Thailand Policies Related to the Kyoto Protocol CDM sink and source projects

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This paper is an overview of a research paper on the topic conducted by documentation review, in-depth interview, participatory observation, focus group and case studies. Thailand can respond to the Kyoto Protocol by implementing CDM sink projects (carbon sequestration & absorption by photosynthesis of trees in the forest) and source projects (GHG mitigation from energy emission reduction). This paper is divided into 3 parts:

1. The causes of global warming that has brought about an international cooperation and negotiations on how to combat climate change. It is important to understand how the Kyoto Protocol came about from its background.

2. The importance of the Kyoto Protocol to Thailand. If Thailand wishes to respond to the Kyoto Protocol then are Thailand's existing policies appropriate to allow CDM projects or either for "sink" or "source".

3. Some case studies of proposed Energy Projects and Forestry Projects as potential CDM qualifying projects to examine the possibility of carrying them out and what barriers to implemention of these projects exist.

The product of doing CDM projects are Certified Emission Redvetions "CERs" to sell to investors (Developed Countries / Annex I countries) and sustainable development projects for hosts (Developing countries / Non-Annex I countries, like Thailand).

1. The Causes of Global Warming and A Brief History of the Climate Change International Negotiation Process

Global Warming[1] is the result of sunlight hitting the earth. Some energy is reflected and some is absorbed by Greenhouse Gases

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[1] Scott J. Callan and Janet M. Thomas (2000) *Environmental Economics and Management: Theory, Policy, and Applications*. 2nd edition, The Dryden Press: A Division of Hartcourt College Publishers, Orlando, Florida, p. 382.

(GHGs)[2] in the atmosphere which further warms the earth. The balance between the proportion of sunlight captured by these GHGs and that which radiates out into space results in a cooling or warming of the planet. Currently it appears that more energy is being trapped by the GHGs, as they are increasing in the atmosphere, resulting in a hotter planet.

The United Nations Conference on Trade and Development (UNCTAD)[3], started the process of international negotiations regarding the state of the world environment. The United Nations Conference on the Human Environment, held at Stockholm Sweden in 1972, marked many firsts with respect to environmental issues, including the first appearance of human induced climate change as a pressing issue on the environmental policy agenda at the international level. The first official calls for reductions in greenhouse gas emissions were made at the Toronto Conference on the Changing Atmosphere in 1988. The year 1988 marked another significant development, in that the Intergovernmental Panel on Climate Change (IPCC) was first established by the United Nations Environmental Program and the World Meteorological Organization. The IPCC, which consists of hundreds of the world's leading scientists, is mandated to assess the state of existing knowledge about the climate system and climate change, the environmental and socioeconomic impacts of climate change and the various options for limiting greenhouse emissions and otherwise mitigating climate change. The IPCC expresses its findings through regular reports. After engaging in a rigorous survey of the world's collective scientific literature of relevance, the IPCC's First Assessment Report was published in August of 1990. The IPCC report provided a considerable stimulus

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[2] Ibid., "Gases collectively responsible for the absorption process that naturally warms the earth."

[3] The Earth Council and Global Change Strategies International Inc., Untied Nations Conference on Trade and Development "Greenhouse Gas Emission Trading Manual", August 2001.

to the existing debate, which quickly evolved into formal negotiations toward an international agreement on climate change.

1.1 United Nations Framework Convention on Climate Change

The ongoing negotiations reached a milestone at the United Nations Conference on Environment and Development held in Rio (1992), where the United Nations Framework Convention on Climate Change (UNFCCC) was signed by 154 countries and the European Union (EU). The ultimate objective of the convention is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." Article 2 out of 26 Articles of the Convention further states that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." The Convention also states the importance of meeting the specific needs and special circumstances of the developing country Parties, particularly those especially vulnerable to the adverse effects of climate change. With respect to trade and competitiveness considerations, the Convention's principles state that measures to address climate change should not "constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade." In many respects the United Nations Framework Convention on Climate Change is an incomplete, but for forward looking document. While no binding reduction limits or specified means of reaching them were agreed upon at Rio, the convention established a series of operational bodies to "make the decisions necessary to promote the effective implementation of the convention." Chief among these bodies is the Conference of Parties (COP). The COP, which is comprised of representatives from each country that has ratified the United Nations Framework Convention on

Climate Change, serves as the supreme body of the Convention. The rounds of COP negotiations that have followed the creation of the United Nations Framework Convention on Climate Change have resulted in the evolution of the Convention, from a collection of agreed upon principles and general expressions of national commitments, into a more specific and substantive agreement.

From the year 1995-2003 there have been the First Conference of Parties (COP-1) through the Ninth Conference of Parties (COP-9). The Berlin Mandate (COP-1) was held in Berlin in 1995. The Second Assessment Report concluded that things had deteriorated since the First Assessment Report so that "the balance of evidence, from changes in global mean surface air temperature and from changes in geographical, seasonal and vertical patterns of atmospheric temperature suggest a discernible human influence on global climate." These findings, coupled with the emerging realization that the emission levels that they had committed themselves to achieve by 2000, served to galvanize the policy process. Participants at the first COP concluded that the existing stabilization commitment was inadequate to meet the objective of the convention. They also agreed to initiate the negotiation of new commitments for the post 2000 period, which would involve a strengthening of the emission reduction targets by developed countries through the adoption of a protocol or other legal instrument. This agreement to negotiate a new legally binding protocol became known as the Berlin Mandate. The Second Conference of Parties was held in Geneva in July of 1996. The COP-2 produced some important political statements. The most significant of these became known as the Geneva Declaration. The Geneva Declaration endorsed the IPCC's findings and called for accelerated negotiations on the text of a legally binding protocol. The Third Conference of Parties (COP-3) the Kyoto Protocol was held in Kyoto, Japan, in 1997, where a legally binding protocol was to be negotiated. With greenhouse gas emission levels growing in almost all the organization for Economic Cooperation and Develop-

ment (OECD)[4] countries previous points of political tension, both within and between nations, were intensified. Countries came into the meetings with widely divergent goals and bargaining positions. Austria, for example was looking for a 20% allowed increase in emissions, while the Alliance of Small Island States (AOSIS) planned to negotiate for 20% reductions. Bill Clinton's call for "meaningful participation" by developing countries in a speech just prior to the Kyoto round of negotiations contributed to an air of impending conflict, as *the group of 77 and China* remained adamant about refusing to agree to anything that was tantamount to new commitment for their member nations. From the beginning it was apparent that reaching an agreement on a protocol would be difficult. A successful resolution to the negotiations was in doubt until the very end of the conference. The negotiation between the representatives of the 160 nations participating culminated in a 48-hour non-stop bargaining session that led to the final agreement. The result is what has become known as the Kyoto Protocol.

1.2 Understandings of the Kyoto Protocol

The Kyoto Protocol[5] is the result of the negotiations by many nations to reduce the cause of global warming which are greenhouse

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[4] The organization for Economic Cooperation and Development consists of Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Republic of Korea, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. UNFCCC: http://www.unfccc.org/siteinfo/glossary.html

[5] *The definition of the Kyoto Protocol (if it becomes enforcement) is the legally binding commitment promises to produce an historic reversal of the upward trend in emissions that started in these countries some 150 years ago.* The Kyoto Protocol (1997), Available from: http://cdm.unfccc.int/

gases.[6] Upon entry into force, it will obligate countries listed in its Annex B (developed nations) to meet differentiated reduction targets for their Greenhouse Gas (GHG) emission relative to 1990 levels by 2008 - 2012. Japan, adopted it on December 11, 1997. In order to enter into force, 55 countries, whose total emission, represent 55 percent of the emissions of the Annex I countries in the year 1990, must ratify it. The Kyoto mechanisms are Economic mechanisms based on market principles that Parties to the Kyoto Protocol can use in an attempt to lessen the potential economic impacts of GHG emission reduction requirements. While each country is assigned a specific emission target, the average required reduction for industrialized ('Annex B' or 'Annex 1') countries is 5.2% below 1990 levels. This is equivalent to a total reduction of 456 million tonnes of carbon dioxide (tCO_2). The Kyoto Protocol sets out three 'flexibility mechanisms' to enable trade in emission rights including Joint Implementation (JI) (Article 6), allowing countries to earn emission reduction units through projects in other Annex B countries, the Clean Development Mechanism (CDM) (Article 12), allowing for the generation of certified emission reductions from projects in Non-Annex B countries (that is, developing countries that are outside the capping regime) and Emission Trading (ET) (Article 17), allowing Annex B countries to trade emission permits known as 'assigned amount units'. The CDM is intended to meet two objectives: to address the sustainable development needs of the developing country as host party and to increase flexibility for Annex I Parties (developed countries) to meet their reduction commitments. Projects undertaken in developing countries that limit or reduce greenhouse gas emissions can earn the investor certified emission reductions if approved by the CDM Executive Board. A share of the proceeds

[6] According to the Kyoto Protocol, there are 6 greenhouse gases: Carbon dioxide, Methane, Nitrous oxide, Hydro fluorocarbons, Per fluorocarbons and Sulphur hexafluoride.

from CDM project activities is to be used to cover administration costs and to assist developing countries vulnerable to potential adverse impact from climate change. The projects must both result in "certified emissions reductions" and contribute to the sustainable development of the host country.

The Kyoto Protocol defines four potential carbon commodities[7], namely:

- Assigned amount units, achieved through emission reductions in Annex B countries that may be sold to other Annex B countries;
- Emission reduction units, achieved through emission reduction activities by one Annex B country in another Annex B country;
- Certified emission reduction, achieved through emission reduction activities by Annex B countries in non-Annex B countries; and
- Removal units, generated through investment in carbon sinks in Annex B countries for use in the existing compliance period.

1.3 The Meanings of Sources and Sinks

The word 'source' and "sink' comes from Boulding's essay

[7] All of these are sometimes referred to as carbon 'credits' of carbon 'offsets'. The first three may be achieved by reducing emissions at source, or by increasing the rate at which they are absorbed from the atmosphere into carbon sinks-for example forests. Removal units-added at COP 7 in November 2001-are a special category of credits generated through carbon sequestration in Annex B countries. All credits represent carbon that is withdraw from the atmosphere for at least 100 years, the minimum time (as defined by the IPCC) necessary to compensate for the radioactive forcing of a specified quantity of CO_2 or other GHG in the atmosphere.

of (1966)[8], "Spaceship Earth", which combined economics and some science in order to bring together the view of the economy as a circular resource, and of the environment as a set of limits, resource stocks (or sources) and natural assimilative capacities (or sinks) for wastes. The review of "Beyond the Limits"[9] states the meaning of 'source' and 'sink' as *'Population and capital draw materials and most forms of energy from the earth. There is a constant flow or throughput from the planetary sources of materials and energy, through the human economy, to the planetary sinks where wastes and pollutants end up.'*

Sink projects and source projects in this context refer to projects related to 'Carbon Sinks' and 'Carbon Sources' by the IPCC, "Special report on emission scenarios, 2000". 'Carbon Sinks' means natural or anthropogenic systems that absorb carbon dioxide (CO_2) from the atmosphere and store them. Trees, plants and the oceans all absorb CO_2 and, therefore, are carbon sinks. 'Carbon source' means a pool (reservoir) that gives up carbon to another reservoir within the Carbon Cycle. For example, if the net exchange between the Biosphere and the Atmosphere is toward the ocean, then the atmosphere is the source. Common human source include fossil fuel combustion, solid waste decomposition, land use change and transport. Carbon stocks[10] include carbon stored in vegetation (above and below ground), decomposing matter, soils, wood products and the carbon substituted by burning wood for energy instead of fossil

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[8] R. Kerry Turner, David Pearce& Ian Bateman (1994) *Environmental economics: An elementary introduction*, Centre for Social and Economic Research on the Global Environment University of East Anglia and University College London, Prentice Hall, p. 7.

[9] Donella H Meadow, Dennes L Meadows, Jorgen Randers (1995) *Beyond the Limits: Global Collapse or a Sustainable Future*, Earthscan Publications Limited, London, p.45.

[10] Parks et al. "An Economic Approach to Planning Trees for Carbon Storage" in *Economics of Carbon Sequestration in Forestry*. R.A Sedjo, R.N. Sampson, and J. Wisnewski (eds.), CRC Press LLC, New York, 1997.

fuels.

2. The Importance of the Kyoto Protocol to Thailand

Thailand ratified the Kyoto Protocol in 2002, at Johannesburg, South Africa. As a Non- Annex I country, Thailand has no commitment to reduce Greenhouse Gases, though it has the opportunity to cooperate with source projects as carbon dioxide emission reduction and sink projects for Carbon dioxide sequestration or absorption. There still is an ongoing debate on whether sink projects should be included in the Protocol.

According to 'Climate Change Treaties and Policy of Thailand'[11], Thailand needs to develop itself to improve the quality of life of its people. It also contributes greenhouse gases to the atmosphere, although marginally by global standards. Thailand is both an emitter and vulnerable to the impacts of Climate Change. That is why the UNFCCC and the Kyoto Protocol is important to Thailand. Thailand emitted less than one percent of the global total in 1990, this would be even less if historical emissions are considered. On the other hand, Thailand as a developing country in the tropics, is highly vulnerable to the impacts of climate change. More than half its population relies on agriculture, so climate change is likely to have a serious impact on the livelihood of these people.

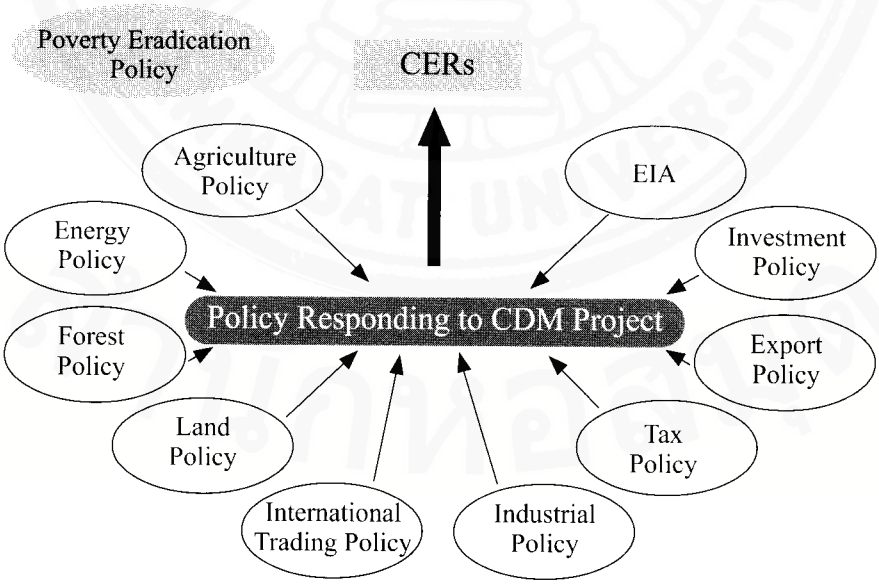
2.1 Thailand Policies Responding to the CDM Projects

The CDM is a market-based mechanism that allows for emission reduction projects that contribute to the sustainable

[11] Office of Environmental Policy and Planning Ministry of Science, Technology and Environment (MOSTE) (2001), presented by Saksit Tridech, Ph.D., Secretary General, Regional Workshop on Climate Change The Challenge and Opportunities, Energy Research Institute (Chulalongkorn University), New Energy and Industrial Technology Development Organization (NEDO) www.er.chula.ac.th

development of the host country through the sale of the certified greenhouse gas emission reductions from that project in a chosen market. The CDM affects policies on energy, industry, forestry, land use, investment, tax, agricultural, international trade, exports, and the environment. Thailand is not committed to any abatement plan or reduction targets, but many of its current policies and actions will lead to a reduction in GHG emissions. **Thailand Policy and Perspective Plan for Enhancement and Conservation of National Environment Quality, 1997-2016**[12] was the first national policy on the environment undertaken in accordance with the 'Enhancement and Conservation of National Environmental Quality Act of 1992'. The Policy and Prospective Plan was formulated with the aim of integrating national resource management, conserving the national environment quality, with sustainable economic and social development to ensure a better quality of life as shown in the following Figure.

Framework of Thailand Existing Policy Responding to CDM project.



[12] Office of Environmental Policy and Planning Ministry of Science Technology and Environment Thailand, 1997-2016, Ministry of Science, Technology and Environment. Bangkok, Thailand, 1997.

2.2 Policies related to 'CDM Source Projects'

2.2.1 Energy Policies and Energy Strategies

The meaning of 'source projects' is 'a pool that gives up carbon to another reservoir within the Carbon Cycle'. One example of a 'source project' would be 'fuel switching' from a fossil fuel power plant which emits more carbon dioxide to a biomass power plants or the natural gas power plants which produce less for the same electricity output. CDM project types are summarized in the table 1 below[13]:

Sector	Project Examples
Forestry	
Afforestation and	In open areas; plantations; reforestation woodlots; agroforestry
Energy	
Power generation	Combined-cycles turbines; distributive networks; clean coal tecnology
Fuel switching	Natural gas; methane; biomass and biogas; hydrogen
Cogeneration	Sugar cane; bagasse; chemical byproducts
Renewables	Wind; solar; biomass; hydro; geothermal
Efficiency	More efficient equipment, processes, or design
Industry	
Efficiency	Boilers; motors; lighting
Cogeneration	Chemical, paper, and metallurgy; oil refining
Retrofits	Iron and steel sector;

[13] Jon Rosales and, Gao Pronove (2003) UNCTAD-Earth Council: Carbon Market Programme, A Guide to the Clean Development Mechanism, (12-13). Available from: http://unctad.org/ghg/

Sector	Project Examples
Production process	Efficiency improvements in design and production
Waste fuels recovery	Cement sector; landfills
Household	
Conservation	Education and outreach
Appliances	Solar water heaters; biomass cooking stoves
Lighting	Fluorescent light bulbs; interior design
Transportation	
Fleet vehicles	Alternative fuel vehicles
Mass transit	Expand existing forms; light rail

The chemical reasons for more carbon dioxide resulting from the burning of oil and coal than the burning of natural gas is given by the the equations below;

Hydrocarbons: $C_nH_{(2n+2)}$
Natural Gas, mainly methane
$CH_4 + 2\,O_2 = CO_2 + 2H_2O + energy$

Oil : bigger 'n' (10 and above) as it's a fluid, denser.
$C_{10}H_{22} + O2 = 10CO_2 + 11H_20 + energy$

Coal : 99% Carbon and some dirty impurities
$99C + 100O_2 + S = 99CO_2 + SO_2 + energy$

Note: In natural gas, one carbon atom to 4 Hydrogen. In oil, 6 carbon atoms to 14 Hydrogen. So for Natural Gas 20% of atoms are Carbon. For oil 45% of atoms are Carbon. For coal almost all is Carbon and the rest pollutants such as Sulphur. Therefore, burning gas gives less CO_2 *for the same energy output.*

The biomass such as rice husk, bagasse (cellulose)(Renewable

energy)

$$C_6H_{12}O_6 + O2 = 6CO_2 + H_2O + energy$$

The burning of cellulose will be 6 carbon atoms less than coal and oil. The biomass power plant will be in the sugar cane plant area or the forest plantation that the carbon dioxide from the power plant can be captured by the photosynthesis into the sugar cane and the trees in the forest as the carbon cycle before its left into the atmosphere. Since it is cycling CO2 it is not actually dumping CO2 as the rice draws CO2 from the atmosphere to grow.

Over the past twenty years, renewable energy has been growing steadily due to number of concerns over the use of conventional energy with its economic costs and environmental impact. Thailand has made big efforts to promote efficient energy utilization. The Energy Conservation Fund was established in 1992 to provide financial assistance and incentives for projects related to energy conservation, renewable energy, research and development as well as public awareness promotion and training. The Energy Conservation Promotion Act was passed by the government in 1992, with the main objectives of promoting energy conservation and renewable energy. The programs and projects responded under the Energy Conservation Program (ENCON Program), and was overseen by the National Energy Policy Office (NEPO)[14].

The main objectives of the ENCON program include:

• Providing financial assistance and incentives for energy conservation, energy efficiency and renewable energy projects;

• Supporting demonstration of energy conservation and renewable energy technologies;

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[14] Name has changed to Energy Policy and Planning Office (EPPO) by Cabinet Resolution 2002.

• Supporting the promotion and dissemination of proven energy conservation and renewable energy technologies;

• Increasing research and development and training in energy conservation technology; and

• Organizing public awareness campaigns to promote energy conservation.

Financial assistance from the Energy Conservation Promotion Fund supports three main areas:

• Compulsory Program

• Voluntary Program

• Complementary Program

Compulsory Program:

Compulsory Program relates to mandatory energy conservation implementation as specified by laws and regulations, involving "designated factories and buildings, and government building"[15]. The owner may request for a grant from the Fund to undertake the required energy conservation measures. Even though the energy conservation can reduce the consumption of the energy use, it can not count as the CDM projects unless every buildings the whole countries have converted to conservation building and the calculations of the reduction of energy have a significance of the carbon dioxide reduction that can create the certified emission reductions (CERs)

The Voluntary Program

Voluntary Program involves provision of financial assistance by the Fund to support energy conservation efforts by both the public and private sectors aiming at more efficient and economical use of

[15] Here are defined as factories and buildings using energy more than 1,000 kW of electricity or its equivalence.

energy, utilization of renewable energy which has less adverse impact on the environment, promotion of products and services which contribute to energy conservation, as well as research projects and development of energy conservation technologies.

The National Energy Policy Office (NEPO) oversees the implementation of the Voluntary Program, by providing financial support and incentives to projects that promote energy conservation or make use of renewable energy technologies. This program consists of 5 sub-programs, that is:

- Promotion of Renewable Energy Utilization;
- Industrial Liaison;
- Research and Development;
- Promotion of Small Power Producers Using Renewable Energy; and
- Promotion of Energy Conservation in Existing Non-Designated Factories and Buildings.

Complementary Program

Complementary Program consists of the following sub-programs:

- Training;
- Public awareness; and
- Management& monitoring

The Renewable Energy Utilization Sub-Program focuses on opportunities to develop fuel substitution and on the introduction and dissemination or renewable energy technologies, or technologies using renewable energy sources more efficiently, by providing grants to cover operational cost for project owners and granting financial support in the form of interest subsidies for project participants.

The Industrial Liaison Sub-Program aims at disseminating energy conservation technologies by enhancing the marketing of high energy-efficient equipment and energy conservation materials, which will indirectly support producers and distributors of such equipment and materials. Emphasis is and will be placed on technologies

that have not been widely utilized in Thailand.

Thai Government support for renewable energy includes:

• **Small Power Producers (SPP) Program of the Electricity Generating Authority of Thailand (EGAT),** the national supplier of electricity and the largest states enterprise in Thailand is committed to buy power from renewable energy producers SPPs, including biomass energy producers. SPPs can be any private or state enterprise that generates electricity either

(a) from non-conventional sources such as wind, solar and mini-hydro energy or fuel such as waste, residues or biomass, or

(b) from conventional sources and using cogeneration to improve efficiency over current practices.

As of December 1998, thirty-one SPPs were already in operations selling 740 MW of power to EGAT, and a number of other projects at various stages of development. After the baht depreciation in July 1997 the government amended the terms and conditions for the SPPs particularly by indexing a part of the capacity payment to the exchange rate in order to cushion the impact of the economic crisis. The economic crisis has also greatly affected the Thai shareholders in SPP projects forcing them to seek new partners. A number of international companies have recently decided to participate in SPP projects, for instance CMS (USA) and National Power (UK)

	Number of Projects	Generating Capacity (MW)	Sale to EGAT (MW)
Commercial Energy			
Natural Gas	23	2,988	1,678
Fuel Oil	1	0	9
Coal	10	1,210	618
Sub Total	**34**	**4,208**	**2,305**
Renewable Energy			
Bagasse	14	301	67.5
Paddy Husk, Wood chips, Saw dust	6	144.3	57
Municiple Waste	1	3	1
Blogas	1	0.06	0.045
Black Liquor	1	32.9	25
Sub Total	**23**	**481**	**150**
Total	**57**	**4,689**	**2,455**

• **Energy Conservation (ENCON) Program**, Energy Policy and Planning Office (EPPO former name, NEPPO), Ministry of Energy. The ENCON Program has offered tariff subsidies of up to 0.36 baht per kilowatt-hour to qualified renewable energy SPPs.

• **Renewable energy research and demonstration projects** on going at the Department of Alternative Energy and Energy Efficiency, Ministry of Energy. Project include mapping the potential for wind energy in Thailand and developing high efficiency industrial biomass burners.

• **Biomass One-Stop Clearing House**, launched in December 2002 by EPPO, the United Nations Development Programme (UNDP) and the Danish Agency or International Development Assistance (DANIDA). The aim of the seven-year program is to provide technical and financial advice for prospective biomass project developers and support relevant policies, legislation and public awareness.

Energy Strategies to Improve Efficiency of Energy Consumption 2007-2017[16]

The government aims to save 3.1 trillion baht in energy costs over the next 15 years through aggressive promotion of energy (surely conservation) consumption, and overhaul of national mass transit system and further industrial restructuring. The Minister of Energy, also aims to reduce energy imports that now account for 12% of total imports. Another goal is to ensure that energy supplies would cover demand for at least 50 years. The natural gas estimation from indigenous sources will be sufficient to meet demand over the next 30 years, based on 5% annual consumption growth. The lifespan of national energy reserves could be prolonged to 50 years through international co-operation strategies and accelerated development of new indigenous energy sources. Prime Minister wants Thailand to be a regional oil trading hub because Thailand has the potential to rival Singapore, which is currently the only oil trade center in Asia. Asia is expected to have an average annual growth rate of 7.3% throughout the next decade. Consequently, it is going to be a second oil trade center to serve the region. A road linking northern Thailand and Southern China will help reduce costs and facilitate the transport of fuel and other petroleum products, which are normally shipped by sea. Thailand has six oil refineries with a combined daily capacity of one million barrels. Refineries in Singapore have a daily capacity of 1.3 million barrels. During the period 2000-2010, petroleum product production capacity of Thailand will be considerably higher than domestic demand. As a result, during this period, it is anticipated Thailand will become an exporter of petroleum products.

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[16] Energy Strategy Workshop preside over by Prime Minister Thaksin Shinawatra, August 28th , 2003, Bangkok Thailand (The workshop was held by the Ministry of Energy with participation of senior officers from related Ministries and private sector representatives. The objective was to determine strategic approaches in the energy sector to increase energy security and to enhance the country's competitiveness.)

To strengthening the national energy security and competitiveness, the strategies for Thailand's energy development will focus on efficient use of energy, acceleration of domestic renewable energy resource development to replace the use of fossil fuel of which indigenous reserves are limited, and efficient energy management to extend, as long as possible, the supply availability of indigenous energy reserves. The efforts will be made to transform Thailand to be the "Regional Energy Center"

Forecasted Power Generation by Type

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EGAT	69,488	68,701	56,163	57,993	58,891	61,290	63,041	62,017	62,289	61,093	59,716
- Hydro	3,853	3,642	3,642	4,446	4,349	4,466	4,749	4,556	4,563	4,590	4,999
- Fuel Oil	12,935	6,158	5,611	2,937	2,642	3,068	4,273	3,713	2,505	2,135	1,951
- Lignite	16,115	14,931	15,413	17,784	16,708	16,950	18,460	17,052	17,414	16,057	17,165
- NG	36,501	43,916	31,469	32,694	35,694	35,169	36,783	35,536	36,673	38,288	35,578
- Diesel	63	29	33	109							
- others	21	25	25	23	23	23	23	23	23	23	23
Purchased	28,271	34,984	54,273	59,880	66,078	71,492	78,851	89,973	100,798	113,116	125,714
- IPP	15,999	20,269	38,291	43,400	49,561	54,928	59,789	63,461	70,293	81,083	93,848
- NG	15,999	20,269	38,291	43,400	37,176	39,710	42,965	40,423	42,024	41,019	39,722
- Coal					12,385	15,218	16,824	23,038	24,900	24,822	24,822
- Other IPP									3,369	13,242	29,304
- SPP	9,571	12,025	13,292	13,619	13,724	13,724	15,978	13,724	13,724	13,724	13,724
- Imported	2,701	2,690	2,690	2,861	2,793	2,840	3,084	12,788	16,781	18,309	18,142
Grand Total	**97,759**	**103,685**	**110,436**	**117,873**	**124,969**	**132,782**	**141,892**	**151,990**	**163,087**	**174,209**	**185,430**

Oil Demand and Supply

Consumption of Petroleum Products[17]: In 2000, demand for petroleum products was 609 KBD, a 45% decrease from the 1999 records. The major reason was that the prices of petroleum products during the year were so high that the overall petroleum consumption decreased, for instance consumption of gasoline decreased by 3.9% and that of diesel by 2.0%. The main reason for the decreased consumption of these two products was assumed to result from less use of cars by the general public. As for fuel oil, the consumption dramatically decreased by 22.3% compared with 1999 records since EGAT had reduced the use of fuel oil for power generation and , as an alternative, turned to use more natural gas, which is a cleaner fuel and is cheaper than fuel oil. Moreover, some industries had also shifted to use more natural gas instead of fuel oil. The share of consumption by product type in 2000 was as follows: diesel, 42.4%, gasoline, 19.1%, fuel oil, 17.5%, LPG, 11.0%, jet, 9.8% and kerosene, 0.1%.

Transport Sector[18]:

The national transport sector will be thoroughly restructured as part of the drive for energy efficiency. The government envisages the development of electric train network, promoting a shift to mass transit from personal vehicles and developing a 3,000-kilometer double-track rail system. More use of rail and marine transport will be promoted, as well as the use of pipelines instead of road transport for petroleum products. The transport system restructuring fund would come mainly from the energy conservation promotion fund, the oil fund and vehicle registration fees, with some ventures financed by the private sector.

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[17] Viraphol Jirapraditkul. National Energy Policy Office, the Royal Thai Government, presented at the Second Seminar on Energy Security in Asia-Addressing Energy Security Challenges in Asia- 6 March 2001, Tokyo, Japan.

[18] Ibid.

An analysis of petroleum[19] product consumption by economic sector in 2000 shows that the transportation sector accounted for 62.5% of the total consumption, followed by the industrial sector, 23.3% and others 14.2%. In 2010, the share of the transportation sector is expected to increase to 69.7% while that of the industrial sector will decrease to 16.4%, mainly due to the decrease in utilization of petroleum products as fuel in power generation by EGAT. Other sectors will account for the remaining 13.9%. (note the chart below contradicts the trend to better transport energy use but was made before the Prime Minister Comment and explains the reason for targeting transportation).

Industrial Sector[20]:

The industrial restructure would focus on competitiveness, while tax measures would be introduced to promote energy saving in factories and transport. Income tax exemptions are being considered for achieving specific energy-saving goals. Implementing of standards for energy saving goods will be expedited and will cover both electrical appliances and vehicles, while new standards for energy-saving factories will be drafted.

Forecasted Petroleum Consumption by Sector

Sector	Consumption (KBD)				Growth (%)			Share (%)		
	1999	2000	2005	2010	2000	2005	2010	2000	2005	2010
Transportation	398	380	502	649	-4.5	5.7	5.3	62.5	67.9	69.7
Industry	157	142	131	153	-9.6	-1.6	3.2	23.3	17.7	16.4
Others	83	86	106	129	3.6	4.2	4.1	14.2	14.3	13.9
Total	**638**	**609**	**739**	**932**	**-4.6**	**3.9**	**4.8**	**100.0**	**100.0**	**100.0**

[19] Ibid.

[20] Ibid.

Green Campaign[21]:

Green campaign to tackle high energy consumption rates, energy consumption was growing by 1.3-1.4 times the economic growth rate a relatively high figure compared with developed countries. The transport, manufacturing and household/business sectors will be the first targets under the scheme where demand figures range from 21% to 37% of total energy consumption, while the farm sector consumes only 6% . The mass transit system in Bangkok will also be improved to increase efficiency and convenience to encourage motorists to keep their vehicles at home. Factories and related facilities should be relocated to the same areas to help cut transport costs. A new technology to generate heat and power simultaneously will also be adopted. Heat from the electricity-generating process can be utilized to produce high-and low-level steam for industrial and household uses . A similar technology is expected to be applied in Bangkok's new international airport to cool buildings. Community will be encouraged to use alternative or renewable fuels, such as solar cells, wind and biomass. Tax breaks will be given to the private sector.

The potential of 'Renewable Energy' as the Thai CDM projects:

Power Producers would be given more encouragement and incentives to explore alternatives such as solar and wind energy and biomass from agriculture waste, farm residues and garbage. The government also aims to raise electricity production from renewable energy to 8% of total national consumption over the next 10 years from 0.5% at present (2003). One possibility would involve allowing local communities to own power plants using renewable energy sources.

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[21] Bangkok Post (August 2003) 'Business Section' http://www.bangkokpost.com

Therefore, the incentive policies of the Ministry of Energy on fuel switching, energy efficiency and SPP projects are giving opportunities to Thai private business and foreign CDM investors to propose 'Source projects' such as AT Biower (Rice Husk Biomass Power Plant), Mitr Phol Bagasse Waste Management Power Plant and Korat Waste to Energy Project in Thailand. In practice, energy projects involve more than just the energy policy, the industrial policy affects permits for the facilities of the power plant etc. To get approval from an 'Environmental Impact Assessment (EIA)' depends on the criteria of 'Enhancement and Conservation of National Environment Quality (1997)'. The public participation and transparent are also the requirement of the EIA approval. The promotion of Board of Investment (BOI) is also involved with the tax exemption of the high technology importing into Thailand.

2.2.2 Industrial Policy[22]

The policy under the Ministry of Industry that related to the energy or 'source' projects will be 'Investment Promotion Policies' which will set the criteria of the project types and factories. The SPP power plant as factory building comes under the Factory Act., B.E. 2535 Section 3, the Factory Act (No. 3) and B.E. 2522 to give the permission of the factory, the location, safety, machine and workers. In the Section 12 of the Factory Act that a person engaging in a factory business of group 3 must obtain a permit from the Grantor and must comply with the criteria provided for in the ministerial rules prescribed pursuant to Section 8,... no person shall allowed to establish a factory before obtaining a permit. The CDM projects also follow the policy of investment promotion of the Board of Investment (BOI) such as criteria of project approval, criteria for shareholding by foreign investors, investment zones, criteria for granting tax and duty privileges.

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[22] Factory Act B.E. 2535 http://www.diw.go.th/law/lawface.htm

2.2.3 The Policy and Prospective for Enhancement and Conservation of National Environment Quality (1997-2016)[23]

The Policy and Prospective Plan for the Enhancement and Conservation of National Environmental Quality, 1997-2016 has been formulated with the aim of managing the country's natural resources and the environment, to facilitate and not to obstruct economic and social development. The policy will result in development that is sustainable and create a better life for the people. The Power Producer more than 10 MW needs to have an EIA approval from the Office of Natural Resource Policy and Planning, the Ministry of Natural Resource and Environment before getting the permit of the power producer project approval from the Ministry of Industry. One of the procedure to perform the EIA is the public participation and local people agreement to allow the power plant in their area.

The purpose of CDM is to benefit both the investor and host countries by contributing to sustainable development in the developing countries and by allowing investor countries to meet their greenhouse gas reduction targets at the lowest possible cost by taking advantage of the lower marginal cost of reducing GHG emissions in developing countries. Therefore, encouraging the SPPs especially, biomass and agricultural waste power plants is helping Thailand both sustainable development for the socio-economic and environment for local people in term of creating the job, income and accessing the electricity use to have better life.

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[23] Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality, 1997-2016, Environmental Policy and Planning Division, Office of Environmental Policy and Planning, Ministry of Science, Technology and Environment (1997) (present time, 2004, this office becomes the Office of Natural Resource Policy and Planning, the Ministry of Natural Resource and Environment)

2.3 Policies related to 'Sink Projects'

There are forest policy, land use policy or land reform policy, agriculture policy, the Policy and Prospective Plan for the Enhancement and Conservation of National Environmental Quality, 1997-2016 and the Investment Policy corresponding to the CDM sink projects.

2.3.1 Thailand Forest Policy

CDM Sink Projects (Land Use, Land Use Change and Forestry/ LULUCF)

Before determining the potential of any CDM sink projects in Thailand, it is necessary to understand the meanings of sink projects in the Kyoto Protocol. The Article 3.3 and 3.4 shall be described as follows, *'The Parties to the United Nations Framework Convention on Climate Change (UNFCCC) may wish to make decisions about the definitions of terms used in Articles 3.3 and 3.4-in particular, "land-use change," "forestry activities," "human-induced" and "direct human-induced," "afforestation," "reforestation," "deforestation," and "carbon stocks" - because these definitions may affect carbon accounting under the Protocol. These definitions are critical to the accounting of sources and sinks under the Protocol: They determine the scope of human activities that are accounted under Article 3.3 and which may be eligible under other Articles (such as Article 3.4) of the Protocol.'*[24] Energy, industry, household and transportation will be "source" projects since they relate to greenhouse gases emission from energy sources of uses.

[24] IPCC (Intergovernmental Panel on Climate Change) Chapter 2: Implications of Different Definitions and Generic Issues. Available from: http://www.grida.no/climate/ipcc/land_use/039.htm

Forest related carbon sinks in the Kyoto Protocol

The Kyoto Protocol (Marrakesh Accords[25]) set the following rules for taking into account for forest related sinks for the first commitment period 2008-2012:

• Emission/removals from afforestation, reforestation and deforestation (ARD) on the basis of Article 3.3 and the agreed definitions will be unlimited.

• Emission/removals from forest management, on the basis of Article 3.4, will be limited to a pre-defined cap for each Party (Annex Z)[26]. A party may choose to account for additional human-induced activities for the first commitment period, provided that these activities have taken place since 1990.

Article 3.3 of the Kyoto Protocol: afforestation, reforestation, deforestation (ARD)[27] - with definitions and accounting rules as agreed in Bonn - implies crediting of sinks that are associated with

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[25] The agreement emanating from Conference of Parties #7 (COP7) held in Marrakech, Morocco from October 29 to November 9, 2001. Delegations from over 170 countries came to final agreement on the package of decisions which elaborate a finely drawn structure for the implementation of the Kyoto Protocol. The resulting Marrakech Accords completed the 1998 Buenos Aires Plan of action and paved the way for ratification of the Kyoto Protocol.

[26] A ceiling on eligible forest management activities for each industrialized country is specified in Annex Z to the Bonn agreement. The figure is 0.00 Mt Carbon per year for Australia, 12.00 Mt Carbon for Canada, 0.88 Mt Carbon for France, 1.24 Mt Carbon for Germany, 13.00 Mt Carbon for Japan, 17.63 Mt Carbon for Russia, and 1.11 Mt Carbon for Ukraine.

[27] Definitions of ARD that are based only on canopy cover may allow activities that lead to significant carbon fluxes to remain unaccounted. According to IPCC, glossaries: afforestation, 'planting of new forests on lands that historically have not contained forests. These newly created forests are included in the category "Changes in Forest and Other Woody Biomass Stocks" in the "Land - Use Change and Forestry" module of emissions inventory calculations'. Reforestation, 'planting of forests on lands that have previously contained forests but that have been converted to some other use. Replanted forests are included in the category "Changes in forest and other Woody Biomass.

certain biomass projects, because it provides an additional incentive to Annex I countries to establish new forests. This can include biomass plantations, provided they fulfill the definition of a 'forest' and have been created since 1990 on former non-forested land. Creation of new forests will help to increase the resource of biomass fuel in the future. The extend to which such plantations will be managed as carbon sinks will depend, among other factors, on the price of carbon credits relative to the revenues that could be achieved from harvesting, in line, for example, with the commercial value of timber.

Article 3.4 of the Kyoto Protocol compromise on forest management, reached in Bonn, suggests that Annex I countries may claim a pre-determined amount of carbon credits for forest management. This is favorable for bio-energy in that it does not create incentives for maximizing the carbon sink in exiting forests, which would in turn be counter-productive to an intensified use of renewable biomass energy. However, the rules for national implementation have not yet been set, and it is up to each country whether or not it wants to put in place incentives for maximizing the carbon uptake in its forests.

The question of forest policies in Thailand whether are appropriate to respond the CDM sink projects, (if Thailand ever wants to cooperate in the term of carbon dioxide sinks.). The report of the Policy and Prospective for Plan Enhancement and Conservation of National Environment Quality for the period 1997-2016 shows that Thailand's forest cover has decreased rapidly over the last three decades (1961-1993), averaging 2.73 million rai (0.4 million hectare) per year. Even after logging was banned nationwide in 1989, about 6.18 million rai (1 million hactare) of forest was destroyed within 3 years (1989-1992), or 1.5 million rai (0.24 million hectare) per year. In 1993, there were only 83.5 million rai (13.4 million hectare) under forest cover, or about 26% of the country's total area. Deforestation directly affected forest ecosystems and biological diversity. Although reforestation has been practiced for a long time, the rate of reforestation cannot compensate for rapid deforestation. In addition, planting of a single species or practicing monoculture,

has been carried out in the course of reforestation, planting a mono-culture cannot rehabilitate primary ecosystem.

There are 3 goals concern with Thailand Forest Resources:

• Forests will cover 50% of the country; with at least 30% designated as conservation forest; and, the remaining 20% designated as economic forest.

• Utilize forested areas in a manner that will retain the natural balance of the ecosystem and environmental quality.

• Conserve and sustainably utilize biodiversity.

To reach the goals, there is Thai Forest Policy Implementation[28] as:

Forest Resource Management

Policy 1: Increase forest cover to 50% of the country. At least 30% is to be designated as conservation forest, and 20% as economic forest, to ensure that the demands of economic and social development are met. And to maintain the environmental balance.

Policy 2: Utilization of forests must be in accordance with natural resources conservation practices.

Policy 3: Protect remaining natural forest areas from encroachment.

Policy 4: Reduce conflict over utilization of forest resources and other resources in forest area.

Management of Biodiversity in Forest Ecosystem

Policy: Protect, preserve, and conserve flora, fauna, aquatic life, and other living organisms in forest areas.

There are major laws relating to forest conservation include

• The 1961 National Parks Act,

• The 1964 National Forest Reserve Act,

• The 1960 Wildlife Preservation and Protection Act (amended

[28] The report of the Policy and Prospective for Plan Enhancement and Conservation of National Environment Quality for the period 1997-2016.pp.23-25.

in 1992)

• The 1992 Forest Plantation Act, and

• The 1992 Land Reform Act

• The 1992 National Enhancement and Conservation of Environment Quality Act

The laws that will complement the CDM sink projects are 'the 1992 Forest Plantation Act, and the 1992 Land Reform Act along with the 1992 National Enhancement and Conservation of Environment Quality Act. Especially forest plantation of Forest Industry Organization make Thailand forest policies respond to CDM projects.

The reason why "Forest Plantation Act" support the CDM projects

In the comments of "the Thailand CDM Implementation Study"[29] states that "Forest Plantation Act", 1992 is open the opportunities for CDM sink project because of the permission to manage and make wood products. In the negotiation of COP 7 discuss the CDM sink projects for reforestation, afforestation and revegation but the negotiation has not allowed the logging business to be counted as CDM project. The sink projects absorb CO2 in the long-term but the measures are not definite yet.

This paper agrees with the recommendation of the study of Mahidol CDM sink projects will distribute to the Thai grassroots' income and opportunities. Regardless of the rules and regulation of the Land Use Policy and Laws toward the foreigners because sink projects produce Certificate Emission Reductions (CERs) in the atmosphere of Thailand and do not impact the ownership of the Land in Thailand.

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[29] Final Report for the Study of National Report for CDM Implementation presented to International Environmental Affair Division, Ministry of Natural Resource and Environment, Mahidol University, Salaya, Thailand, January 2003. (in Thai Language), Chapter 5. p. (5-19).

The 1941 Forest Act act defines the forest area and sets the area for forest conservation, forest utilization etc. It is not only an area control but also covers plant species and sets up a department with authority to manage. If Thailand is to implement forest projects to absorb GHGs emissions (LULUCF/ Land Use, Land Use Change and Forestry, Article 3.3 and 3.4 in the Kyoto Protocol) as CDM project under Clean Development Mechanism (CDM), this act should potentially protect such forests. Forests absorb carbon dioxide by photosynthesis and it is the cheapest way to remove carbon dioxide from the atmosphere.

Forest policies are, therefore, in line with the UNFCCC. All forest policies were established as a result of human encroachment and activities which lead to a decrease in forest area. Therefore forest policies are promoted in order to increase forest area back up to 50% of the country's area or at least 30% for conservation forest area and 20% for commercially forest area so that it will respond to economic and social demanding as well as environmental conservation. Natural resource management will be used to operate these policies so as to restore forest by planting local species mainly. Forest types will be defined clearly such as conservation forest or commercial forest etc. There are five laws used for forest management - the 1941 forest act, the 1961 national park act, the 1964 national forest reserve act, the 1960 wildlife preservation and protection act and the 1992 forest plantation act

The Ninth Conference of Parties (COP-9)[30]

The forest stewardship council (FSC) offered the standard of forest management in the COP-9. In Thailand, Forestry Industrial Organization (FIO) has the FSC Certification in Kao Kra Yang, Pinsanulok Province and Thong Par Phom, Kanchanaburi Province as the good examples that human and forest can live in harmony

[30] The Ninth Session of the Conference of the Parties and the Nineteenth Session of the Subsidiary Bodies (1-12 December 2003) Milan, Italy.

on the principles of Socio-Economic and Environment Sustainable Development.

Forestry Industrial Organization (FIO) setting the forest stewardship council (FSC) standard for forest plantation (800,000 rai or 125 plantations)

The FSC's Principles and Criteria (P&C) apply to all *tropical, temperate and boreal forests*. Many of these P&C apply to plantations and partially replanted forests. More detailed standards for these and other vegetation types may be prepared at national and local levels. The P&C are a complete package to be considered as a whole, and their sequence does not represent an ordering of priority.

FSC aims to clear up the confusion by providing a truly independent, international and credible labeling scheme on timber and timber products. This will provide the consumer with a guarantee that the product has come from a forest, which has been evaluated and Environmental standard.

The Forest Stewardship Council has developed rigorous procedures and standards to evaluate whether organizations (certification bodies) can provide an independent and competent forest evaluation (certification) services. This process is known as 'accreditation'. FSC accredited certification bodies are required to evaluate all forests aiming for certification according to the FSC Principles and Criteria for Forest Stewardship.

All accredited certification bodies may operate internationally and many carry out evaluations in any forest type. Certified forests are visited on a basis, to ensure they continue to comply with the Principles and Criteria. The performance of the certification bodies is closely monitored by FSC. Products originating from forests certified by FSC-accredited certification bodies are eligible to carry the FSC-logo, if the chain-of-custody (tracking of the timber from the forest to the shop) has been checked.

From in-depth interviews, the officers of FIO and FSC Sweden officers, Forest Stewardship Council (FSC) principles are as

follows:

Principle 1:	Compliance with Laws and FSC Principles
Principle 2:	Tenure and Use Rights and Responsibilities
Principle 3:	Indigenous Peoples' Rights
Principle 4:	Community Relations and Worker's Rights
Principle 5:	Benefits from the Forest
Principle 6:	Environmental Impact
Principle 7:	Management Plan
Principle 8:	Monitoring and Assessment
Principle 9:	Maintenance of High Conservation Value Forests
Principle 10:	Plantations

Forest Stewardship Council (FSC) is an international standard for wood certificate by approach on 3 sustainability regimes as follows;

• **Economic sustainability:** in terms of providing more incomes and occupations

• **Social sustainability:** in terms of local culture and life-style can be kept.

• **Environmental sustainability**: in terms of biodiversity and buffer zones.

This holistic approach on sustainability means that people have incomes, occupations and good quality of life as well as their life-style will not destroy the environment and protect biodiversity.

2.3.2 Reforestation Project in King's Honor: an advantage of the Article 3.3 of the Kyoto Protocol

His Majesty the King celebrated the 50th anniversary of his accession to the Throne in 1996 and the people can express their love and gratitude to the King by joining in a national wide reforestation project to mark this significant event. Concerned about the environ-

mental degradation caused by deforestation, His Majesty has asked for accelerated efforts on forest and natural resource conservation. Thus, by planting trees to mark the King Golden Jubilee, Thai people will be able to pay tribute to the King and at the same time help in bringing back the country's forest cover and ecological balance.

The large scale reforestation project in honor of His Majesty the King is led by the Government through the Ministry of Agriculture and Cooperative. Publicity on the project has been made through all form of mass to encourage government agencies, state enterprise, the public sector and the general public to take part project. All individuals and organizations can participate by planting trees themselves, or by donating money maintenance of the trees planted to the reforestation areas.

Referring to Article 3.3 of the Kyoto Protocol, *"The net changes in greenhouse gas emission by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be used to meet the commitments under this Article of each Party included in Annex I. The greenhouse gas emissions by sources and removals by sinks associated with those activities shall be reported in a transparent and verifiable manner and reviewed in accordance with Articles 7 and 8."* By the definition of this Article, the Reforestation Project in King's Honor can take advantage of degraded or unused lands with the available funds to perform such activities and to create carbon credits (CERs) to respond the Kyoto Protocol in a win-win situation.

3. Some Case Studies of Proposed CDM Projects

3.1 Energy Projects: AT Biopower, Mitr Phol , Korat Waste to Energy CDM on-going projects and Unocal: Power-Repowering Electricity in Thailand

3.1.1 AT Biopower

Project Title: AT Biopower Rice Husk Power Project in Phichit Province, Thailand.

Project Category: Biomass Electricity Generation for Grid Connection.

Baseline: EGAT Power Development Plan

Project: Replace the fossil fuel of EGAT to rice husk to generate 20 MW net Electricity Export to Grid.

Certified Emission Reductions (CERs) or GHG reductions: Total 585,076 ton CO2 equivalent for 7 years (2006-2012).

3.1.2 Mitr Phol Sugar Corp. Ltd.

Project Title: Thailand Biomass Waste Utilization Project

Project Category: Biomass Electricity General for Grid Connection

Baseline: Using Bagasse 0.356 Mt and Coal 0.104 Mt. To produce 89 GWh Electricity and steam for the Sugar Mill and 230 GWh Electricity Export to Grid.

Certified Emission Reductions (CERs) or GHG reductions: 28,000 ton CO2 equivalent x 10 years

3.1.3 Korat Waste to Energy (KWTE) Project

Project Description: To implement Anaerobic Baffled Reactor (ARB) at Sanguan Wongs Industries (SWI), the largest Thai starch production facility. The ABR will remove organic materials

in waste water, and hence reduce COD and subsequent fugitive Methane (CH4) emissions. Biogas (CH4) will be used in SWI to dry the wet starch cake to the final dry starch product, to replace fuel oil using

Project Category: Waste to Energy "Biogas Electricity General for Grid Connection"

Baseline: To replace fuel oil to Biogas (CH4). Excess Methane (CH4) will be utilized in Generators to produce electricity for grid connection and also for internal use.

Certified Emission Reductions (CERs) or GHG reductions: 370,000 ton CO_2 equivalent per year

3.1.4 Unocal: Power - Repowering Electricity in Thailand, In-depth Interviw Paul S. Tish, Unocal (Thailand): Repowering Electricity in Thailand[31]

Paul explained why Natural Gas is the energy of choice for Thailand and how Natural Gas yields the highest value to Thailand. Natural gas via pipeline is used for power generation, compressed natural gas (CGC) for transportation, gas by-products (ethane, LPC,NGL) for petrochemical feedstock and LPG for transportation, commercial and domestic fuel. The IPP projects that can have CDM potential total some 2,134 MW of capacity.

These IPP projects will switch from being coal fired thermal plants to Gas-Fired Combined-Cycle Gas Turbine (Gas CCGT) plants which will yield many benefits to the whole Kingdom of Thailand, especially the following groups:

- The Thai people will gain from lower electricity cost.
- The people in Prachuab Khiri Khan will preserve their way of life as before.

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[31] Paul Tish (2003) presented at Energy Research Institute, Chulalongkorn University, A 12-Year Anniversary Forum, "Energy Uses in the Future: Natural Gas Yields Highest Values to Thailand", Bangkok, Thailand.

• The Thai government will save foreign exchange, by not importing coal and displacing crude oil imports with condensate produced with natural gas.

• The Thai government will earn royalty and corporate income tax from natural gas and condensate production and sales.

• PTT Plc. Will earn additional gas pipeline tariff, expand national gas infrastructure that enhances energy supply security and enhances the share value of PTT Plc.

• PTTEP will earn larger revenue from natural gas and condensate production and sales and enhance its share value.

• Thai people with technical skills will gain direct employment at Navamindra (Arthit) new petroleum resource development. Other Thai people will be employed in businesses that support the Navamindra resource development.

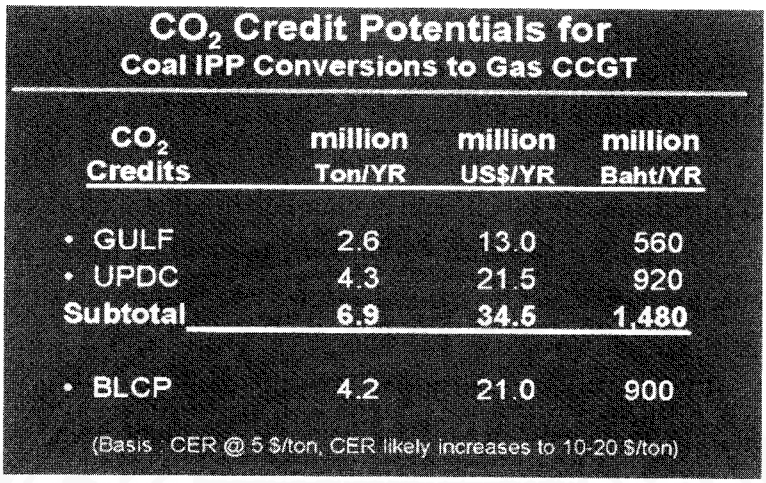
• The two IPP projects will save ~50% of their capital investment because the Gas CCGT plants will cost less than the coal thermal option.

• The Thai people will benefit from the development certainty of these two Gas CCGT plants.

• Global greenhouse gas (CO2) emissions from these two projects will be reduced by 6.9 million tons each year.

• Benefits from the Kyoto Protocol "Clean Development Mechanism" have been estimated to be worth ~1,480 million Baht each year.

CDM Potential GULF project will get 2.6 million carbon ton / year and UPDC project will get 4.3 million carbon ton/ year which will be totally 6.9 million carbon ton/year. It is only the beginning or the repowering electricity in Thailand.



CO_2 Credit Potentials for Coal IPP Conversions to Gas CCGT

CO_2 Credits	million Ton/YR	million US$/YR	million Baht/YR
• GULF	2.6	13.0	560
• UPDC	4.3	21.5	920
Subtotal	6.9	34.5	1,480
• BLCP	4.2	21.0	900

(Basis : CER @ 5 $/ton, CER likely increases to 10-20 $/ton)

The repowering will have CDM benefits as Phase I will reduce CO2 emissions by 2.7 million tons each year; the carbon dioxide CER is worth 580 million baht a year (US$ 13.5 Million @/ 5.00 a ton). The repowering Phase II will reduce CO2 emissions by 2.8 million tons each year. The carbon dioxide CER will worth 600 million bahts a year (US$ 14.0 million @ $5.00 a ton). With the expectation of CER value is rising between $10-$20 a ton, if the Kyoto Protocol enters into force.

3.2 Forest Projects : CDM - like forest project: reforestation Military Pilot Division 9, 400 rai in Kanchanaburi Province, Carbon Dioxide sink project (PTT funded)

As mentioned in "Reforestation Project in King's Honor, His Majesty the King celebrate the 50th anniversary of his accession to the Throne in 1996", this research has taken the advantage of the PTT available fund to such a project in Tung Kang Yang, Sai Yok, Military Division 9 area, Kanchanburi Province where the area met the criteria of the PTT Reforestation Project in King's Honor.

The objectives of this project as following:

• To be respond to His Majesty the King and the Queen's

purpose in environmental and natural resource conservation;

• To expand the area of forest in the country to achieve government's policy;

• To encourage people to aware how important of forest is and participate to solve natural damages; and

• To create public awareness on global warming, the Kyoto Protocol and CDM sink projects.

Project activities of CDM like sink project

• Propose project to oil fund, PTT;

• Find the area and labor for planting, Military Division 9;

• Experts on CDM like sink project are required as well as teak tissue culture;

• Observe the area, soil quality, water supply and relation of planter and local people. Make a conclusion on proper strategy;

• Training course for solders (now become foresters) is needed to provide an understanding of project objectives;

• Due to the past experience, the forest plantation is treated not efficient after the reforestation and leave it growth naturally but to claim CDM sink project 20 years to absorb carbon dioxide emission, a monitoring system and maintenance are needed. Moreover, a measurement of carbon dioxide per ton is required in order to calculate the price of carbon storage.

Remarks:

• Teak plantation, 100 trees per rai and approximately 7 years can be harvested 50 trees to make the rest grow efficiently;

• Cloned teak plantation by tissue culture has the rate of survival about 90% than the others;

• Cost of intensive plantation is higher than traditional plantation because cloned teak is certificated with high productivity, growth and environmental conditions resistance;

• Teak is natural habitats easily growth locally. Under intensive plantation, teak can absorb carbon dioxide emission higher than

tradition plantation about 4 times.

The outcomes of the project:

At the first stage, this project is expected to be a reforestation project after the project implementation, to compromise with local people. Other economic species (papayas and corns) are introduced into the plantation without permission. The researcher and the authority of military have negotiated and convinced them that the CDM project will give them future income and chance to take care of the environmental including soil instead of short term income. Regardless of this project, there is no incentive to local people to stop encroach the land and plant their today economic incentive plants (corns, pineapples and papayas). Unfortunately, this project has a conflict with local people. Teak cannot growth as much as possible due to other species coming in and complete with. In addition pesticide and herbicide are being used to control pest and weed which destroy teak also.

The experience of the project showed that Thai local people will change their perception by tangible evidence. The public awareness of future disaster and catastrophe will not attract to their interest as the present income. The future income from CERs - CDM sink project sound illusion for them unless the government designs the CDM - Land Use, Land Use Change and Forestry (LULUCF) policy to make it permissible.

As long as people will not sacrifice to the environment, it could not be a chance to take care of our environment. Not only supporting money to them for implementing the project but the government can encourage people by giving awareness and knowledge. Although it is just 400 rai, it is a good typical project, as sink project, which shows the advantages, disadvantages, difficulty and easiness to do project and a good start of CDM like Pilot Project implementation.

In conclusion

Though Thailand as a Non - Annex 1 country has many policies that are complimentary to the Kyoto Protocol. Many of these ùsourceû projects were started before ratifying the Kyoto Protocol and relate to good or best practices in the use of energy. The primary motivation has been economic, so as to reduce Thailand's dependence on imported energy. Similarly, with a large agricultural sector, government policy has been to try to add value to this valuable part of the Thai economy. Most agricultural workers are quite poor so if value can be added to their products, for instance rice, by using the residue to generate power then their may be some improvement in the lot of everyone associated with agriculture. It may also improve the local environment in avoiding local pollution which should similarly help the local agricultural communities.

Now that the Kyoto Protocol is ratified and enforced the first steps are being taken to structure some projects to take advantage of the Clean Development Mechanism. In particular Factories that burn Biomass for energy not only help the local agriculture get rid of their waste in a cleaner way, it also helps the Kyoto Protocol meet its objectives of reducing greenhouse gases. As such a project like AT Powers is in a position to use Thai Government policy regarding SPPs by providing power to the grid, it may make use of the Clean Development Mechanism by selling Certified Emission Reductions (CERs) or Carbon credits for the electricity generation they have displaced. This new market may make many more such projects economically attractive and lead to a greater participation in the Kyoto Protocol in the future.

It is early days for the Kyoto Protocol and the Carbon Credit market is in its infancy. The first few projects in Thailand are trying to get started which should lead to a greater understanding of how the clean development mechanism works so others with good renewable energy ideas will be able to use the Clean Development Mechanism to make their projects more economically attractive. This also fits in with the Thai Governments objective of increasing the use of renew-

able energy sources from the current low level of less than 1% to over 8% by 2013.

The potential to Thailand of 'sink' projects compared with Thailand's existing forest policies and laws appears complimentary and beneficial. It may reinforce the 'Reforestation Project in King's Honor' an example of CDM like project case study in Tung Kang Yang, Sai Yok, Military Division 9 area, Kanchanburi Province and community forest management as described in the sink project section, 'afforestation and reforestation' in Article 3.3 of the Kyoto Protocol. Similarly for 'Forest Management' in Article 3.4 matches with the forest plantations of the Forest Industry Organization (FIO) that FIO have set their 2 forest plantations in Kao Ka Yang, Pitsanulok Province and Thong Par Poom, Kanchanaburi Province to be under the Forest Stewardship Council (FSC) ensuring the socio-economic and environmental concerns are in harmony. The FIO plans 125 of their forest plantation to comply with the FSC which is equivalent to 800,000 rai of FIO forest land in Thailand. These are good examples of 'Forest Management' for Thai Foresters. Hopefully, the forest sequestration and sink project guidelines forest projects set in COP 9, Milan, Italy this December 2003 are the same as the FSC. Till now the deforestation rate has been increasing, hopefully, the Thai government may change seizing the opportunity to implement Thai forest policies as 'sink projects' thus subsidizing Thailand objectives. Then we can reverse the deforestation and make Thailand a beautiful country with "abundant Tropical Rain Forests" again.

Unfortunately, there are doubters, such as local & foreign NGOs, academics and governments on whether CDM projects especially 'sink projects' are complementary or conflict with Thailand's interests. Some Thais believe that if Thailand uses CDM money to replant our Thai forest, the developed countries might claim these forests as foreign owned land. This is ridiculous and no legal basis.

They discuss the 'carbocracy[32]', if CDM is the only climate change reduction mechanism or is it the north's political technique to manipulate the south. Is it too good to be true to be able to develop in a clean and sustainable way and make profit while doing good for the world climate (by selling CERs to Annex I countries). Thai people do not want to be monitored or have others control what happens in businesses such as replanting Thailand's forests. If Annex I countries can appease the distrust and Thai people learn to not fear the good intentions of the Kyoto Protocol, then progress may be more likely to be made for the benefit of all.

References

Bangkok Post (2003) http://www.bangkokpost.com

Biermann, Frank and Brohm, Rainer. *"Implementing the Kyoto Protocol Without the United States: The Strategic Role of Energy Tax Adjustments at the Border"*, Global Governance Working Paper, No. 5 January 2003. Available from: http://www.glogov.org/workingpapers/workingpapers.html

Donald Berg (2002) The International Institute for Sustainable Development and the Center for Sustainable Development in the Americas. Establishing National Authorities for the CDM, Center for Sustainable Development in the Americas Publishers, United States of America.

Donella H Meadow, Dennes L Meadows, Jorgen Randers (1995) Beyond the Limits: Global Collapse or a Sustainable Future, Earthscan Publications Limited, London.

Environmental Resources Management. (2001). National Clean Development Mechanism Strategy Study for the Kingdom of Thailand. Interim Report.

Environmental Resources Management. (2002). National Clean Development Mechanism Strategy Study for the Kingdom of Thailand. Final Report.

Final Report for the Study of National Report for CDM Implementation presented to International Environmental Affair Division, Ministry of Natural Resource and Environment, Mahidol University, Salaya, Thailand, January

[32] Using Carbon dioxide tool to colonize the developing countries.

2003. (in Thai Language)

Jim Taylor (1998) Land Conflicts in Southeast Asia Indigenous Peoples. *Environment And International Law*. Community Forests, Local Perspectives and the Environmental Politics of Land Use in Northeastern Thailand, White Lotus Co., Ltd., Thailand.

Jon Rosales and, Gao Pronove (2003) UNCTAD-Earth Council: Carbon Market Programme, A Guide to the Clean Development Mechanism, (12-13). Available from: http://unctad.org/ghg/

MOSTE (2000). Thailand Initial National Communication. International Environment Affairs Division, Office of Environmental Policy and Planning, Ministry of Science, Technology, and Environment, unknown published date.

National Energy Policy Office (2002) Privatisation and Liberalisation of the Energy Sector in Thailand. Available from: http://www.eppo.go.th/doc/idp-07-Priv29Mar99.html

National Energy Policy Office (2002) Thailand Energy Strategy and Policy Available from: http://www.eppo.go.th/encon/Strategy/encon-Energy-Strategy-E.html

Office of Environmental Policy and Planning (2000). Thailand's National Greenhouse Gas Inventory 1994. Prepared by Center for Applied Economics, Faculty of Economics, Kasetsart University, December 2000.

Philippa England (1997). Seeing Forests For Trees: Envionment and Environmentalism In Thailand. UNCED and The Implementation of forest Policy in Thailand, A join project of the National Thai Studies centre Australian National University and the Asia Research Centre on Social, Political Economic Change Murdoc University, Silkworm Books Publishers, Thailand.

Project Design Document for A.T. Biopower Rice Husk Power Project (2003) Available from: http://www.atbiopower.co.th/project/index/html

The Kyoto Protocol (1997), Available from: http://cdm.unfccc.int/

UNFCCC (1997). Kyoto Protocol to the United Nations Framework Convention on Climate Change.

UNEPs (1999). Information Unit for Conventions, Convention on Climate Change, July.

United Nations (2000). The Clean Development Mechanism- Building International Public-Private Partnerships Under the Kyoto Protocol. United Nations, New York and Geneva. 2000. (UNCTAD/GDS/GFSB/Misc.7)

Viraphol Jirapraditkul. National Energy Policy Office, the Royal Thai Government, presented at the Second Seminar on Energy Security in Asia-Addressing Energy Security Challenges in Asia- 6 March 2001, Tokyo, Japan.