

CHAPTER IV

THE COSTS AND BENEFITS OF SINGAPORE IN DECIDING TO RATIFY THE KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

The history of the establishment of Kyoto Protocol and its objectives and purposes has been explained in Chapter II. In Chapter III, the overview about Singapore as a small country that contributes in a small amount of GHG emission to the global emission had ratified the protocol. Then, it also explained the process of ratification and the importance of Singapore as the host country in receiving the foreign investment.

The Chapter IV of this undergraduate thesis covers the considerations of Singapore between ratifying or rejecting the Kyoto Protocol to the UNFCCC. By using the model of Rational Choice by Allison, the author attempts to provide the support and against arguments of each alternative. By ratifying the Kyoto Protocol, Singapore had chosen the rational decision considering the benefits, such as open up various economic opportunities from the protocol through the foreign investment in clean energy sectors and leading the advancement of technology in clean energy sectors. At the end, the author would like to prove the hypothesis based on the implementation of the theoretical framework provided in this undergraduate thesis.

A. Singapore Decided to Ratify the Kyoto Protocol to the UNFCCC

Before the decision of Singapore in adopting the Kyoto Protocol, Singapore rejected the possibility of adopting the protocol in 2005. In the next year, Singapore

decided to ratify the protocol. Each of decision whether to ratify or reject the protocol had its own costs and benefits. The decision of Singapore in ratifying the protocol brought us to see the benefits that arise, which are the betterment of the international image of Singapore in the international community, open up economic opportunities through the clean energy investment, and also lead the advancement of technology in the clean energy sector. However, the decision generates cost in ratifying the protocol which is Singapore needs a lot of resources whether in form of human or natural resources in developing clean energy sectors.

Support arguments:

a. Betterment of the International Image of Singapore in the International Community

The ratification on UNFCCC in 1997 and Kyoto Protocol in 2006 are proof of Singapore in international efforts concerning to address the issue of climate change. Singapore that ratified both of the international agreements is proofing that they wants to be the part of the global environment sustainability effort. The ratification of Singapore cannot be separated from the facts that global norms are influencing countries such as environmental sustainability and responsibility in taking care of the environment. By actively supporting the global efforts which are the Kyoto Protocol to reach the general objective to stabilize the GHG concentrations in the atmosphere, it is an evidence that Singapore did their duty as a part of global citizen (Hamilton-Hart, 2006). Even though Singapore is a small country and contributes only in a small number of GHG emission concentration in the atmosphere, the ratification status had shown the intention of Singapore in addressing the issue of climate change.

Before Singapore accepted to ratify the protocol, there were several considerations that might become the reason behind the rejection of Kyoto Protocol. One of the considerations was that Singapore did not agree with the information provided by the scientist about the climate change issue. By ratifying the protocol, Singapore showed their acceptance of the scientific evidence of global climate change that occurred as the result of human activities and could give a serious threat to the future economic condition. The establishments of the UNFCCC and Kyoto Protocol as the global climate change regimes need to be strengthened by the acceptance and ratification of the parties involved to ensure that the law has the power to force its parties to implement. The purpose of the ratification of Singapore to the protocol was able to strengthen the position of Kyoto Protocol as the global climate change regime.

As quoted by Hamilton-Hart (2006) from the Minister for the Environment and Water Resources 2006, Yacoob Ibrahim described that climate change was one of the environmental challenges in these days. He mentioned that Singapore committed in addressing the climate change. It was consistent with the good record of Singapore on an environmental issue. According to the Ministry for the Environment and Water Resources, it was reported that Singapore had achieved a 17 percent reduction from 1990 levels by 2003 and a 22 percent reduction from 1990 levels by 2004. Moreover, Singapore had performed environmental efforts in pollution control and tree planting. It reflects that Singapore had been maintaining their commitment in addressing the climate change (Hamilton-Hart, 2006).

The international responsibility and reputation of a country, the interests, and obligations regarding the involvement in the international actions become the consideration of a country to change their perception to change the decision to become more involved in global climate change regime. The reputation gained by Singapore after they ratified the protocol was labeled as “Garden City” because through the National Parks Board of Singapore, it established a greenery maintenance and upgrading programme by planting 62,600 trees in 2006. It gave Singapore great backbone to be called as the Garden City (National Climate Change Committee, 2008). Moreover, Singapore was also labeled as the “Living Laboratory” because of the growth of research and development of Singapore in clean energy, and it was making Singapore become the test-bedding location for the clean energy industries to innovate in Singapore (Kiong, 2012). In addition, the availability of expertise, skill, and talent of Singapore to clean technology, has made them labeled as the center for clean technology (Selvakumar, 2013).

The ratification of the UNFCCC and the Kyoto Protocol is a movement from Singapore as a proof of their commitment to join the international community in addressing the climate change issue. Not-ratifying the Kyoto Protocol will raise questions on its commitment in addressing the climate change issue. The betterment of international image of Singapore in the international community was started when Singapore decided to ratify the protocol. Moreover, the advantage is a good reputation gained by Singapore after they ratified the protocol.

b. Foreign Investment in Clean Energy Sectors Increases

Under the Kyoto Protocol, parties that are listed in the Annex I have obligations to set a limit and reduce their greenhouse gases emission. Beside setting limitation and reducing the greenhouse gases (GHG) as the main objectives, the parties of Annex I are persuaded to develop the renewable and clean energy. The source of energy that is produced in the world is commonly known from the unrenovable energy which is fossil fuel. The energy that is produced from fossil fuel produces a lot of GHG emissions resulting in global scale issue, the climate change.

In addressing the issue of climate change, the countries listed in the Annex I shall promote sustainable development by implementing policies and measures in accordance with each national circumstance. These obligations are listed in the Article 2(1) of the Kyoto Protocol and this article contains the indicative list that parties may implement to achieve the commitment in limiting and reducing the GHG emission. One of the measures related to renewable and clean energy listed in the Article 2(1) of the protocol is:

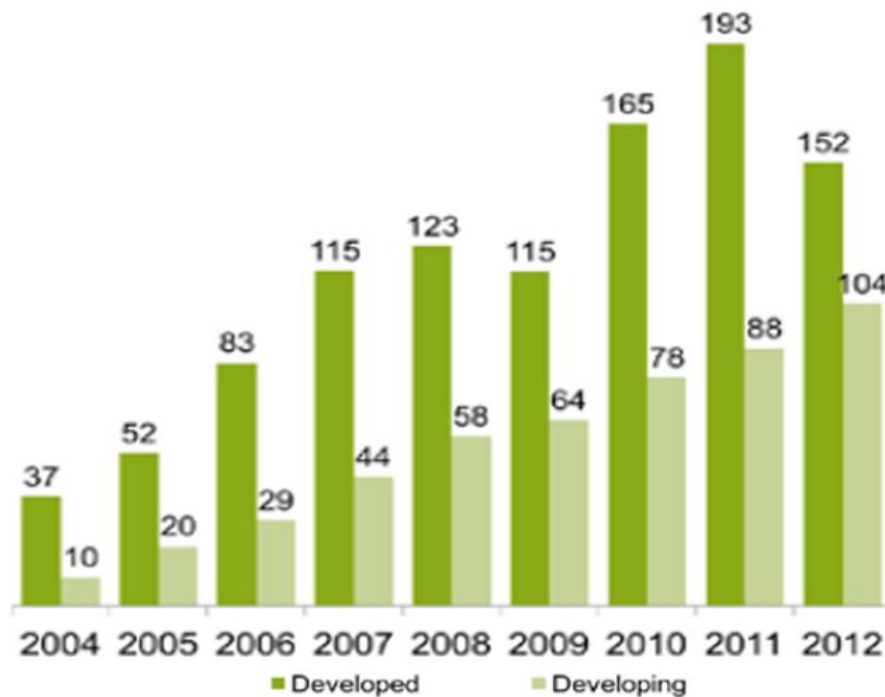
(iv) Research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies (United Nations, 1998)

By developing renewable forms of energy, it hopes that the new renewable clean energy can replace the energy produced from the burning of fossil fuel in the future. The number of GHG emissions produced from fossil-fuel combustion will eventually decrease and is replaced by the existence of new renewable clean energy. The parties that ratified this protocol indirectly have to follow the global norms

established from the binding global climate regime especially parties of the convention listed in the Annex I. The Annex I countries that had developed renewable energy in their countries eventually can implement in the non-Annex I parties by investing in clean energy. The investment of renewable and clean energy to the non-Annex I countries as the effort of their commitment in tackling the issue of climate change is indirectly shaping new global trends in developing the renewable energy. Since the establishment of Kyoto Protocol as the global climate regime, the foreign investment in renewable energy in the world is increasing as shown in the figure below.

Figure 2

Global New Investment in Renewable Energy: Developed V Developing Countries, 2004-2012



New investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals. Developed country volumes are based on OECD countries excluding Mexico, Chile, and Turkey
 Source: UN Environment, Bloomberg New Energy Finance

As a global regime is established in this case Kyoto Protocol, it may establish norms and standards of action that spread across the globe (Hamilton-Hart, 2006). The increasing of global foreign investment in renewable energy showed in the figure above is the evidence of the global norms that become trends in developing renewable energy. The investment in the developing countries that mostly are included in the non-Annex I party shows us that the trends are not only happening in the developed countries but also resonate globally.

The variety of energy efficiency measures consisted in the efforts of mitigation on climate change shows that the responsibility in having environmental management is a complementary with business efficiency. The environmental and economic goals are indeed essentially side by side, and business is a part of the solution to solve the environmental problems. The increasing global investment in renewable energy is an evidence that the sustainability of the environment and the growth of economic are both important (Hamilton-Hart, 2006). The foreign investment in renewable and clean energy in Singapore is increasing as the countries from the Annex I party put an investment to the non-Annex I party in the clean energy sector and Singapore is included in the non-Annex I category from their ratification status to the convention.

Singapore became the destination for the Annex I countries to put their investment in clean energy seeing from the interest of Singapore in promoting research and development in clean energy sectors, the skilled labour in the engineering sector supporting the research and development on clean energy sectors.

Moreover, the reputation of Singapore as a “living laboratory” makes it as a test-bed for energy companies to innovate in the clean energy sectors. There are several test-bedding projects in Singapore such as CleanTech Park, Intelligent Energy System Pilot, Punggol Eco-Town, Pulau Ubin Micro-Grid, Zero Energy Building, Electric Vehicle (EV) Test Bed and Solar PV Systems.

The increase of foreign investment in clean energy sectors in Singapore has also been proven from the leading clean industries in the world setting their headquarters in Singapore. The leading clean energy industries in Singapore are as follows:

Table 2

Leading Industry Players in Clean Energy Sector of Singapore

Atlantis Resources Corporation (UK),	Atlantis Resources Corporation is one of the largest leading tidal energy companies in the world, and it has established its global headquarters in Singapore.
China Guangdong Nuclear Power Holding Corporation	China Guangdong Nuclear Power Holding Corporation established its integrated biomass – solar power generation plant and set up regional headquarters for its renewable energy operations in Singapore.
Vestas Wind Systems (Denmark)	The world’s largest supplier of wind power systems has chosen Singapore as the base for its largest R&D centre outside Denmark.
Bosch (Germany)	Announced that it is investing €15 million to conduct research in organic photovoltaic technology.
DNV (Norway)	Risk management service provider, it has established a new Clean Technology Centre (CTC) for developing new cleantech services in technology qualification and

	certification, risk assessment, and asset management. DNV activities cover the following areas: clean energy; green shipping and offshore design; green ports; climate change adaptation; carbon market services; sustainable cities and urban solutions.
Gamesa (Spain)	Gamesa is a wind turbine manufacturer, has chosen Singapore as the base for its first R&D centre in Asia.
GreenWave Reality (US)	Building energy management systems company is developing the energy management software and hardware for smart grid applications and Light Emitting Diode (LED) lighting.
Phoenix Solar (Germany)	Phoenix Solar is photovoltaic solutions provider in PV system integration in Singapore and the region.
Panasonic (Japan)	Panasonic is an energy solutions R&D centre in Singapore; tests and commercializes its “Total Energy Solution”, involving the system integration of several clean energy components such as solar systems, lithium-ion batteries, home energy management systems and energy-efficient air conditioning in “Punggol Eco-Town”.
Renewable Energy Corporation (Norway)	Renewable Energy Corporation (REC) established one of the largest integrated solar manufacturing complexes in the world. They established their headquarters in Singapore.
Trina Solar (China)	Trina Solar collaborate with the Solar Energy Research Institute of Singapore to develop high-efficiency back-contact solar cells.
Yingli Green Energy (China)	Yingli Green Energy established their regional headquarters and R&D centre in Singapore.

Source: Belgian Foreign Trade Agency (Belgian Foreign Trade Agency, 2014)

The number of leading clean technology industries in Singapore is an evidence that ratifying the Kyoto Protocol increases the foreign investment in clean energy sectors as it is in-line with the global trends of developing clean energy to mitigate climate change. The obligations on researching and promoting renewable and clean energy of Annex I party not only create trends on renewable energy occurring in the countries listed in the Annex I party but also resonate to the non-Annex I party.

c. Technology Advancement in Clean Energy Sectors

The dependency of Singapore on fossil fuel is high to fulfill the high demand on electricity since Singapore is urbanized city and has a lot of manufacture industries that rely on electricity to ensure the production running. To solve the problem of fossil-fuel dependency, the advancement of technology to generate clean energy is necessary. As the ratifying of Singapore to the Kyoto Protocol, the foreign investment in clean energy sectors increases. The diffusion of technologies in the developing countries happened in three channels. Those channels are coming from trade in goods, foreign direct investment and licensing (Keller, 2004). The foreign direct investment is affecting the diffusion of technology in Singapore especially in clean energy sectors. Several studies find the evidence that corporation transfers their firm-specific technology to their foreign affiliates (Dechezlepretre, Glachant, Hascic, Johnstone, & Meniere, 2011). It is also advancing the technology in clean energy sectors in Singapore. The technology of clean energy promoted by the investor might help Singapore in addressing the issue of fossil-fuel reliability in producing electricity. The promotion of the clean energy technologies brought from

the Annex I is the proof of their commitment in mitigating climate change. The list of clean energy industries mentioned before is enhancing the development of clean energy in Singapore. One of the clean energies that has a prominent result in the advancement of clean energy technology is solar energy.

Solar energy is one of the renewable sources of energy that almost all of the countries can harness. By the establishment of Renewable Energy Corporation (REC) from Norway in Singapore as one of the largest integrated solar manufacturing industry in the world, it helps Singapore in harnessing the solar energy. It is also supporting that Singapore has high intensity in solar radiation throughout the year because of its location in the equatorial line. REC has invested over S\$2.5 billion on its first phase expansion which will produce for 800MW of solar photovoltaic modules. The technology that REC promoted will urge Singapore to enhance their research and development more in the solar energy (National Climate Change Secretariat, 2012). As a form of research and development of Singapore in solar energy, they conduct a research institute called Solar Energy Research Institute of Singapore (SERIS). Under the Economic Development Board, the government launched SolarNova in 2014 as a landmark programme to accelerate solar deployment throughout the country (Economic Development Board, n.d.).

The renewable energy promoted by the Annex I countries to the Singapore as non-annex I party had brought Singapore in the advancement of technology in the clean energy sectors. The reliability of Singapore to the use of fossil fuel to generate energy can be reduced by the existence of technology in harnessing the

renewable and clean energy. The energy industries invested in Singapore had harnessed many different types of renewable sources that they can find in Singapore. In addition, the geographical Singapore as the gateway between the west region and the east region plays a key role as the leading clean energy hub for the Asian region. The clean energy development finally can benefit the region even the global scale (Kiong, 2012).

Against argument:

d. Resources required as the Increase of Foreign Investment and Advancement of Technology in Clean Energy Sectors

Beside the benefits that Singapore gets from the decision in ratifying the Kyoto Protocol, it also generates cost from the decision of Singapore in ratifying the protocol. The cost that Singapore faces to ensure the result of the decision reaches its maximal benefits. The cost faced by Singapore is that they need a lot of resources whether in form of human or natural resources in developing clean energy sectors. A number of clean energy industries established in Singapore make them essentially need skilled workers in large quantities to run the industries and a large number of raw materials to ensure the production running.

Singapore is known for their amount of skilled labour who has expertise in engineering and good ability in doing research and development. Even though that Singapore has large quantities of skilled labour, the needs for a skilled workforce in clean energy industries is increasing since the clean energy industries keep on innovating on renewable and clean energy sources (Jayantee Saha, 2015). Due to the small number of Singaporean citizen, the government has an open immigration

policy that will increase the amount of skillful talent in engineering in Singapore. However, the increasing number of foreign workers in Singapore will create financial inequalities among the Singaporean population (InterNations, n.d.). In addition, to ensure the fulfillment of skilled labour demand for the clean energy industries, the government developed lots of training and scholarship programs in tandem with the industry partners and educational establishments (Singapore Economic Development Board, 2017).

With the small surface of the land area of around 700 km², Singapore has lacks of arable land and natural resources. Singapore land condition has made them lack of natural resources such as fuels, metals, or minerals (InterNations, n.d.). This condition forces them to import most of the raw materials needed by the industries in Singapore. The lack of natural resources such as metal complicates them in producing the material needed for developing renewable energy. For example, in developing solar photovoltaic the metal is one of the materials to build the solar panel. As their lack of metal, they cannot build the solar panel. So they have to import the finished panel from other countries. In terms of the development of clean energy in solar energy, Singapore has to import the solar related products. The majority of the unassembled solar photovoltaic cells, are coming from Austria, China, and the United States. For the assembled solar photovoltaic cells, they mainly come from Austria, Taiwan, and China. The import of solar photovoltaic cells whether unassembled or assembled is shown below:

Table 3

Import of Unassembled Photovoltaic Cells

IMPORT OF UNASSEMBLED PHOTOVOLTAIC CELLS (NMB) HS CODE: 85414021		
	2012	
Country	Qty ('000)	Value (S\$'000)
Austria	8,349,353	136
China	4,070,299	1,446
Christmas Island	10	0
Denmark	1	1
France	112	1
Germany	112	11
Hong Kong	450	23
India	18,000	31
Japan	1	0
Korea, Rep of	1885	17
Malaysia	111,142	15
Mexico	9,124	7
Netherlands	282	4
Taiwan	132,096	218
Thailand	256	290
United States	432,516	190
Grand Total	13,125,639	2,388

Source: International Enterprise Singapore

The table above shows that Singapore has imported the materials for developing the solar energy. The total number of imported solar photovoltaic in 2012 are more than 13 billion of unassembled solar photovoltaic cells that worth for more than two million Singapore dollar. Most of the imported materials are coming from the countries that are listed in the Annex I party. It strengthens the argument that countries in the Annex I party have an earlier research and development on renewable and clean energy. It is also one of the efforts in broadening the global trends on renewable and clean energy.

B. Singapore Decided to Reject the Kyoto Protocol to the UNFCCC

Before the decision of Singapore in adopting the Kyoto Protocol, Singapore rejected the possibility of adopting the protocol in 2005. This alternative had its own costs and benefits for Singapore. By having a decision to reject the protocol, Singapore might be benefited from the increasing their fossil fuel-based industrial activities without concerning the GHG emission they produced. However, in rejecting the Kyoto Protocol, Singapore decreases their international image in the international community. The international might see that Singapore had no effort nor concern in addressing the issue of climate change. The international cooperation and the technology innovation in clean energy would be lessened since the Kyoto Protocol is international scale agreement and might open up another cooperation opportunities either regional or worldwide.

Support arguments:

a. No Limitation in Increasing Fossil Fuel-Based Industrial Activities.

Kyoto Protocol with their objectives and purposes succeeds to shape the point of view in the international community regarding the degradation of the environment. As the effort to decrease the global emission, the protocol offered some mechanisms which are emission trading, joint implementation, credit system, etc. The countries in the world have been categorized in Annex I, Annex II and Non-Annex which had different obligations among them. The Kyoto Protocol actually has good intention to lower the global emission for the better future. The protocol indirectly shapes global trends that is the whole countries around the world are concerned with the issue of climate change and reduce their national GHG

emission. However, this situation actually is not suitable for the countries which are the non-Annex countries that most of them are the developing countries, especially in their economic sector. The complex consequences would harm the developing countries (Babiker, Reilly, & Jacoby, 1999)

The limitation and reduction of the number of the GHG emissions which is the fundamental obligation in Kyoto Protocol, could not be fulfilled by the developing countries. In the globalization era, when all states in the world compete for each other to expand their market and receive more money, not all developing countries are able to follow the acceleration of developed countries. Some of the developing countries are only able to produce and export the raw material and they become the host state as the place to build some branches or factory of Multinational Corporation (MNC). If the developing countries are required to cut their emission through many ways, this situation could hamper the potential of the developing countries for the revenue from the export sector as well as the factories built within the countries to adjust with the limitation. This situation clearly would shift the patterns of production and consumption of any economic activities in the domestic (Ellerman, Jacoby, & Decaux, 2010).

In Singapore case, the rejection of Kyoto Protocol would be an advantage. Singapore which is categorized as developing countries, would face some disadvantages if deciding to ratify the Kyoto Protocol, especially in the economic sector. The export-oriented system implemented in Singapore would be disrupted because of some adjustment regarding the deduction of emission. The adjustment in the production process would result in the consequences that possibly decrease

the revenue for Singapore. Besides, Singapore also experienced high dependency in the consumption of oil during the process of industry, and it would be disrupted if Singapore has to implement the Kyoto Protocol. Therefore, if Singapore rejected to ratify the Kyoto Protocol, Singapore had no limitation in conducting their economic activities and gained more profit without concerning on reducing the use of fossil fuel as one of the largest GHG emission producers.

Against arguments:

b. Derivation of the International image of Singapore in the International Community.

After the rejection of adoption of Kyoto Protocol in 2005, Singapore decided to ratify the Kyoto Protocol in 2006. The shifting situation in Singapore was through long considerations. If a state decides to ratify the Kyoto Protocol, it means that the state has to obey some circumstances and also has to bring the consequences. By ratifying the Kyoto Protocol, it reflects that Singapore is ready to implement the purposes and objectives of Kyoto Protocol within their domestic policy. This shifting situation directly influenced the international image of Singapore in the international community.

Previously, Singapore enjoyed their rejection toward Kyoto Protocol. There was no adjustment to follow the Kyoto Protocol in domestic regulation and the economic activity. The production and consumption of Singapore had no change and they were able to maintain their economic growth. However, the Singapore finally decided to shift their perspective into ratifying the Kyoto Protocol. As a state, before the decision maker decides to shift to ratify there would be a rational consideration. One of the considerations might be the international reputation. The

reputation of a state could be seen from their record or their action. By ratifying the Kyoto Protocol, it shows the commitment of Singapore to be more concerned toward their environment.

On the other side, if a state rejects to implement the Kyoto Protocol, the rest of the world would think that the state did not concern toward the sustainability of the environment. For instance, United States repeatedly announced that they refrained from the Kyoto Protocol and reject to implement to their domestic regulation. President George W. Bush considered that it would disrupt any activities of United States especially in conducting their economic activities. During Bush administration, United States faced the 'isolation' from the 129 countries that ratify the Kyoto Protocol. This situation was directly impacting to the international image of the United States that did not concern toward the sustainability of environment (Depledge, 2005). This situation also happened to Singapore, if Singapore did not ratify the Kyoto Protocol until 2006. It was impacted to the derivation of the international image.

c. Lesser International Cooperation and Clean Energy Innovation

One of the disadvantages of Singapore on keeping rejecting the Kyoto Protocol was there would be lesser international cooperation and it would impact to the low technology advancement in clean energy innovation. Regionally, Singapore has been known as one of the richest countries and most advanced in technology development. As a small country and not having many natural resources, Singapore has to perform their best in fulfilling the necessity of their people. Therefore, Singapore has to maintain their good relationship with other

countries since Singapore has to import many goods and services from other countries with the expectation to conduct the international cooperation. The participation in the Kyoto Protocol in addressing global issue might link in another cooperation. As said by Barret and Stavins (2003), one cooperation on one issue could link to another cooperation (Scoot Barret, 2003). So, the less of one country in participation in addressing on an issue, the less cooperation they will get in the future.

Beside the international cooperation in fulfilling the goods and services, Singapore also intends to promote them as the center of energy research and excellence. Through the international cooperation, Singapore is expected to have collaboration in the research and development in many aspects. One of them is the collaboration in the technology advancement. Singapore believes that, by cooperating with many states, it would give many advantages especially in developing the technology of clean energy. The advantages that Singapore received would be reverse if Singapore stayed on their previous decision. There would be a possibility that Singapore could not set up their international cooperation with many countries. Moreover, most of the technology advancement in Singapore was the result of international cooperation with many states. As an evidence, the United States has less benefit from the trend of innovation in climate change because they did not ratify the protocol. Even though they have less benefit in the innovation in climate change through cooperation, they still become the leading inventor country in the field (Macabrey, 2009). It is because they have a lot of natural resources

unlike the condition of Singapore. Therefore, the technology advancement in Singapore would not be as advance as they ratified the protocol.

Based on the model of Rational Choice by Allison, Singapore had chosen the most rational choice. The government of Singapore faced two alternatives whether to ratify the Kyoto Protocol or keep rejecting the implementation of Kyoto Protocol. In selecting decision, the government considered the benefits, the cost and attempts to maximize the decision itself. By ratifying the Kyoto Protocol, Singapore received three benefits i.e. the betterment of the International image of Singapore in International community, the increase of the foreign investment in clean energy sector, and the advancement of technology in Singapore especially in clean energy sector.