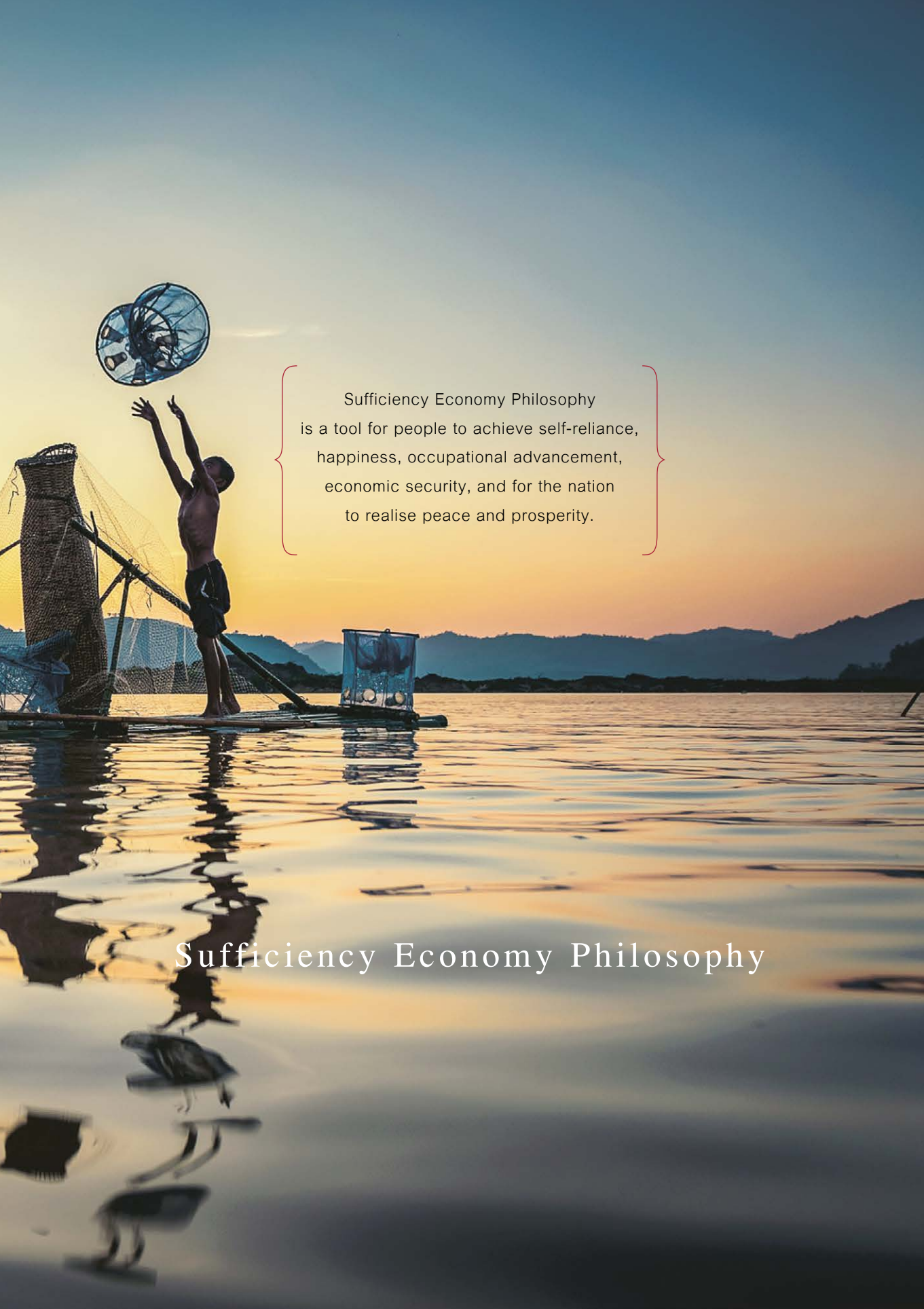
His Majesty stressed coordination between technological and management innovation until one finds the proper way to treat soil acidification. This is development that seeks to strike a balance between the natural

environment and social psychology of a community. It also fits with His Majesty's working principle of "not being dogmatic" and not clinging to knowledge and technology unsuitable to the Thai ways of life (The Office of the National Economic and Social Development Board, Learning King Bhumibol Adulyadej's Working Principles, December 2008).

### Recommendations

1. Continuous research and development should be given importance.
2. His Majesty's initiatives on innovation should be integrated into the National Economic and Social Development Plans and also into the government's national administration policy, as a way to stimulate and promote further innovations in the production sector of the country.
3. The findings from past research and development should be used to add value to products and services thereby increasing the country's competitiveness, so Thailand can be promoted from the group of middle-income countries to the higher levels in the future.
4. There should be public dissemination of knowledge and advancement in science, technology and innovation so Thai people can increase their competitive capacity, and the country will attain economic growth and stability as well as developing strength to withstand fluctuations due to globalisation.





Sufficiency Economy Philosophy  
is a tool for people to achieve self-reliance,  
happiness, occupational advancement,  
economic security, and for the nation  
to realise peace and prosperity.

Sufficiency Economy Philosophy



*“...Development of the country must proceed in stages. First of all, there must be a solid foundation with the majority of the people having enough to live on by using methods and equipment which are economical and also technically correct. When such a secure foundation is ready and operational, then we can gradually expand and develop to increase prosperity and raise the economic standard to a higher level by stages...”*

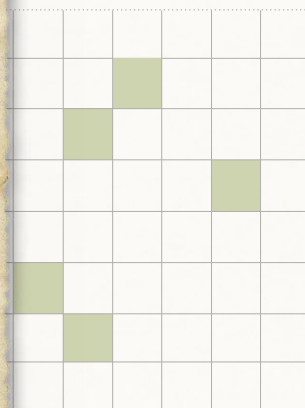
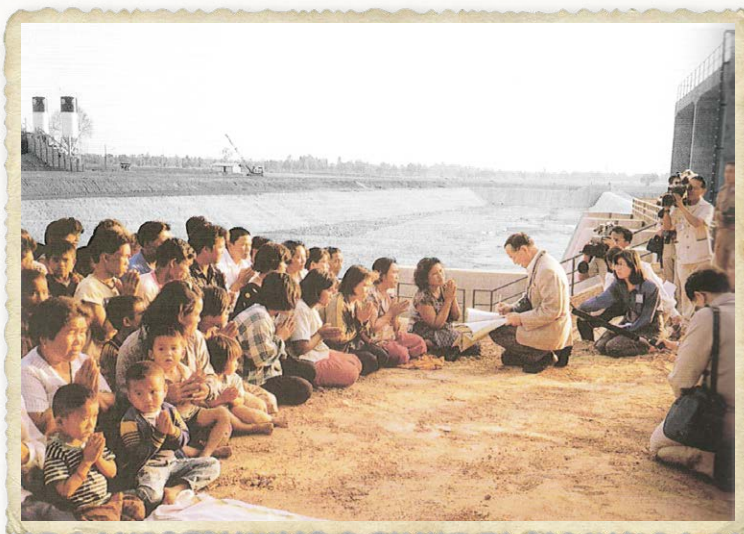
*King Bhumibol Adulyadej's speech delivered to Kasetsart University students at their graduation ceremony on 18 July 1974*

#### 1. “Sufficiency Economy” Royal Initiative

For over four decades, King Bhumibol Adulyadej bestowed on the Thai people his concept of “Sufficiency Economy,” a practical guideline for development that embraces Thai culture and the Buddhist teaching of the Middle Way and heedfulness. His Majesty's concept of Sufficiency Economy basically comprises moderation, reasonableness, and built-in resilience. It illustrates how one must combine knowledge and ethics as the foundation of life. Importantly, to achieve true “happiness,” one must cultivate “mindfulness, wisdom and perseverance.”

The monarch's first speech on “Sufficiency Economy” was delivered to Kasetsart University students at their graduation ceremony on 18 July 1974:

*“...Development of the country must proceed in stages. First of all, there must be a solid foundation with the majority of the people having enough to live on by using methods and equipment which are economical and also technically correct. When such a secure foundation is ready and operational, then we can gradually expand and develop to increase prosperity and raise the economic standard to a higher level by stages...”*



His Majesty's idea was subsequently reinforced and expanded on several occasions. In the same year, the king referred to it again during his birthday speech on 4 December 1974 delivered at Dusidalai Hall, Chitralada Villa, Dusit Palace:

*"...It doesn't matter what others say, whether Thailand is behind the times, old-fashioned, or lacking in modernity. But we have enough to eat and live on. May we all wish that our country have sufficiency and peace. May we endeavor to bring our country to sufficiency. It doesn't have to be the peak of prosperity. Just sufficiency and peace. Compared to other countries, if we can maintain sufficiency, we will be at the peak..."*

In this royal speech, His Majesty proposed that the path of unbridled development, which

only focused on economic growth, could inadvertently bring more troubles down the road. Instead, the monarch stressed sufficiency of his people as the first priority. Only when the foundation is firm and secure, can we turn to working on economic expansion. Unlike conventional macroeconomic policy that espouses rapid industrialisation as the driver of the national economy, the Sufficiency Economy aims primarily at well-being of the rural population who then formed the majority in the country. In effect, this is development that values income distribution and economic stability before moving on to higher levels.

Later, King Bhumibol Adulyadej discussed Sufficiency Economy in another royal speech on his birthday at Dusidalai Hall, Chitralada Villa, Dusit Palace on 4 December 1998:

*“...Sufficiency Economy is like the foundation of life. The foundation of national stability is like the foundation pillars of a house. A building will stand firm because of the pillars, but most people usually overlook or even forget about them...”*

*King Bhumibol Adulyadej’s speech on the importance of “Sufficiency Economy” disseminated by the Chaipattana Foundation in 1999*

“...In 1974, I said that we should strive to have enough to live on. Today it is 1998. So it has been 24 years now. To have enough to live on, of course, means Sufficiency Economy. If everyone has enough to live on, everything will be alright. Furthermore, if the whole country can subsist with sufficiency, the better it will be, but Thailand at the time was on the verge of insufficiency. Some individuals had plenty, but some had practically nothing. In the past, there was enough to live on, but today, impoverishment is creeping in. We must, therefore, implement a policy on Sufficiency Economy so that everyone will have enough to live on...”

The monarch continued to raise the importance of “Sufficiency Economy” in another speech disseminated by the Chaipattana Foundation in 1999, as follows:

“Sufficiency Economy is like the foundation of life. The foundation of national stability is like the foundation pillars of a house. A building will stand firm because of the pillars, but most people usually overlook or even forget about them.”

## 2. Definition of “Sufficiency Economy”

Sufficiency Economy is a practical guideline for living and conduct at every level, from individual, family, community and the whole country. It advocates the “middle way” in approaching national development and administration, and how to balance economic development in the age of globalisation. Sufficiency encompasses moderation, reasonableness, and self-immunity or built-in resilience to the impact from change be it from within or without. Application of knowledge to





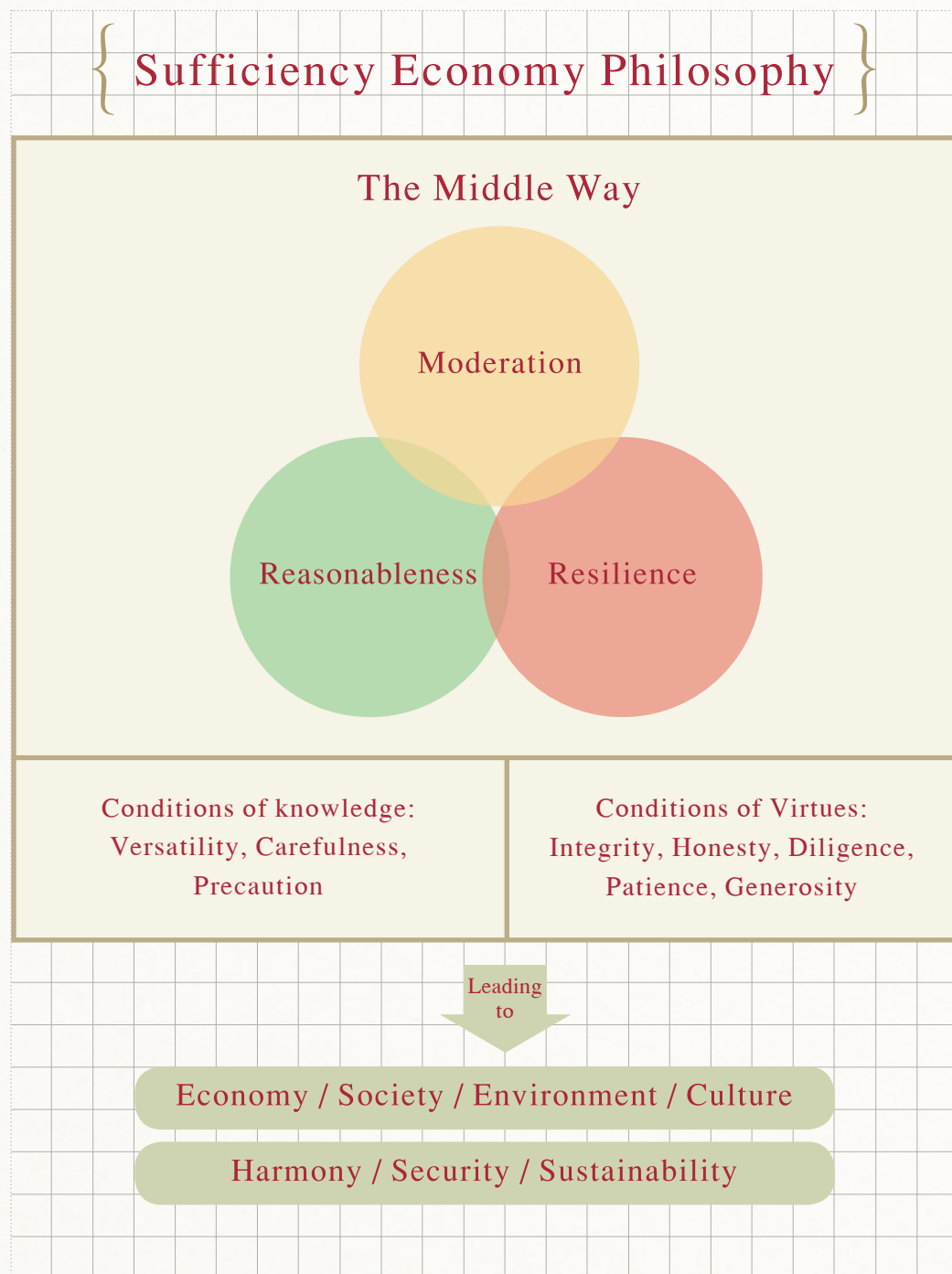
planning and implementation must be based on versatility, thoroughness and precaution. Equally important is the cultivation of virtues, honesty and integrity in every citizen, especially state officers, academics and business people, so they have proper knowledge, patience, perseverance, insights or wisdom which enable them to live in balance and be ready to encounter rapid and widespread physical, social, environmental and cultural change from the outside world.

The Office of the National Economic and Social Development Board invited scholars from economic and other fields to study and condense King Bhumibol Adulyadej's speeches on Sufficiency Economy, and subsequently asked for royal permission to disseminate the findings. On 29 November 1999, His Majesty

graciously granted the office a revised version with royal permission to publish it as a guideline for every sector and the general public.

*"...In 1974, I said that we should strive to have enough to live on. Today it is 1998. So it has been 24 years now. To have enough to live on, of course, means Sufficiency Economy. If everyone has enough to live on, everything will be alright. Furthermore, if the whole country can subsist with sufficiency, the better it will be, but Thailand at the time was on the verge of insufficiency. Some individuals had plenty, but some had practically nothing. In the past, there was enough to live on, but today, impoverishment is creeping in. We must, therefore, implement a policy on Sufficiency Economy so that everyone will have enough to live on..."*

*King Bhumibol Adulyadej's speech on Sufficiency Economy on his birthday at the Dusidalai Hall, Chitralada Villa, Dusit Palace on 4 December 1998*



The definition of “Sufficiency Economy” comprises the following traits:

To achieve sufficiency requires two sets of “conditions” when making decisions and undertaking activities, namely:



Moderation refers to the right balance of neither too little nor too much without harming oneself or others, such as in moderation of production and consumption;



Conditions of Knowledge consist of knowledge of relevant subjects and precautions in integrating it during planning and implementation



Reasonableness means that any decision on the proper level of sufficiency must be based on reason and consideration of relevant causal factors as well as on possible consequences from such-and-such action;



Conditions of Virtue consist of ethical behaviour, integrity, patience, perseverance, mindfulness and generosity.



Resilience refers to the built-in ability and readiness to face any impact and change by carefully considering possible future scenarios and coping with them in an appropriate manner.





### 3. Application of “Sufficiency Economy”

The concept of Sufficiency Economy can be applied at every level, within every sector and field of the economy, be it agriculture, industry, rural sector, financial and fiscal sector, real estate, trade and foreign investment, to name a few. The basic principle is universal: moderation, reasonableness, and the need for building resilience for oneself and society, based on knowledge, versatility, precaution, and virtues like integrity, diligence, perseverance and generosity.

Below are possible ways to apply Sufficiency Economy at each level:

#### Personal/Family Level

Personal/Family Level

- Strive to attain self-reliance in five aspects

- 1) mind
- 2) society
- 3) technology
- 4) natural resources and environment
- 5) economy

- Understand the meaning of “sufficiency” and not exploiting others

- Seek to develop one’s strengths and skills
- Have happiness and contentment with what one has; follow the Middle Way as a guide for living

#### Community Level

Community Level

Consisting of people/families who have achieved sufficiency

- pool their skills and resources to work together for the public’s benefit
- have compassion for one another, which will lead to generation of social force
- develop networks with other communities

#### State or National Level

State or National Level

Consisting of societies that have been empowered

- collaboration between various communities/societies to carry out development based on the Sufficiency Economy concept
- lay the foundation of the country to attain sufficiency first and gradually develop the economy and society step by step to the next levels

#### Examples of Sufficiency Economy

#### Farmers

Farmers who follow the New Theory advocated by His Majesty as follows:

First step: A guideline on how to set up agricultural land for a family to attain sufficiency in limited space by dividing up the plot into four portions in ratios of 30:30:30:10, i.e.:

The first portion, taking up 30 percent of total area, will be dug as ponds to store rainwater in the rainy season, that can be used in cultivation in the dry season as well as for raising aquatic animals and plants;

The second portion, taking up 30 percent of the area, is for growing rice in the rainy season, which will supply daily food for the family all year round, thus cutting down on expenses and helping to achieve self-reliance;

The third portion, taking up 30 percent of the area, is for growing fruit and other trees, vegetables and herbs for daily food, and if there is surplus, for sale;

The fourth portion, taking up 10 percent of the area, is for residence, livestock, walkways and other farm buildings.

Second step: Farmers pool resources to set up groups or cooperatives that will facilitate production, marketing, and improvement of the community welfare, as well as foster unity among the locals and prepare them to be ready for engaging in the outside world.

Third step: Farmers' groups coordinate with outside institutions, be it to seek financial support from banks, or attract investment by the private sector, and thereby improve their quality of life.

### { Business people }

Business people

- Business people accept a moderate profit, that is reasonable for the business people or shareholders, as "normal profit" and which must be from enterprises that do not exploit consumers or are illegal.

- Exporting business is allowed, with stress on building resilience and awareness that well-rounded knowledge, precaution and thoroughness are necessary for keeping up with constant change in the age of globalisation.

- Borrowing money for investment is allowed as part of the generation of income but one must be able to pay back debts.

- Business people must cultivate morality, integrity, perseverance, patience and social responsibility; there must be improvement in production efficiency and quality of products to keep up with the market's demand and technological change.

- Business people must maintain balance when dividing profits among stakeholders, from the employees, companies, consumers, to the public at large.

### { Politicians }

Politicians

- Every issuance of policies, legislation and rules and engagement in any political activities must abide by the principle of Sufficiency Economy and public benefit.

- Politicians must possess good attitudes and views and always espouse sufficiency, integrity, perseverance and mindfulness in every endeavor.

### { State officers }

State officers

- State officers must live in accordance with the sufficiency principle, with moderation and self-reliance and refrain from all vices.

- State officers must be committed to cultivating virtue, integrity, proper knowledge, patience, perseverance, mindfulness, wisdom and heedfulness.
- Every preparation of policy, plans, or projects must be in accordance with the principles of Sufficiency Economy, with emphasis on developing and solving economic, social and psychological problems.

### { Teachers }

#### Teachers

- Teachers must abide by the principles of Sufficiency Economy as guidelines for living, and possess diligence, perseverance and abstention from vices.
- Teachers must develop curriculum according to the principle of Sufficiency Economy.
- Teachers must be committed to one's duty of teaching and lifelong learning.
- Teachers must disseminate knowledge and understanding of Sufficiency Economy among children and youths so they can think analytically, with reason and creativity along with cultivation of moral and mental development.

### { School and University Students }

#### School and university students

- Students must know how to manage time wisely be it to pursue study or to play and know how to live in moderation.
- Students must possess intellectual curiosity and make decisions based on true knowledge.

- Students must behave well and possess self-discipline, diligence, integrity, generosity and gratitude.
- Students must know how to spend money wisely and carefully.
- Students must know how to enhance resilience, such as by being frugal, actively searching for knowledge, and not consuming intoxicants or addictive substances.

### { People of all ages and faiths }

#### People of all ages and faiths must:

- live in accordance with understanding of oneself, self-reliance, and generosity for one another.
- live within one's means and in accordance with every religious teaching that advocates morality.
- refrain from harming oneself or others.
- not indulge in luxuries beyond one's means.
- know how to share and help others in a proper way and within one's capacity.
- live in accordance with the Middle Way -- with moderation, not having too much or too little.

### { Examples of fiscal policy }

#### Examples of fiscal policy

- Sufficiency in setting targets, such as the volume of money circulated in the economy should not be too much to undermine economic stability nor too little to cause economic recession.
- Fiscal policy must be responsive to changing situations.



- Policy makers must take precautions when implementing change in fiscal policy. Changes must be made step by step with careful consideration of circumstances.
- Policy makers must take preventive measures to avoid problems by considering current problems and future challenges.
- Management of interest or foreign exchange rates must be based on good reasons and balance.
- Policy makers must build good resilience in management with good governance principles.
- Policy makers must adopt transparency in fiscal administration.
- Policy makers must aim at stable economic growth and fair income distribution.
- Policy makers must avoid “economic populism” policy that may cause long-term negative impact.
- Fiscal administration must be conducted on the basis of knowledge and morality.

Examples of how to conduct business in the industrial sector

- Examine one’s own potential and circumstances (such as type of work, size of budget, production and market situations) and aim for moderation.
- Abide by reason, intellect and wisdom.
- Focus on areas of strength and expertise.
- Build up one’s business step by step.
- Use resources constructively and reasonably.
- Build good resilience through prevention or risk management.
- Have contingency plans in case of uncertainty.
- Do not overspend or create debts beyond one’s capacity to repay.

- Prepare reserves and not chase after profit with greed.
- Run business based on knowledge and morality.

### { Examples of how to develop educational policy }

Examples of how to develop educational policy

- Strive for Thailand to become a society of learning based on Sufficiency Economy by nurturing generation of knowledge guided by morality, to enable the country to acquire strength and sufficiency.
- In the age of globalization, knowledge is pivotal to the new economy and society, so the educational system must provide quality lifelong learning to everyone from birth to death. In a future of rapid change, building resilience through education is the best way to strengthen the people and eradicate poverty. Therefore, education is the core of development in every aspect, from politics to economy, society, rural development, agriculture, industry, and so on.

#### 4. Incorporation of Sufficiency Economy Philosophy into Public Policy

1. King Bhumibol Adulyadej’s espousal of Sufficiency Economy has taken root in the Thai society. The monarch put emphasis on “human development” -- how to attain self-reliance, sufficiency, moderation, reasonableness, and resilience. His Majesty warned Thai people not to be reckless and to use knowledge and morality as guidelines for living.



2. The Office of the National Economic and Social Development Board has successively integrated the Sufficiency Economy Philosophy into its key policies starting from the eighth national economic and social development plan (1997 - 2001). This plan advocated "human-centred development," participation by every sector in the society, and an holistic approach to foster balanced development. The subsequent ninth plan (2002 - 2006) continued this integration through its emphasis on development that balanced social, economic and environmental aspects, with a primary goal of elevating the quality of life of Thai people to one of "well-being" and pursuing the Middle Way in steering the country through crisis toward stability and sustainability.

The tenth plan (2007 - 2011) placed importance on balanced development, peaceful coexistence

in society and sustainable harmony between humans and the environment.

The eleventh plan (2012 - 2016) aimed at creating resilience and proper risk management in order to steer the country toward balance and sustainability.

The twelfth plan (2017 - 2021) continues the approach of human-centred development through espousing inclusiveness, balance and sustainability. The goals of the twelfth plan are to elevate the status of Thailand from the middle-income group of countries to the high-income group while ensuring there are appropriate balances in income distribution, healthy ecology, and peaceful co-existence in the society. The country can thus realize its long-term vision of "stability, prosperity, sustainability."



*Thailand achieving stability,  
prosperity, sustainability, and  
becoming a developed country that runs  
on Sufficiency Economy Philosophy.*



*Vision in Thailand's  
Twenty-Year National Strategy*

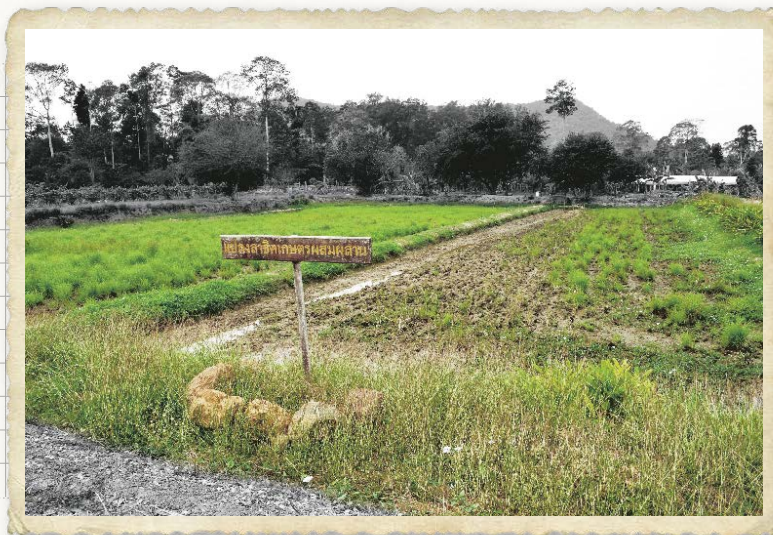
3. The twenty-year national strategy (2017 - 2036) envisions *“Thailand achieving stability, prosperity, sustainability, and becoming a developed country that runs on Sufficiency Economy Philosophy.”* According to the long-term strategies, Thailand will maintain its sovereignty with economic, social and cultural security and every citizen will enjoy well-being and happiness.

4. To meet the United Nations' Sustainable Development Goals (SDGs), Thailand has set up a Sustainable Development Commission in compliance with the agreement or international cooperation to meet current and future demands of the people and thus improving their quality of life. One of the key components in fulfilling the task was setting up a sub-committee in charge of promoting understanding and

evaluating implementations of Sufficiency Economy Philosophy.

5. The Sufficiency Economy Philosophy has been implemented in every sector of the society. For the community and civil sector, there was follow-up of cases of people applying the concept to improve their livelihoods. In the agricultural sector, the application of the concept has improved several local communities, strengthened their security, enabled them to cut household expenses, relieved them from indebtedness and allowed them to attain self-reliance. In the business sector, the concept has been widely implemented by companies of all sizes, from large to medium and small. They profess to not exploiting consumers or committing illegal activities to reap undue profit. Moreover, a number of business enterprises





have shown greater social responsibility by taking part in poverty-reduction and rural development programmes.

6. The Office of the Royal Development Projects Board has organized a series of contests on the theme of Sufficiency Economy Philosophy. The first one was held in 2007 on the occasion of King Bhumibol Adulyadej's eightieth birthday, with the aims to disseminate His Majesty's ingenuity and to identify success cases of people in agricultural and business sectors who have applied the Sufficiency Economy Philosophy.

The second contest was held in 2009 - 2010, a joint collaboration between the Chaipattana Foundation, the Budget Bureau, Interior Ministry, Royal Thai Army, the Office of the Royal Development Projects Board, and the Research and Development Institute of

Sufficiency Economy Philosophy Foundation. The goals were to promote the Sufficiency Economy Philosophy and encourage its application by the general public as well as state, business and agricultural sectors in their lives and work.

The second contest was divided into ten categories, namely 1) people in remote areas, 2) general public, 3) communities that advocate Sufficiency Economy, 4) farmers who advocate His Majesty's New Theory, 5) farmers' groups that advocate the New Theory, 6) local government agencies/organisations, 7) central government agencies/organisations, 8) large-scale businesses, 9) medium-sized businesses, and 10) small businesses. The results of the contest provided examples of successful applications of the Sufficiency Economy Philosophy.



7. There have been several major examples of progress in implementing the Sufficiency Economy Philosophy in the political sector, namely, issuance of the Royal Decree on Criteria and Procedures for Good Governance, B.E. 2546 (2003); inclusion of the Sufficiency Economy Philosophy in the Constitution of the Kingdom of Thailand B.E. 2550 (2007); and clear stipulation of the Sufficiency Economy Philosophy in the government's national administration and economic policies since 2007 that required every government unit to put it into practice.

In addition, the government has incorporated the Sufficiency Economy Philosophy in every action plan, as appeared in the Constitution, national economic and social development plans, and presentations of the government's administrative policies to Parliament.

8. With regard to educational institutions, the Sufficiency Economy Philosophy has been instilled in every level of schooling so that the youth will hold it as their main principle in their work and everyday living and develop a "sufficient lifestyle." Moreover, the Sufficiency Economy Philosophy has been included in every curriculum such that as of 2007, there were 135 schools that met the criteria as "school model of sufficiency", and the number kept rising each year. Plans are in place to develop these schools into "learning centres for Sufficiency Economy Philosophy" wherein staff will be trained until they acquire adequate understanding of the Philosophy and can efficiently put the Philosophy into practice. The basic educational curriculum has also included the traits of "sufficient lifestyle" as a measure of the quality of students.





*United Nations' Secretary-General HE Kofi Annan presented King Bhumibol Adulyadej with the "Human Development Lifetime Achievement Award."*

*“His Majesty’s ‘Sufficiency everywhere during these times approach strongly reinforces and sustainable path towards agenda and visionary thinking everywhere.”*

9. The Sufficiency Economy Philosophy has also been well accepted in the international community. Past successful applications by various sectors, with tangible results have been a showcase of how the Sufficiency Economy Philosophy can be a viable alternative to solving current crises around the world.

The Tenth United Nations Conference on Trade and Development (UNCTAD) in February 2000 issued an official statement to show appreciation for King Bhumibol Adulyadej’s Sufficiency Economy Philosophy as a viable development concept in the age of globalization. Later, during the ASEAN Inter-Parliamentary Assembly on 22 September 2001, the Sufficiency Economy Philosophy received consensus as a viable alternative path of development by

the member countries. On 26 May 2006, then United Nations Secretary-General Kofi Annan presented His Majesty with the “Human Development Lifetime Achievement Award” with the following dedication:

*“His Majesty’s ‘Sufficiency Economy’ Philosophy is of great relevance to communities everywhere during these times of rapid globalization. The philosophy’s ‘middle path’ approach strongly reinforces the United Nations’ own advocacy of a people-centred and sustainable path towards human development. His Majesty’s development agenda and visionary thinking are an inspiration to his subjects, and to people everywhere.”*

Moreover, in 2007, the United Nations Development Program (UNDP) published a



*Economy' Philosophy is of great relevance to communities of rapid globalization. The philosophy's 'middle path' the United Nations' own advocacy of a people-centred human development. His Majesty's development are an inspiration to his subjects, and to people*

*Award citation delivered by United Nations  
Secretary-General Kofi Annan on 26 May 2006*

bilingual report on human development for Thailand (Thai-English) that proposes an approach to national development, human development and recommendations on policies based on Sufficiency Economy Philosophy, which was distributed to 166 countries around the world. In 2015, the United Nations also adopted the "Sustainable Development Goals" (SDGs) as their agenda, which Thailand has fully supported by setting up the Committee on Sustainable Development based on Sufficiency Economy Philosophy.

Many countries have shown interest in implementing His Majesty's Sufficiency Economy Philosophy. The Ministry of Foreign Affairs is thus tasked with promoting and publicizing the implementation through

organizing conferences, seminars and workshops among developing countries in ASEAN, Africa, South Asia and the South Pacific. The Ministry has conducted field trips to various Royal Projects that have successfully implemented His Majesty's development principles.

Due to geo-social differences, each country has different needs in applying the Sufficiency Economy Philosophy. Thailand has seen a number of international delegations from various levels, from cabinet ministers to policy and operating officers, who have come to learn about His Majesty's innovative approach to development.

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## Laws relating to the Sufficiency Economy Philosophy

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Laws relating to and supporting the Sufficiency Economy Philosophy are as follows:

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1.  
**Constitution of  
the Kingdom of  
Thailand,  
B.E. 2550 (2007)**

The concept of Sufficiency Economy was included in Part 3 on State Administration Policies, Section 78 (1) saying the State should administer State affairs with a view to establish sustainable development of society, economy and security of the nation. It was also stipulated in Section 83 and 84 regulating that the State should encourage and support the implementation of the Sufficiency Economy Philosophy with consideration of overall national interests.

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2.  
**Constitution of  
the Kingdom of  
Thailand,  
B.E. 2560 (2017)**

In chapter VI on Directive Principles of State Policies, Section 75 stipulates that the State should organise an economic system that enables the people to benefit from economic growth in a comprehensive, fair and sustainable manner so they can achieve self-reliance according to the Sufficiency Economy Philosophy. The State should eliminate unfair economic monopolies and develop the competitive capacity of the people and the whole country.

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3.  
**Law on Annual  
Appropriations**

This is key legislation on how the state budget allocates funds to various agencies in order to support the government's national development policies that are in line with the Sufficiency Economy Philosophy. The annual budget allocation is based on the key guidelines of the Sufficiency Economy Philosophy.

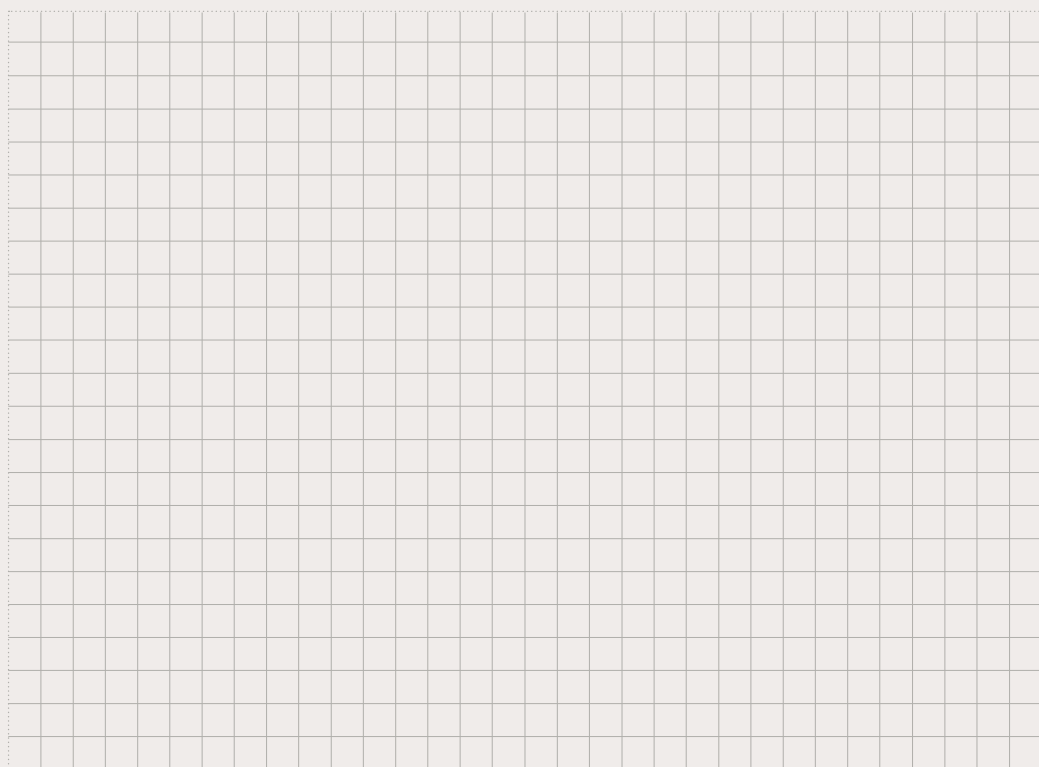


## Recommendations

1. Every government agency should implement the Sufficiency Economy Philosophy as its main agenda, for the concept contains diverse and profound aspects that can be applied to every level and field of operation.
2. There should be concerted campaigns to promote the Sufficiency Economy Philosophy in every sector of the society including the public and business sectors, so they have knowledge and understanding of the principle

and can apply it in daily life, and this will benefit themselves, families, communities, societies and the country as a whole.

3. There should be efforts to instill in school and university students the value of applying Sufficiency Economy Philosophy in daily life. The concept may be included in both curricular and extracurricular activities. Students should be encouraged to participate in such activities, so they will remember the principles better through the Learning by Doing process.





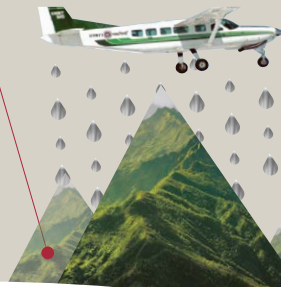


# Conclusion

The King's wisdom and his Development Principles constitute a body of knowledge born out of King Bhumibol Adulyadej's love and concern for all Thai citizens, that focuses on "sufficiency" and lays groundwork on how to achieve "well-being" and sustainability in succeeding stages.

## Forest

Planting love of forest in the people's hearts, natural reforestation and "Three Forests, Four Benefits" principle result in sustainable conservation of forest.



## Royal Rainmaking

Solution to droughts long suffered by farmers and the general public.

## Check Dams

To preserve watershed areas, slow run-offs and prevent floods.

## Social Welfare

Establishment of charity foundations is His Majesty's way to empower the people to attain self-reliance and sustainability.



## Public Health

Better access to medical and public health services, especially for the poor and little educated, regarding self-care.



## Education

Satellite-based long-distance education helps reduce gaps in educational opportunity and quality and opens a channel for self-study.



## Transportation

Construction of new transportation routes in both Bangkok and the rural areas, and campaigns to promote awareness of traffic discipline.



## Philosophy of Sufficiency Economy

A practical guideline on life and conduct for everyone at every level, from the individual to family, community and national levels.





# { The King's Wisdom and His Development Principles }

## Soil

Soil rehabilitation and enrichment  
Promotion of vetiver grass to prevent soil erosion and restore moisture.

## Water Conservation

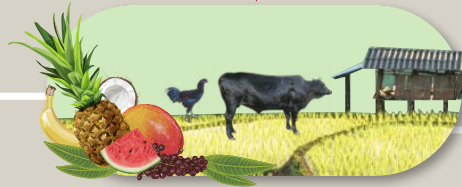
Systematic and holistic water resources management on the theme of "From the Sky onto the Mountains and into the Ocean."

## Agriculture

"New Theory Farming" is a farmland management system for farmers with limited land to maximise resources and attain food security and year-round water supply.

## Occupation Promotion

Cooperatives empower villagers to attain self-reliance and help one another.



## Communication

Use of communication technology to assist the public in times of emergency and for national development.



## Environment and Climate Change

"Nature cures nature" principle and user-friendly methods that anyone can undertake at low cost but yield high efficiency.

## Innovations

The heart of innovation is simplicity, user-friendliness, low cost and use of local resources that are in harmony with the ecology and ways of life.



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## Conclusion

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The King's wisdom and his Development Principles constitute the vast body of knowledge His Majesty King Bhumibol Adulyadej bestowed upon Thai people through numerous royal initiated projects and the Royal Development Study Centres. They cover water, forest, soil, agriculture, occupation promotion, public health, social welfare, education, transportation, communication, environment and climate change, innovation and Sufficiency Economy Philosophy. This knowledge can help improve people's livelihoods in every aspect as well as provide guidelines on national administration and development toward sustainability. It has been gleaned and fine tuned throughout the seven decades of His Majesty's reign. The King's wisdom and his Development Principles are knowledge that transcends time, as they focus on learning and seeking ways to solve problems through human development and to improve the country's sustainable development based on the concept of sufficiency.

In *The Development King: for the Benefit of the People*, Her Royal Highness Princess Maha Chakri Sirindhorn put it succinctly: "...The objective of His Majesty's development approach is to achieve 'sustainable development' to improve people's livelihoods without destroying the environment and to make people happy with due consideration to geographical conditions, religious beliefs, racial groups, economic and social backgrounds. Although there are various development approaches, the most important attributes of a development practitioner are love, caring, responsibility and respect for fellow human beings. It is plain to see that development directly relates to mankind and is a matter of having the right mindset..."

The King's wisdom and his Development Principles are indeed a body of knowledge born out of His Majesty's love and concerns for all Thai people. Throughout his reign, His Majesty King Bhumibol Adulyadej carried out his duty, with principle, perseverance and dedication,

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The King's wisdom and his Development Principles constitute a body of knowledge that has been gleaned and fine tuned throughout the seven decades of His Majesty's reign.

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The King's wisdom and his Development Principles are knowledge that transcends time, as they focus on learning and seeking ways to solve problems through human development and to improve the country's sustainable development based on the concept of sufficiency.

## Conclusion

to seek solutions for his subjects' problems. His Majesty's first priority was to relieve them of their immediate suffering, to enable them to attain "sufficiency," and at the same time to lay groundwork for their "well-being" down the road. The underlying concepts of the King's wisdom and his Development Principles are simplicity, user-friendliness, speediness, practicality, yielding tangible benefits, with sustainability as the ultimate goal.

Water His Majesty believed that "Water is life", a premise that led to his various projects on water resource management. The monarch adhered to holistic principles, seeing the relationship between every aspect. He studied the issue, conducting research on the methodology until he arrived at his solutions systematically. In his water development schemes, His Majesty always considered the geo-social aspects of the area -- the physical geographical terrain of the area, and the humanistic element or culture, traditions and lifestyle of the inhabitants. His Majesty's main goal in water sources development was that the local people could benefit. His principle was also that the local folk would be involved in the project together with the local government, from start to finish in a participatory manner, from brainstorming, execution and direction. He also expected the local villagers to provide mutual support within the community, and have a sense of ownership that would help them take pride in, maintain and preserve the construction.

King Bhumibol Adulyadej offered his insights on water-related problems, particularly water shortages, to an audience of relevant government officials including those from the Royal Irrigation Department whose job is to develop water sources. They went back to study and implement various projects that became royal initiated projects scattered through various regions of the country. Two outstanding projects were the Pasak Jolasid Dam, under royal initiative, that stores water from the Pasak River, and the Khun Dan Prakan Chon Dam, under

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The underlying concepts of the King's wisdom and his Development Principles are simplicity, user-friendliness, speediness, practicality, yielding tangible benefits, with sustainability as the ultimate goal.

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## Conclusion

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royal initiative, that stores water from the Nakhon Nayok River. The schemes received close scrutiny through the whole processes, from project approval to land expropriation and construction until they were completed.

Laws supporting the projects are: State Irrigation Act, B.E. 2485 (1942); Immovable Property Expropriation Act, B.E. 2530 (1987); Announcement of the National Peacekeeping Council No. 44, announced on 24 February B.E. 2534 (1991) on amendments to Immovable Property Expropriation Act; and Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992).

The benefits of the two royal projects have been tremendous. The Pasak Jolasid Dam can store up to 960 million cubic metres of water and thus control the water supply for household consumption, agriculture, irrigation, and industry, while helping to preserve the ecology in the Lower Pasak and Lower Chao Phraya River Basins. It also provides additional water reserves for about 2.2 million rai (352,000 hectares) of a pre-existing irrigation project in the southeastern zone of the Chao Phraya plains. The dam has moreover contributed to relief of floods, droughts, and water pollution, as well as serving as fish habitat. Meanwhile, the Khun Dan Prakan Chon Dam has benefited up to 185,000 rai (29,600 hectares) of farmland. It also provides relief for flooding, drought, soil acidity as well as contributes to preservation of the ecology. Thanks to the dam, which provides a large-scale fish habitat, the local inhabitants have expanded the scope of farming activities. Boasting scenic views, both Pasak Jolasid and Khun Dan Prakan Chon Dams have been turned into destinations for ecotourism as well.

*The Royal Rainmaking Project* is an outcome of fourteen years of research and experiments spearheaded by King Bhumibol Adulyadej. From extensive study of numerous books and

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The King spent fourteen years conducting extensive study and experiments on artificial rainmaking techniques.

## Conclusion

academic research on artificial rainmaking techniques, His Majesty has finally developed a workable technology.

Laws supporting the projects are: Royal Decree on the organisation of the Office of the Permanent Secretary, Ministry of Agriculture and Cooperatives, B.E. 2518 (1975); Royal Decree on the organisation of the Office of the Permanent Secretary, Ministry of Agriculture and Cooperatives, (No. 2), B.E. 2535 (1992); and Reorganisation of Ministry, Sub-Ministry, and Department Act (No.10), B.E. 2556 (2013).

Forest King Bhumibol Adulyadej has imparted his forest conservation principles that focus on cultivation of a sense of love and caring in the people's minds, and the understanding that interdependence between humans and forest is key to sustainable conservation. His Majesty advised there should be cooperation among all agencies in charge of development works in the same areas in order to achieve balance with and sustainability of nature. Among the royal initiatives on forest management and conservation are: natural reforestation practice based on the cycle of forest growth and natural replacement; the principle of growing three types of forests, earning four benefits -- trees that yield fruit, timber for building houses and for use as fuel, and having a forest that protects the soil and water; construction of small-scale check dams that are in harmony with natural conditions and help preserve humidity in their locales; conservation and breeding of some wildlife species on the verge of extinction; and forestry research and reforestation.

The Huai Hong Khrai Royal Development Study Centre serves as a model of sustainable development programme that aims at striking a balance between conservation and development wherein local inhabitants can make use of forest resources while coexisting

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Interdependence between humans and forest is key to sustainable conservation.

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The Huai Hong Khrai Royal Development Study Centre serves as a model of sustainable development programme that aims at striking a balance between conservation and development and sensible use of forest resources.

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harmoniously with nature. In this model, everything is interrelated, on the theme of “beginning with forest, ending in fishery, and along the way are agriculture and other related occupations”. At the Huai Hong Khrai Royal Development Study Centre, several royal initiative programmes on forest conservation have been implemented, namely channelling of water from reservoirs to forest areas (for irrigated areas); construction of check dams along the natural waterways (for the non-irrigated areas) which help maintain humidity. The results of these projects have shown dramatic improvements in restoring the ecology and increasing the biodiversity and abundance of natural resources. The Huai Hong Khrai Royal Development Study Centre has been compared to a living museum, a learning centre that disseminates, to the public, a body of knowledge based on extensive study, research and experiments. Importantly, local communities near the Centre have put what they learned into practice and have been participating in environmental conservation in line with His Majesty’s vision.

Laws supporting the projects are: National Park Act, B.E. 2507 (1964); Act on the Partial Transfer of Authority from the Office of the National Economic and Social Development Board to the Office of the Royal Development Projects Board, B.E. 2536 (1993); Royal Decree on the Organisation of the Office of the Royal Development Projects Board, B.E. 2538 (1995); Ministerial Regulation on the Organisation of the Office of the Royal Development Projects Board, B.E. 2551 (2008); Plant Quarantine Act, B.E. 2507 (1964); Fertilisers Act, B.E. 2518 (1975); Plant Variety Act, B.E. 2518 (1975); Hazardous Substance Act, B.E. 2535 (1992); Plant Variety Protection Act, B.E. 2542 (1999); and Emergency Decree on Fisheries, B.E. 2558 (2015).

Soil King Bhumibol Adulyadej deemed the soil to be as essential an element as water, thus his various initiatives to rehabilitate arid, infertile soil so it can become arable again.

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The results of the royal projects on forest management have shown dramatic improvements in restoring the ecology and increasing the biodiversity and abundance of natural resources.

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The King made various initiatives to rehabilitate arid, infertile soil so it can become arable again.



## Conclusion

His Majesty's initiatives on soil improvement included a variety of techniques depending on the quality of soil in a given area, namely increasing buffers of organic nutrients for sandy soil, moisture and adhesive elements for arid and rocky soil, adding rich top soil on dense, tough and laterite-ridden soil, building 'living walls' for soil under threats of soil erosion, and the 'Klaeng Din' (tricking the soil) method of treating highly acidic soil.

From his in-depth research, the King developed principles for maintenance and rehabilitation of soil quality that revolve around making use of natural cycles to restore "living soil". One outstanding technique was the promotion of vetiver grass as a living wall to prevent soil erosion. The extensively long and vertically penetrating root system of the grass helps make the soil more porous thus reducing its denseness as well as restoring its moisture. The Huai Sai Royal Development Study Centre has been successful in conducting research and experiments on cultivation of different vetiver grass varieties to prevent soil erosion, and preserve the topsoil and moisture. There have been campaigns to promote vetiver grass in areas facing soil erosion nationwide, in addition to establishment of the Vetiver Networks at both domestic and international levels (namely Thailand Vetiver Network and Pacific Rim Vetiver Network, the latter having 22 member countries in the Pacific Region).

Laws supporting the projects are: Land Development Act, B.E. 2551 (2008); and Ministerial Regulation on the Organisation of the Land Development Department, Ministry of Agriculture and Cooperatives, B.E. 2557 (2014).

*Agriculture* In His Majesty's view, Thailand's prosperity primarily relies on the prosperity of the agricultural sector. For successful agricultural development, research is mandatory to find

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The Huai Sai Royal Development Study Centre has been successful in conducting research and experiments on cultivation of different vetiver grass varieties to prevent soil erosion.

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Thailand's prosperity primarily relies on the prosperity of the agricultural sector. For successful agricultural development, research is mandatory to find effective solutions while implementation should be done step by step, but without being too dogmatic about theory.

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## Conclusion

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effective solutions while implementation should be done step by step, but without being too dogmatic about theory.

The Six Royal Development Study Centres, in different parts of the country, conduct field research and experiments that take into account real potential and human suitability in each locale. According to His Majesty's guidelines on agricultural development, there should be study and research on both farm animals and plant varieties, be they cash crops, crops that improve soil fertility, and all kinds of herbs, as well as development of technology, to improve productivity. The technology must be uncomplicated and inexpensive so farmers can apply it easily and can make the best use of what nature has to offer. The King fully realised that the rehabilitation of degraded natural resources directly contributes to agricultural development and productivity as well as improvement of farmers' quality of life. All six Royal Development Study Centres are demonstration sites of integrated development wherein His Majesty's initiatives have been successfully put into practice. They are likened to living museums of nature, open to farmers, students and anyone interested in learning.

King Bhumibol Adulyadej's "New Theory," meanwhile, aims at tackling the problem of drought and water shortage for farming. The theory proposes how to maximise a limited area of farmland to ensure food security as well as year-round water supply. The Monarch used science and mathematics to calculate in minute detail the amount of land and water needed in this land management model. He then shared clear, simple guidelines so everyone can understand and practice it. The New Theory farm management is also based on the principles of self-reliance and community unity, and it benefits the economy, the society and the environment.

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According to His Majesty's guidelines on agricultural development, there should be study and research on new plant varieties, be they cash crops, crops that improve soil fertility, and all kinds of herbs.

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## Conclusion

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*Occupation Promotion* Among King Bhumibol Adulyadej's top concerns were rural development and farmers' occupations. His Majesty believed farmers should not rely solely on cash crops but should have supplementary income both from and outside agriculture. The King thus recommended the "cooperative method" to enable villagers to form groups based on self-reliance and mutual help. These cooperatives encourage collaboration among farmers be it in work done physically, intellectually or with passion, and cultivation of honesty, mutual trust and help. Examples of successful cooperatives are the Hub Kapong Agricultural Cooperative Limited and Nongpho Ratchaburi Dairy Cooperative Limited. His Majesty also initiated the establishment of a cattle bank to collect cows and buffalo to produce quality breeding and to distribute them to farmers. Officially called the "Royal Cattle Bank for Farmers," its mandates are to

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Farmers should not rely solely on cash crops but should have supplementary income both from and outside agriculture.

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The "cooperative method" enables villagers to form groups based on self-reliance and mutual help, and promotes cultivation of honesty.



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control, look after, distribute and loan the cows and buffalo for agricultural uses, with the aim of increasing the animals' number through banking principles. Since its establishment, the bank has helped poor farmers across the country to have buffalo and cows to plough their lands in order to increase yields and their income.

Laws supporting the projects are: Cooperatives Act, B.E. 2542 (1999); Civil and Commercial Code; Ministerial Regulation on the Organisation of the Cooperative Promotion Department, B.E. 2557 (2014); Allotment of Land for Living Act, B.E. 2511 (1968) and its amendments; Regulation of the Cooperative Promotion Department on Land Allotment in Royal Initiated Hub Kapong Cooperative Village, B.E. 2524 (1981); Dairy Cow and Dairy Product Act, B.E. 2551 (2008); Animal Epidemics Act, B.E. 2558 (2015); Animal Breeding Development Act, B.E. 2509 (1966); Cruelty Prevention and Welfare of Animals Act, B.E. 2557 (2014); and Regulations of the Department of Livestock Development on the operation of the Royal Cattle-Buffalo Bank for Farmers, B.E. 2556 (2013).

*Public Health* King Bhumibol Adulyadej deemed the development of people's well-being and good health crucial for national development. In other words, the country's economic and social development is tied to the health of individual citizens. His Majesty's initiatives in public health came from witnessing chronic health problems and understanding the needs of the people, which led him to recommend development of a proactive medical service model.

Each of the royal initiated projects caters to different beneficiaries, namely the Royal Mobile Medical Unit for villagers in remote areas with difficult access to public health service; the Village Paramedics Training Project that recruits and trains volunteers in remote communities

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The Royal Mobile Medical Unit has been expanding its work continuously, attracting a growing number of volunteer doctors from hospitals in Bangkok and other provinces.

## Conclusion

in first aid; the Mobile Floating Clinic (The Vejapha Boat) for people living along the waterways with no access to roads, the Royal Traffic Police Training Project to assist emergency patients obstructed by traffic on their way to the hospital, and the Rajpracha Samasai Institute to treat leprosy patients and conduct research on leprosy, a contagious disease difficult to cure and ridden with social stigma. All of these programmes have proven successful. The Royal Mobile Medical Unit has been expanding its work, attracting a growing number of volunteer doctors from hospitals in Bangkok and other provinces. There are more Village Paramedics ready to provide basic medical treatment, while injured people and pregnant women are assured of timely medical care. The number of people stricken by leprosy, once a major health menace, has dropped dramatically.

Laws supporting the projects are: Drugs Act, B.E. 2510 (1967); Communicable Diseases Act, B.E. 2523 (1980); Public Health Act, B.E. 2535 (1992); Medical Facilities Act, B.E. 2541 (1998); National Health Security Act, B.E. 2545 (2002); and National Health Act, B.E. 2550 (2007).

*Social Welfare* During natural disasters, accidents, or outbreaks of contagious diseases, King Bhumibol Adulyadej always responded quickly to help the affected people. His Majesty's social welfare projects cover both immediate and long-term assistances based on the principle "Help the people to help themselves". Thus the short-term relief must be prompt, right after the incident takes place, followed by long-term assistance by ensuring the victims continue to be taken care of, including to have an education so they can work decently and efficiently as good citizens of the country. After a typhoon hit at Laem Talumphuk Cape, the King not only donated his personal money to fund the emergency relief missions but also used the Aw Saw Radio Station at Dusit Palace to raise funds from the general public to help the victims.

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His Majesty laid important groundwork for disaster relief and expanded its scope by upholding the principles of collective good and social engagement for public well-being.

## Conclusion

His Majesty laid important groundwork for disaster relief and expanded its scope by upholding the principles of collective good and social engagement for public well-being.

In setting up the Rajprachanugroh Foundation under Royal Patronage, King Bhumibol Adulyadej followed a tactful strategy of encouraging Thai people to be helpful, generous and not abandon one another in times of hardship. The foundation's name "Rajprachanugroh" means mutual assistance between the King and his people. The foundation is therefore a form of sustainable assistance imparted by His Majesty, as it empowers people to become self-reliant. Since its establishment, the Rajprachanugroh Foundation has been successful in providing assistance to affected people across the country and in instilling a sense of public participation.

Laws supporting the projects are: Constitution of the Kingdom of Thailand, B.E. 2550 (2007); Civil and Commercial Code; National Education Act, B.E. 2542 (1999); Act on Compensation for Persons Affected resulting from State and National Missions or from Humanitarian Act, B.E. 2543 (2000); Compulsory Education Act, B.E. 2545 (2002); Social Welfare Promotion Act, B.E. 2546 (2003); Public Disaster Prevention and Mitigation Act, B.E. 2550 (2007); National Child and Youth Development Promotion Act, B.E. 2550 (2007); Ministerial Regulation on Registration, Operation and Foundations Registry B.E. 2545 (2002); Orders of the Ministry of Finance on Fund Advances for Disaster Relief and Emergency Assistance B.E. 2556 (2013) and its amendments; and Regulation of the Rajprachanugroh Foundation under Royal Patronage.

**Education** King Bhumibol Adulyadej valued education as an important tool to develop human resources and the country, thus his support of all forms of education, be they formal or non-formal education, special education for children with special needs, welfare education

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for disadvantaged children, and academic research and development in various disciplines. Throughout the years, His Majesty provided scholarships for students across the country. Distance education via satellite is one form of education which the King viewed as a solution to overcome the lack of access to education, and inadequacy of teachers and teaching equipment in the rural backwater areas. In line with the Sufficiency Economy Philosophy and the principle of lifelong learning, satellite-based distance education creates standard quality of teaching, reduces education disparity, and gives an opportunity for students to learn and research by themselves. According to His Majesty's guidelines, the contents of this platform of education should be easy to teach, easy to understand, and easy to take notes. Also, the technology must be user-friendly, inexpensive and effective.

King Bhumibol Adulyadej graciously gave permission to set up a television station for distance education via satellite at the Wang Klai Kangwon School. As the broadcasting centre, the TV station sends satellite signals to all member schools, now numbering over 24,000 across the country. His Majesty also initiated a distance learning TV programme called "Suksatas" (or "Quest for Knowledge"), a documentary series featuring local wisdom in science, geography, history, culture, tourist attractions and arts. In some episodes, the King himself acted as a teacher, leading the Wang Klai Kangwon School students and teachers on field study trips. Examples of these episodes are "Khao Tao Reservoir Project," "Royal Rain," "Water Management," and "Laem Phak Bia Environmental Research and Development Project." His Majesty was the world's only monarch who did this kind of teaching, integrating knowledge from different disciplines in a holistic, thought-provoking manner spiced with royal humour as well as graphics, drawings and photographs he took himself as teaching tools.

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His Majesty integrated knowledge from different disciplines in a holistic, thought-provoking manner spiced with royal humour as well as graphics, drawings and photographs he took himself as teaching tools. He was the world's only monarch who did this kind of teaching.

## Conclusion

Laws supporting the projects are: Constitution of the Kingdom of Thailand, B.E. 2550 (2007); Civil and Commercial Code; Institute for the Promotion of Teaching Science and Technology Act, B.E. 2541 (1998) and its amendments; Compulsory Education Act, B.E. 2545 (2002); Teachers and Educational Personnel Council Act, B.E. 2546 (2003); Ministry of Education Regulatory Act, B.E. 2546 (2003); Child and Youth Development Promotion Act, B.E. 2550 (2007); Vocational Education Act, B.E. 2551 (2008); Promotion of Non-Formal and Informal Education Act, B.E. 2551 (2008); National Science, Technology and Innovation Act, B.E. 2551 (2008); Broadcasting and Television Businesses Act, B.E. 2551 (2008); National Education Act, B.E. 2542 (1999) as amended by the National Education Act (No. 3), B.E. 2553 (2010); Organisation to Assign Frequency Waves and to Regulate the Radio Broadcasting, Radio Television and Telecommunications Services Act, B.E. 2553 (2010); Ministerial Regulation on Registration, Operation and Foundation Registry, B.E. 2545 (2002); and Regulation of Distance Learning Foundation.

*Transportation* Most royal initiated projects on transportation involved the construction of new rural roads in remote and rugged areas to serve villagers who did not have access to roads. As for traffic in the Bangkok Metropolis and its perimeter. King Bhumibol Adulyadej's royal guidelines to tackle traffic problems included the need to solve immediate problems urgently, tackle traffic problems with road networks, and create sustainable solutions by fostering public awareness. To address traffic congestion when crossing the Chao Phraya River, the King initiated construction of the Rama VIII Bridge as a component in the East-West Chaturathit Network. The world's longest asymmetric three fan cable-stayed bridge, the Rama VIII Bridge integrates the state-of-the-art structural engineering with the aesthetics of

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Thai-styled architecture and fine art as well as the surrounding landscape of Bangkok. Importantly, it helps relieve traffic congestion in the inner city area as well as of the outbound flows. Another royal initiative is the Borommaratchachonnani Parallel Elevated Roads Project that speeds up traffic between the Pinklao Bridge and the Taling Chan Intersection thanks to no traffic light on the elevated road.

Laws supporting the projects are: Highway Act, B.E. 2535 (1992) and its amendments; Immovable Property Expropriation Act, B.E. 2530 (1987); Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992); Regulation of the Office of the Prime Minister on Procurement, B.E. 2535 (1992) and its amendments; Bangkok Metropolitan Administration Act, B.E. 2528 (1985); Royal Decree on Demarcation of Areas for Expropriation to build a Municipal Highway Linking Wisut Kasat Road and Arun Amarin Road, B.E. 2541 (1998); Notification of the Office of the Prime Minister on Immovable Property Expropriation to build a Municipality Highway Linking Wisut Kasat Road and Arun Amarin Road in case of urgent need; Bangkok Metropolitan Administration ordinance on Prohibited Zones for construction, modification, use or change of uses of certain buildings or types of buildings around the Rama VIII Bridge in Bang Yi Khan Sub-district of Bang Phlat, and the Sub-districts of Arun Amarin, Siriraj, and Ban Chang Lo in Bangkok Noi District of Bangkok, B.E. 2547 (2004); and Ministerial Regulation on the Organisation of the Department of Highways, Ministry of Transportation, B.E. 2558 (2015).

*Communication* King Bhumibol Adulyadej's interest in communication technologies covered a wide range, from radio broadcasting stations to ham radios, portable telephones or walkie-talkies, computers, long-distance satellite transmission, and wireless internet networks. For every type

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The King initiated construction of the Rama VIII Bridge as a component in the East-West Chaturathit Network and the Borommaratchachonnani Parallel Elevated Roads Project that speeds up traffic.

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For every type of communication, His Majesty studied and experimented until he developed expertise with the equipment. Under his auspices, the Aw Saw radio broadcasting station was founded.

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of communication, His Majesty studied and experimented until he developed expertise with the equipment. Under his auspices, the Aw Saw radio broadcasting station was founded as a media channel to foster understanding and education for the people, for public relations and campaigns in relief work, and for the people to have closer access to His Majesty. Every year, the King bestowed on his subjects a series of computerized new year greeting cards, which he designed himself. Considering the growing significance and reliance on the internet in modern communication, a royal project was launched to install wireless internet networks at the six Royal Development Study Centres. Implementation of high-speed wireless internet has improved the speed and efficiency of information sharing and dissemination services for the general public, thus adding value and appeal to the six Centres as hubs of modern learning.

Laws supporting the projects are: Broadcasting and Television Business Act, B.E. 2551 (2008); Telecommunication Business Act, B.E. 2544 (2001); and Organization to Assign Frequency Waves and to Regulate the Radio Broadcasting, Radio Television and Telecommunications Service Act, B.E. 2553 (2010).

*Environment and Climate Change* King Bhumibol Adulyadej displayed his interest and far-sightedness on environmental issues long before climate change became a global concern. His Majesty's initiatives and guidelines covered a wide range of subjects, including forest conservation and reforestation of natural as well as commercial forests, development of water supplies (from small-scale to medium-sized and large-scale projects), prevention and treatment of wastewater, waste management and applicability of its by-products, promotion of alternative energy and biomass fuel, solutions to traffic problems, promotion of sustainable

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A royal project was launched to install wireless internet networks at the six Royal Development Study Centres.

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King Bhumibol Adulyadej displayed his interest and far-sightedness on environmental issues long before climate change became a global concern.



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careers, to name a few. The King's principles on environmental management are based on systematic and integrated research and experiments that integrate the understanding of natural processes, physics and chemistry. By advocating a simple "nature cures nature" approach, His Majesty proposed development of tools and technology that people can be put to use easily, inexpensive but efficient, and addressing concerns of specific locales. Examples include various techniques of wastewater treatment ("good water chases bad water"; using water hyacinths, and a combination of aquatic plants and aeration that culminated in the Chaipattana Aerator) and treatment of solid waste by turning it into fertiliser.

The royal initiated Laem Phak Bia Environmental Research and Development Project is a model of successful environmental conservation based on the "nature cures nature" principle. After ten years of the project, the once degraded mangrove forest, water pollution and overflowing household waste have been transformed. The area now witnesses flourishing mangrove biodiversity with increasing numbers and species of birds, fish and other marine life, contributing to better job prospects, improved quality of living, and growth of local economy. The community is one of the key destinations for ecotourism. Last but not least, the substantial body of knowledge from years of research and experiments has been shared with and replicated by other communities in and out of the country.

Laws supporting the projects are: Factory Act, B.E. 2535 (1992); Hazardous Substance Act, B.E. 2535 (1992); Public Health Act, B.E. 2535 (1992) and its amendments; Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992); Regulation of the Office of the Prime Minister on Streamlining Solid Waste Administration, B.E. 2557 (2014);

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The King's principles on environmental management are based on understanding of natural processes, physics and chemistry. By advocating a simple "nature cures nature" approach, His Majesty proposed development of tools and technology that people can be put to use easily, inexpensive but efficient, and addressing concerns of specific locales.

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The Laem Phak Bia Environmental Research and Development Project is a model of environmental conservation based on the "nature cures nature" principle, that successfully transformed the once degraded mangrove forest, water pollution and overflowing household waste.

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Royal Decree on Establishment of Wastewater Management Authority, B.E. 2538 (1995), and amendments in 1997, 2005 and 2015; Act on Promotion of Marine and Coastal Resources Management, B.E. 2558 (2015); Regulations of the Office of the Prime Minister on Climate Change Administration, B.E. 2550 (2007); and Royal Decree on Establishment of Thailand Greenhouse Gas Management Organization (Public Organization), B.E. 2550 (2007).

*Innovation* When King Bhumibol Adulyadej embarked on the task of inventing something to solve a problem of his people, he combined principles, theory, and practice, making good use of both Western science and Oriental wisdom as well as technology based on local ways of life, without being too dogmatic. For His Majesty, the heart of innovation is simplicity, user-friendliness and low cost. He advocated adapting local materials to fit with the ecology and local ways of life, so that anyone could learn and also adapt to their locale, thus achieving self-reliance and sustainability. Known as the Father of Thai Innovation, the King made numerous contributions in the area of innovation, in particular the Chaipattana Aerator and the “Klaeng Din” (tricking soil) theory.

Aware of the severity of water pollution in big cities, King Bhumibol Adulyadej proposed building a low-cost aerator, for which he borrowed an idea from a traditional Thai farming tool called, “Luk,” used by farmers to scoop water into paddy fields. A paddle-wheel machine attached to a floating buoy, the Chaipattana Aerator adds oxygen to the wastewater through rotation of water spraying buckets scooping up water, exposing it to air, and then releasing it, in the process creating air bubbles which carry oxygen below the water surface. The aerator has been found to improve the quality of polluted water from household use as well as from industrial and agricultural sources.

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For His Majesty, the heart of innovation is simplicity, user-friendliness and low cost. He advocated adapting local materials to fit with the ecology and local ways of life.

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The King proposed building a low-cost aerator, for which he borrowed an idea from a traditional Thai farming tool called, “Luk,” used by farmers to scoop water into paddy fields.

## Conclusion

Many areas in southern Thailand have long suffered from acidic soil, making it unsuitable for farming. King Bhumibol Adulyadej thus proposed an idea, called “Klaeng Din” (tricking the soil), to alternately dry out and wet the land to accelerate the soil’s chemical reactions and raise the acidity to the maximum, followed by various techniques to de-acidify the soil such as controlling the groundwater level to prevent the release of sulphuric acid, applying lime materials, washing away acidity with water and growing a selection of crops. The once acidic soil has been put to maximum use again.

Laws supporting the projects are: Patent Act, B.E. 2522 (1979); Enhancement and Conservation of the National Environmental Quality Act, B.E. 2535 (1992); and Land Development Act, B.E. 2551 (2008).

*Sufficiency Economy Philosophy* King Bhumibol Adulyadej’s key concept, “Sufficiency Economy” is both a philosophy and a guideline for conduct and for development that embraces Thai culture and the Buddhist teaching of the Middle Way and heedfulness. It comprises three key components, namely moderation, reasonableness, and built-in resilience. It advocates how one must combine knowledge and ethics as the foundation of life and stresses human development. In His Majesty’s view, the first priority is the sufficiency of the people and when the foundation is firm and secure, we can turn to working on economic expansion and further development. The King compared Sufficiency Economy to the foundation of life and of national stability; it is like the foundation pillars of a house that keep the building secure.

Application of Sufficiency Economy can be done at every level, from individual to family, from community to the whole nation. It prescribes how to approach national development and

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## Conclusion

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administration, in particular to balance economic development in the age of globalization. The concept can be applied to every sector of the economy, be it agriculture, industry, rural sector, financial and fiscal sector, real estate, trade and foreign investment and education. The government has incorporated Sufficiency Economy Philosophy in national development plans, starting from the Eighth National Economic and Development Plan (1997 - 2001) to the Ninth National Economic and Development Plan (2002 - 2006), the Tenth National Economic and Development Plan (2007 - 2011), the Eleventh National Economic and Development Plan (2012 - 2016), the Twelfth National Economic and Development Plan (2017 - 2021) and the Twenty-Year National Strategy (2017 - 2036). All the plans share in common an emphasis on human development, balanced social, economic and environmental aspects, peaceful co-existence in society and sustainable harmony between humans and the environment, building resilience and proper risk management in order to steer the country toward balance and sustainability, elevating the status of Thailand from the middle-income group of countries to the high-income group while ensuring there is an appropriate balance in income distribution, healthy ecology, and peaceful co-existence in the society, so the country can realise its long-term vision of “stability, prosperity, sustainability.”

The Tenth United Nations Conference on Trade and Development (UNCTAD) in 2000 issued an official statement to show appreciation for King Bhumibol Adulyadej’s Sufficiency Economy Philosophy as a viable development concept in the age of globalization. During the Asean Inter-Parliamentary Assembly in 2001, the Sufficiency Economy Philosophy received consensus as a viable alternative path of development by the member countries. Subsequently, the United Nations Development Program (UNDP) released the Thailand Human Development

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This path of development aims at elevating the status of Thailand from the middle-income group of countries to the high-income group while ensuring there is an appropriate balance in income distribution, healthy ecology, and peaceful co-existence in the society, so the country can realise its long-term vision of “stability, prosperity, sustainability.”

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During the Asean Inter-Parliamentary Assembly in 2001, the Sufficiency Economy Philosophy received consensus as a viable alternative path of development by the member countries.



## Conclusion

Report 2007, that proposed an approach to national development and human development as well as recommendations on public policies based on Sufficiency Economy Philosophy, which was distributed to 166 countries around the world. In 2015, the United Nations also adopted the “Sustainable Development Goals” (SDGs) as their agenda, which Thailand has fully supported by setting up the Committee on Sustainable Development based on Sufficiency Economy Philosophy. A number of countries have expressed interest to implement the concept in accordance with their geo-social conditions and have sent delegations from various levels, from cabinet ministers to policy and operating officers, to come to learn about His Majesty’s innovative approach to development.

Laws supporting the projects are: Constitution of the Kingdom of Thailand, B.E. 2550 (2007); Constitution of the Kingdom of Thailand, B.E. 2560 (2017); and Law on Annual Appropriations.

Moreover, the Sufficiency Economy Philosophy serves as an important stepping stone enabling the country to achieve the goals projected by the current government’s Thailand 4.0 model of development. The Sufficiency Economy Philosophy prescribes knowing one’s potential, choosing appropriate direction and form of development, developing inner strength, built-in resilience and risk management guided by knowledge and morality, and promoting innovations such as those pioneered by King Bhumibol Adulyadej. Such approach is used as a guidance for the Thailand 4.0 model, which promotes the use of innovation and technology in reforming the economic structure in which the agricultural sector remains at the core. Under the new scheme, the strength of grassroots economic fundamentals will gradually lead to empowerment of local communities, and then of the whole nation, which through linkages between the

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A number of countries have expressed interest to implement the Sufficiency Economy concept in accordance with their geo-social conditions and have sent delegations to come to learn about various development programmes.

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## Conclusion

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national, regional and global economies, will enable Thailand to achieve stability, prosperity and sustainability.

In retrospect, the numerous royal initiatives by King Bhumibol Adulyadej have empowered Thai people to attain sufficiency and well-being, and thus contributed to sustainable human and national development. Appreciation for His Majesty's boundless compassion, intellect and dedication spread beyond the Thai frontiers to international circles as well. On 26 May 2006, the then United Nations Secretary-General Kofi Annan presented the King with the "Human Development Lifetime Achievement Award", praising His Majesty's "Sufficiency Economy Philosophy" as being of great relevance to communities everywhere during these times of rapid globalization and that the philosophy reinforces the United Nations' own advocacy of a people-centred and sustainable path towards human development.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) issued a eulogy praising King Bhumibol Adulyadej as one of the world's great monarchs for the twenty-first century. Throughout his reign, His Majesty has shown lifelong dedication and commitment to perform his duties, to bring about social equality, to foster unity of the Thai people, and to guide Thailand on a sustainable path of development based on the Sufficiency Economy Philosophy. UNESCO also commended the Sufficiency Economy Philosophy as a major pillar in sustainable development, in resonance with the organization's values and mission.

On 28 October 2016, the United Nations General Assembly (UNGA) convened a special session to express its condolence and eulogy to His Majesty King Bhumibol Adulyadej as

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The then United Nations Secretary-General Kofi Annan presented the "Human Development Lifetime Achievement Award" to His Majesty King Bhumibol Adulyadej.

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## Conclusion

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“the Great King.” The President of the UNGA, representatives from countries in Eastern and Western Europe, Latin America and the Caribbean, Africa, Asia-Pacific, and Permanent Ambassador for the United States took turns paying tribute to His Majesty. It is difficult to list all the important contributions the King bestowed on his people throughout his life. His Majesty will be remembered as the People’s King, one who dedicated his energy and intellect to serve the people, to bring them well-being and progress. For several decades, he tirelessly visited farmlands across the country, learning about troubles of local communities, and pioneering in the launching of numerous projects to improve agriculture and bring sustainability to the poorest areas. He displayed prowess in music, art, painting, composition and photography. The works he left behind are true historical legacies. The King fulfilled his Coronation promise of “reign[ing] with righteousness for the benefit and happiness of the Siamese people” through his development work and royal guidelines that benefit both Thailand and the world. A genuine leader, he was an inspiration for people in and outside the country. He was a monarch with vision and creativity, having up to forty patents under his name for inventions which primarily aimed to solve problems for his subjects. A great statesman, he guided the country with dignity, dedication and far-sightedness. His life was one of true giving, doing good deeds every day without seeking reputation or returns. He viewed every Thai as part of his family, thus what he did was for the family. Thai people have been so fortunate to have His Majesty King Bhumibol Adulyadej as the head of the family, a father who always cared for every member with boundless love and devotion.

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The King tirelessly undertook development work and bestowed royal guidelines that benefit both Thailand and the world.

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A great statesman, he guided the country with dignity, dedication and far-sightedness. His life was one of true giving, doing good deeds every day.







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## Categories of laws covered in this book

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### 1. Constitution of the Kingdom of Thailand

The legal system in Thailand categorises laws into seven levels in order of hierarchy of laws as follows:

As the country's supreme law, the Constitution establishes the form of national governance and administration as well as the rights and duties of the citizens. It prevails over all other laws. Any laws found to be contrary to or inconsistent with the Constitution will be invalid. All other laws must follow the principles and policies in the Constitution.

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### 2. Acts and Codes

Acts and Codes are enacted through legislative process as designated in the Constitution by the National Assembly and given royal assent before their promulgation. As the National Assembly represents the people, the Acts and Codes are thus deemed to be laws being approved by the people as the source of national sovereignty. The Acts and Codes are therefore laws enacted by the king with the advice and consent of the National Assembly, second in importance to the Constitution. The majority of laws in the country are typically issued in the form of "Acts" with some laws consisting of multiple chapters of a given subject matter issued as "Codes," such as Criminal Code, Land Code, and Revenue Code, to name a few. For each Code to come into effect, however, requires promulgation of an Act in support of the particular Code.

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### 3. Emergency Decrees

The status of Emergency Decree is equivalent to an Act. As stipulated in the Constitution, the king may issue an Emergency Decree in accordance with advice by the Council of Ministers for special purposes, such as to maintain national safety and security or to protect national interests that require urgent undertaking and thus cannot wait for the legislative branch to pass the law through the normal procedure. It must be presented to the National Assembly for approval without delay (two or three days depending on what is designated in the Constitution). If the Emergency Decree is approved, it shall remain in force.

## Categories of laws covered in this book

### 4. Announcements of the Revolutionary Council

If the National Assembly disapproves, the Emergency Decree will lapse, without affecting any act done during the enforcement of such Emergency Decree.

Announcements of the Revolutionary Council are generally orders given by those with state Sovereignty, following their successful coup d'état, the undertakers will assume power and can issue laws that have a binding effect on the people. However, such laws are not called "Acts", but "Announcements" followed by the name of the group, such as Announcements by the Revolutionary Council, by the Reform Council, by the National Council for Peace and Order, and so on. Regardless of the names, these Announcements have binding effect on the people. (According to the Supreme Court's ruling No.1662/B.E. 2505 [1962], "the Supreme Court rules that the head of the Revolutionary Council who successfully seized power in 1958 has the power to govern the country, and any order issued by the head of the Revolutionary Council is thus equivalent to a law.")

### 5. Royal Decrees

A Royal Decree is a law enacted by the king with advice of the Council of Ministers. The executive branch may exercise power to issue a Royal Decree by the virtue of law and the king has the Royal Prerogative to issue a Royal Decree which is not contrary to the law. A Royal Decree is usually ranked lower than an Act, an Emergency Decree and a Royal Command, so it cannot contradict other laws of higher ranks.

A Royal Decree specifies details of a particular Act or Emergency Decree, thus enabling the National Assembly to deliberate only on the principles and agenda in the Act or Emergency Decree and allowing the executive branch to draw up and/or amend the details in such-and-such Royal Decree as appropriate. However, there are some Royal Decrees that are issued under the power of the

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## Categories of laws covered in this book

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### 6. Rules and Ministerial Regulations

Constitution, such as the Royal Decrees to open or close the sittings at the National Assembly, or a Royal Decree to dissolve it, which are considered of higher rank than the Royal Decrees issued by virtue of an Act.

A Ministerial Regulation is a law issued by a minister in charge of the execution of an act or emergency decree, to be implemented according to each primary law. Typically, the primary law shall empower the minister to issue Regulations in each case.

Like Royal Decrees, The Ministerial Regulations are issued by the executive branch, but considered secondary in importance and thus cannot contradict or be inconsistent with primary law and any higher laws. Besides stipulating operational regulations, they may concern rules, by-laws or announcements aimed at facilitating administration.

Rules are secondary laws usually issued when the executive branch needs to specify certain details in coordinating logistics among different agencies that are neither frameworks nor policies. In general, an Act as the primary law shall specify what Rules will be issued.

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### 7. Municipal Ordinances, Provincial Ordinances, Sanitation District By-laws

Municipal Ordinances, Provincial Ordinances, and Sanitation District By-laws are laws issued in accordance with the Municipality Act B.E. 2496 (1953), the Provincial Administrative Organization Act, B.E. 2498 (1955), and the Sanitary District Act, B.E. 2495 (1952), respectively. Under these laws, local administrative units come into existence, namely municipalities, provincial administrative organizations, and sanitation districts, each of which has authority to issue ordinances/by-laws in its respective jurisdiction, but these ordinances/by-laws must not be contrary to or inconsistent with all the higher laws which can be applicable throughout the country.





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- ฝนหลวงและการบินเกษตร, กรม. ดั่ง...น้ำพระราชหฤทัย. ๕๘ ปี ฝนหลวงเพื่อปวงชน. กรุงเทพมหานคร. (ม.ป.ท.), ๒๕๕๖.
- พงศ์ปิยะ ปิยสิรานนท์. ด้วยพระบารมี พื้นฟูปรุฟไทย. กรมพัฒนาที่ดิน กระทรวงเกษตรและสหกรณ์. กรุงเทพมหานคร. (ม.ป.ท., ม.ป.ป.), ๒๕๕๐.
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- รายงานประจำปีศูนย์ศึกษาการพัฒนาอ่าวคุ้งกระเบนอันเนื่องมาจากพระราชดำริ. (ม.ป.ท.), ๒๕๕๗.
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- วิชาการเกษตร, กรม. พรบ.กักพืช พรบ.ควบคุมยาง พรบ.ปุ๋ย พรบ.พันธุ์พืช พรบ.คุ้มครองพันธุ์พืช. กรุงเทพมหานคร : กรมวิชาการเกษตร, ๒๕๕๙.
- วิชาการเกษตร, กรม. พระบาทสมเด็จพระเจ้าอยู่หัวกับการพัฒนาการกสิกรรม. กรุงเทพมหานคร : หจก.มีเดียเพลส, ๒๕๓๙.
- วิชาการเกษตร, กรม. ๘๔ พรรษา กษัตริย์เกษตร. กรุงเทพมหานคร : พันธุ์ปาลิขชี, ๒๕๕๔.



อุษณีย์ เกษมสันต์. เชื้อนปลากัดชลสิทธิ์ โครงการพัฒนาลุ่มน้ำป่าสักอันเนื่องมาจากพระราชดำริ. พิมพ์ครั้งที่ ๑.  
กรุงเทพมหานคร : บริษัท โอ.เอส.พรินติ้ง เฮ้าส์ จำกัด, ๒๕๕๒.

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