

**IMPACT OF CLIMATE CHANGE TO
PEOPLES LIVES AND ECONOMIC
SITUATION OF MEKONG DELTA
REGION**

**(The contribution of Korea for the
international cooperation)**

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NIPA Expert in Vietnam

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I. Introduction

Last April, VCCI Can Tho (Vietnam Chamber of Commerce and Industry's Can Tho Branch) asked me (Chung, Heuk Jin) the article of the impact of climate change to the economic situation in the Mekong Delta, but I hesitated the answer, because in the past there have been many research works of the leading international organizations, experts inside and outside the country, the research agency or articles in academic circles about the issue. Meanwhile, I, writer of this document only have experience working 2 years as a policy expert of the Institute of Strategic Environmental Resources (ISPONRE) group advisor (Think-tank) under the Ministry of Natural Resources and Environment in Vietnam in the South of Vietnam. So I have reserved the answer. However, after receiving suggestions earnest again, I has changed my mind in a positive direction.

I think that can write in the direction of looking for alternatives that experience and science and technology of Korea can contribute to the content available framework, which is able to create new value added than as the proposed solutions and strategies to respond to new existence, survived the impact of climate change on the Mekong River delta.

On the other hand, the expert, Kim Do Kyong also working as consultants NIPA in the field of Information Technology and Environment Management at the Center of Environmental Technology in Ho Chi Minh City has decided to share his knowledge and valuable experience with me. So we have replied to write the document to VCCI Can Tho.

Starting from this point, I collected data from report the field trips to Mekong delta, the photo archives of the English newspaper cutting from Vietnam and participated in seminar materials 'DELTA 2013 Workshop', co-sponsored by City of New Orleans, Louisiana, Mississippi, the United States and Ho Chi Minh city in last May for 4 days 3 nights. An expert advisor Kim Do Kyong collected materials from university, research institutions, and local agencies related to climate change in Vietnam, and South Korean companies to invest in the Mekong River Delta. On the basis of a set of necessary documents, we predicted models will convert the structure of the industry after the Mekong Delta due to the impact of climate change, we also propose a new application model of the industry to adapt to climate change Korean green industry that can contribute.

II. Awareness raising on global climate change

1. Definition of global climate change

What is the difference of Weather (Meteorology) and Climate? Weather (meteorological) atmospheric conditions such as temperature, rainfall, wind, etc. is defined in units of a day or a week. The information that we get daily updates on the news as "Today the rain and the wind" or "Tomorrow will be blue and hot" etc is 'weather'. Meanwhile, the average of weather types defined for that particular area over a long period of time is called climate.

For example, Southeast Asian subtropical climate is hot and humid all year round, even though Korea is the difference between the seasons, but the correlation is the temperate regions of the mid-latitudes. However, despite the climate seems relatively stable, but the fact of climate change is not stopped in time and area. There are times when the climate oscillations occur larger, comprehensive and at times small. But about 2000 years ago, Earth's climate was relatively stable climate like now and since then new people settled on an earth and human society emerging.

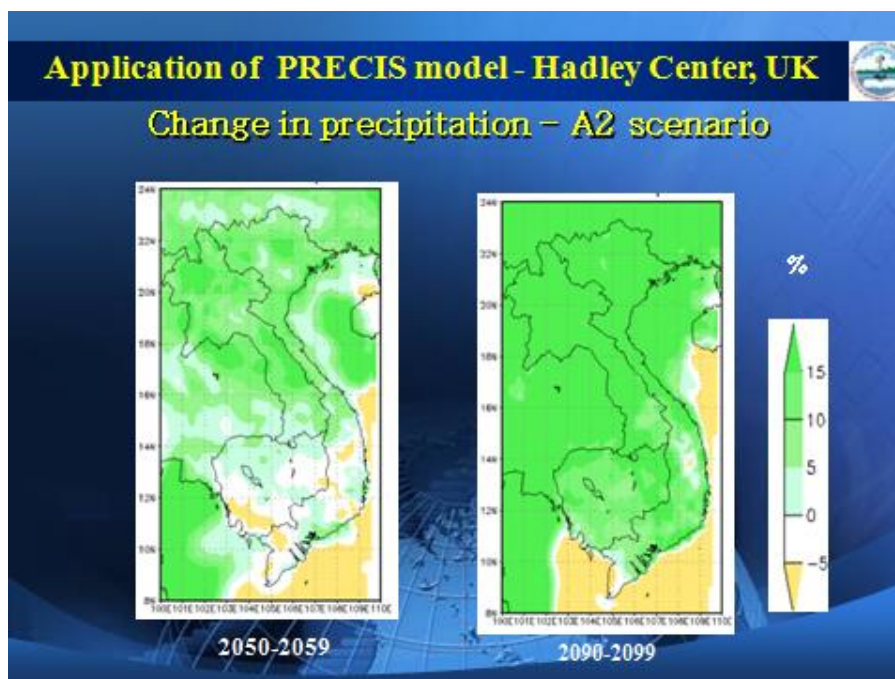
Thus climate change is a huge impact to human society. However, until now, because of the magnitude and scope of climate change is still quite long compared to the cycle of human life we should still not very important. But when the temperature suddenly increased recently, making the issue of climate change became a major concern.

Most clearly demonstrated, you can visually see the climate change is the increase in temperature. Earth's temperature is maintained by the atmosphere surrounding the earth. Canine atmosphere helps maintain the Earth's temperature through the greenhouse effect. But increasingly industrialized going strong, increasing emissions of greenhouse gases caused by humans who have made the atmosphere becomes thicker, the amount of solar heat radiating universe less than a day ago, and since then started phenomenal increase in average temperature, also known as the warming of the earth.

If according to research reported in the special scenario of greenhouse gas emissions released by the IPCC, by 2100 average temperatures forecast to rise to about 5 °C.

2. The relationship between the Earth, Humans and Climate Change

Climate change has been happening for hundreds of thousands of years ago, along with the repetition of the Great State glaciers and ice, Earth's ecological environment change also followed in order to adapt to the times and any man that is not the exception. About one thousand years ago, the climate began to stabilize, which is an agricultural society began to form predictions since then. However, the current climate change is not due to natural causes but rather is due to human causes. That's the problem.



Climate change has brought both benefits and bring the damage, depending on the region. In the past when human civilization has not yet developed, such as the Industrial Revolution, the damages and benefits are the same. But now, the damages are more serious than benefits, because the tectonic movement or deformation of the Earth's crust occurs in the context of industrial development on a large scale with the construction of large urban spread along the coast.

5) Sea Level Rise Scenarios

- By mid of the 21st century sea level is expected to increase about 30cm
- Sea level would rise about 75cm by the end of 21st century compared to the period of 1980 - 1999.

SLR Scenario	Decades in the 21 Century								
	2020	2030	2040	2050	2060	2070	2080	2090	2100
Low (B1)	11	17	23	28	35	42	50	57	65
Medium (B2)	12	17	23	30	37	46	54	64	75
High (A1FI)	12	17	24	33	44	57	71	86	100

Source 'climate change scenarios and sea level rise for Vietnam'
 (Report of the Ministry of Natural Resources and Environment, June 2009) 'Climate change and sea level rise scenario for Vietnam'
 (Ministry of Natural Resources and Environment 2009.6)

In the past 20 centuries, sea temperatures have increased as faster than the increase of the amplitude of the average temperature on the earth's surface. Sea levels also rise by an average of 10 ~ 20cm. If

this phenomenon continues to grow, the island nation located in the Pacific region, the country located in low-lying areas, or countries with high population density, crowded coastal areas, and the It lies near the sea will soon be submerged in sea water. For example, in countries focus heavily populated coastal areas such as Bangladesh, the serious damage caused by seawater intrusion is a concern. Or the Republic of Maldives to the 2011 forecast of sea-level rise of up to 88cm and then 12 million people will be displaced. On the other hand, national case Tuvalu, current sea levels have risen and begin migration to Australia or New Zealand.

Besides, if sea temperatures rise, glaciers are influenced by sea water will melt quickly. Currently atmospheric temperature has increased by about Arctic 5 °C and this phenomenon has led to the glaciers of the North Pole region decreased 40%. In Switzerland, glaciers have been reduced by one third, in addition to the Greenland and Antarctic ice volume also continued to decline. Mount Kilimanjaro has melted the ice from 80% in 1912, 40% of Kenya mountain snow has melted from 1963. And the time snow started melting in North America has become faster from 1 week to 4 weeks.

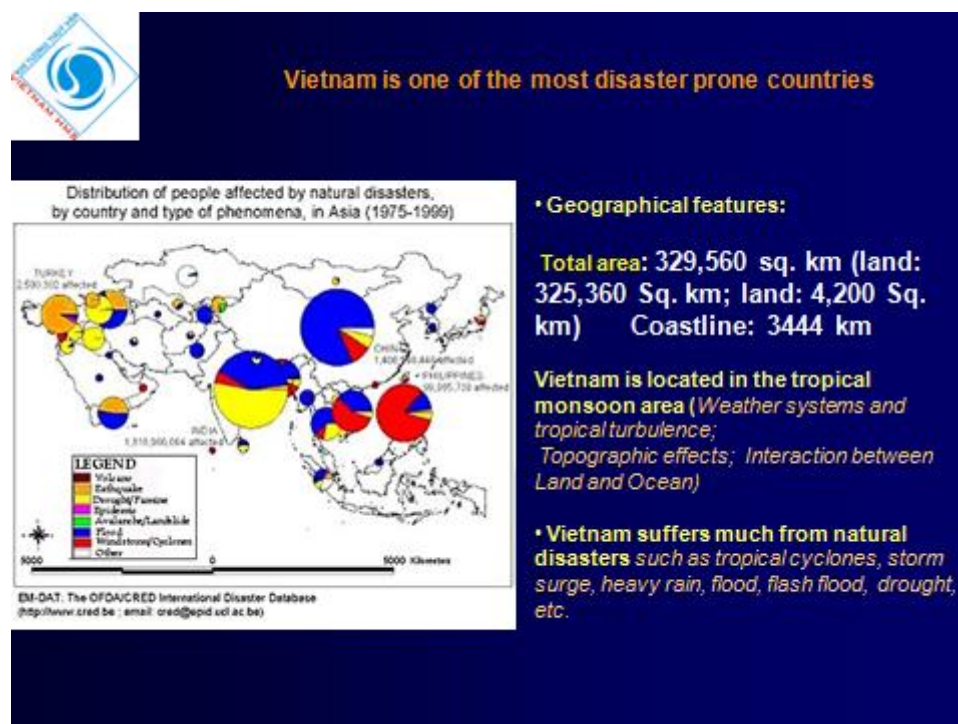
III. The impact of climate change in Vietnam and the Mekong Delta

1. The impact of climate change in Vietnam

1.1. The impact of natural disasters of climate change

1) Increasing floods and droughts

Vietnam lies in the monsoon region, as reported by the Bureau of Meteorology figures Vietnam are cited below, we can see Vietnam as one of the countries most prone to natural disasters around the world due effects of climate change.



Source materials Meteorological Department Vietnam, Ministry of natural resources and environment
NATIONAL Hydro-Meteorological service

2) Statistics for damage caused by natural disasters (2010), Source of the Bureau of Meteorology figures Vietnam

But the damage caused by floods in 2010, very serious. 2 storm towards Central and Highland situation that has caused severe flooding, causing immense damage to life, economic, social people. And consequently can not recover easily until the later years.

In 2010, due to storm damage, hurricane, tornado, flood, lightning, hail, causing landslides caused 282 people dead, 96 missing, 528 wounded and 6 thousand 157 houses collapsed roofs, 5 thousand 916 classrooms, hospital rooms 168 damaged, washed, 160 665 ha of rice were destroyed, 521 damaged boats.

Total damage is estimated at 16,211 billion (Refer to the table below)

Table: Statistics of damage caused by floods in 2010

Type of damage		Number of losses
People	Deceased Persons	282 peopls
	Missing Persons	96 peopls
	Wounded Persons	528 peopls
Buildings and neighborhoods	Flooded house	6,157 houses
	Submerged · damaged house	482,178 houses
	Flooded school	334 schools
	Damaged school	5,582 schools
	Flooded and damaged hospital	168 hospitals
Agricultural production	Flooded rice field	160,665 ha
	Flooded crops	199,071 ha
	Number of dead cattle	4,567 cattles
	Number of dead pig	32,555 pigs
	Number of dead pig	767,782 fishies
Transportation	Flooded land	155,675,108 m3
	Damaged road	1,244 km
	Flooded and damaged bridge	420 bridges
Irrigation works	Destryoyed land	2,584,708 m3
Fisheries	Flooded and damaged boat	521 boats
	Losses area of aquaculture ponds	28,481 ha
Estimated total damage		16,211 billion VND

1.2. Impact on life, daily activities of the people and the movement of population

1) Short-term Impact

The impact of climate change in the short term is not very big impact to daily life and livelihood of the people. It can be seen much less affected compared to the Mississippi River delta. However, the volatility of market prices, traffic distribution structures, export mechanisms have tremendous influence in the production of the farmer and the emerging causes of social problems such as loss income, increasing income disparity, unemployment, etc.

2) Long-term impact

If sea levels continue to rise, increasing storms and rainfall is constantly changing, then the damage will become more serious. Without prior preparation or treatment measures to cope with the change in the number of landless people will increase, but whether they will lose ground means of livelihood, forcing them to go find a new job and since then the migration occurs.

1.3. Impact on business activities, livestock and industrial production

1) Short-term Impact

Currently the market price fluctuations strongly influence than climate change. Secondly, the impact of low productivity, resource depletion of fish stocks due to pollution and coastal land is great. However, if you continue to build dams upstream, will entail amplification effects and can quickly feel the impact of climate change.

2) Long-term impact

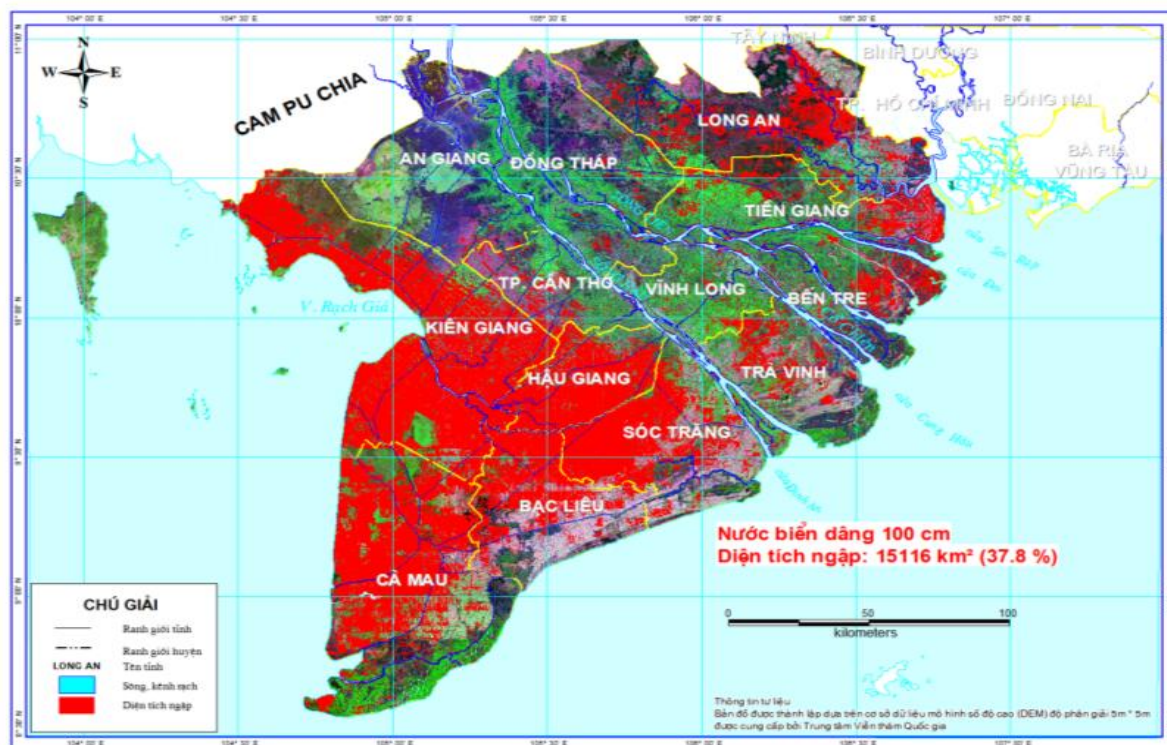
The essential elements necessary for life of the people living along the river as fishing grounds, food security may be affected by the threat of the complex nature of climate change Mekong Delta and upstream dam construction.

Climate change increases flood damage, drought, severe shortage of water resources, saline intrusion, etc, seriously makes it difficult to survive, survive or method of farming aquaculture traditional. Therefore, a new industry can help to adapt and overcome these difficulties will become a new source of growth for the economy of the Mekong Delta.

2. The impact of climate change in the Mekong Delta

2.1. The influence of climate change in the Mekong Delta

Sea level rise will lead to coastal land loss, severe soil salinization due to saltwater intrusion from the sea, floods, prolonged droughts, etc.



Source 'Climate change and sea level rise scenario for Vietnam'
(Report of the Ministry of Natural Resources and Environment, June 2009)

Based on the scenario of the Ministry of Natural Resources and Environment in Vietnam in June announced in 2009, the same as in the picture above can be seen when the sea is 100cm 37.8% of the Mekong Delta will turn lost.

To help understand this problem, we would like to Source a recent article.

※ **Source the article "Rising sea levels push plains in danger of disappearing (Delta Rising sea levels put at risk)** published in the English newspaper "Viet Nam News" dated 06/24/2013

Mekong Delta, the largest granary of the country, 2040 will sea levels rise by 30cm. This is the content that is included in the report of the World Bank released worldwide last week under the title "Turn down the heat: Climate extremes, Impacts and the case for regional resilience"

Also according to the report, sea levels will rise by 30cm led to the 12% decline in production of crops. Sea level rise, tropical cyclones more intense, landslides caused by human activity will collapse, disintegration of economic activity plains as agriculture, aquaculture, fisheries, tourism etc. ...

World Bank forecasts losses shrimp farming and catfish of the Mekong Delta will reach 130-190 million annually.

Riverbank erosion, landslides increasingly serious

※ **Source: "Plain drought, sea water destroyed 6,000 hectares of rice (Delta drought, seawater ruin 6,000 ha of rice)"** on the English version newspaper "Viet Nam News" in June 2013.

Drought and salinity were made for 6,000 hectares of summer-autumn rice Mekong Delta burned to death. Soc Trang province suffered the worst with 5,600 ha.

3 months before the crop is damaged up to 5,600 hectares of rice

Due to drought, salt from sea water flowed into the inland penetration of up to 60 km from the Mekong river mouths.

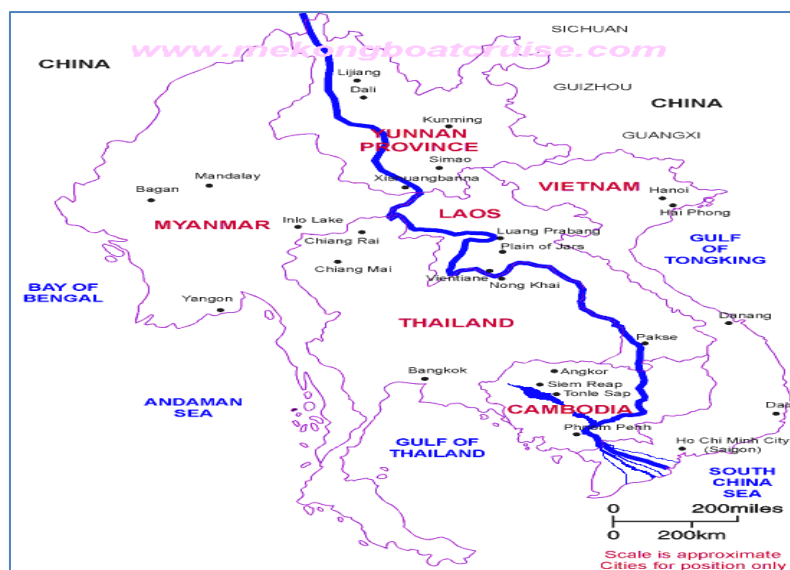
Mekong Delta region face a severe water shortage, water level upstream the Mekong River has declined 10-40% from normal levels.

To prevent water shortages and saltwater intrusion in the dry season, need to upgrade the irrigation system, the infrastructure of the Mekong River delta.

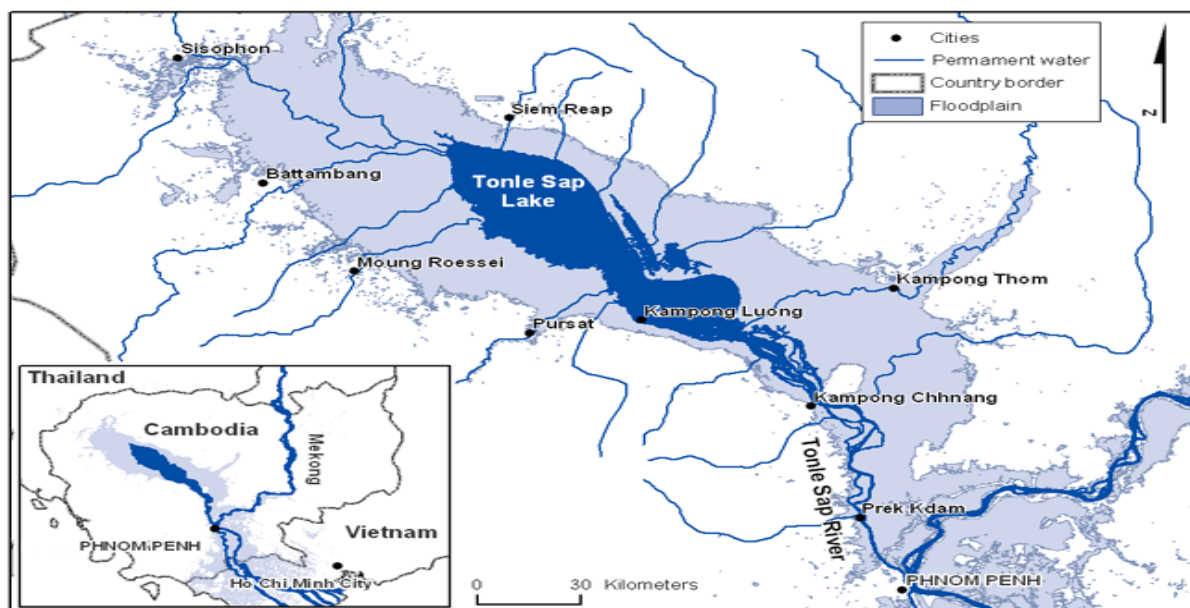
Moreover, investors need to monitor budgets, monitoring and forecasting of water resources standby to effectively manage agricultural systems and irrigation.

2.2. Installation of upstream dams and environmental risks in Mekong Delta

I have been traveling in Cambodia to investigate actual KOICA project "Southeast Asia Disaster" with Dr. Chung Hee Seong, President of Environment and Civilization Company. The writer would like to Source some of the content of the report made at that time.



The Mekong River is where management issues transboundary river basins, including the most complex of China, Laos, Thailand, Myanmar, Cambodia and Vietnam. Mekong delta Commission currently manage the basin. In Cambodia, a country that has an area of large river basins and also the countries most badly affected.



Tonle Sap lake or on the river Mekong flows through Cambodia perform natural functions of water on a large scale. During the rainy season (June ~ November), Tonle Sap lake acts to reduce flooding. As the dry season (December ~ May) acts to provide 50% of the river water in the Mekong River delta. The dry season, the lake is quite narrow and shallow, with a range of 1 meter deep area of the lake about 2.700km². However, during the rainy season, the water level rises up to 9m depth and lake area increased to 16,000 km². Thus, the Tonle Sap help prevent flooding in downstream areas during the rainy season and provide additional compensation for the Mekong countries dried up during the dry season.

Recently, due to the impact of climate change and the effects of upstream dam construction in China has led to the function of the safety valve is weakened. This is a great influence on the lives of more than 3 million people live in the basin. Among them, particularly the Mekong Delta downstream end of the river system, it can be said to suffer fatal nature. The function of the safety valve is impaired lakes Sea will lead to increased seawater intrusion phenomenon, roads, traffic, etc, infrastructure will corrode, rust clay; damage to communications, road infrastructure, equipment and facilities is expected to increase.

Not only China but also Laos dam plans, this has become a hot issue between Vietnam and Laos. Since the latter can be the upstream countries will also have plans to build dams to ensure water resources should be a strong possibility this problem will become international disputes. Despite the Commission Mekong River Basin management, but China did not join the committee and the powers of the Commission and should not be limited to promote the role of coordinating the relationship between the national .

2.3. Assess the impact to the economic structure of Mekong Delta

From focusing mainly rice and aquaculture, will appear gradually become a new industry growth dynamics

※ **Source the article " Their Beleaguered Delta Farmers sell off land"** Viet Nam News published dated 25/06/2013

Pham Van Dam, who has been a rice farmer for more than 50 years in Hau Giang Province's Chau Thanh A District, said he has not earned any profits in recent years due to the volatility in prices. This summer-autumn crop has been especially bad with very low yields as well as prices. He plans to sell all of his 5,000sq.m of paddies located near National Highway 61B and shift to some other business, he said.

Tran Thi Ngoat, a farmer in Can Tho City's Thot Not District, said for the last three years, tra farmers have incurred severe losses after fish prices slumped and costs kept rising. Thus 60-70 per cent of them have has stopped farming and want to sell their land to settle debts, she said. Again, despite falling prices — at VND100 million per 1,000sq.m, down by half from six years ago – no one wants to buy, she said.

※**Source article "Mekong Delta targets higher GDP growth"** The newspaper published "Viet Nam News" dated 11/06/2013

Authorities in the Cuu Long (Mekong) Delta have outlined a major development plan that calls for an annual increase in GDP growth of 11-12 per cent a year from now to 2020. Industrial production and the services sector would account for 60 per cent of the economy, while agricultural production would drop to under 40 per cent, the Southwestern Region Steering Committee said. To meet the target, the Delta, the country's largest rice, fruit and fishery area, plans to diversify its products and begin intensive farming in specific regions. Specialised cultivation zones will be used to grow high-quality, high-yield products, especially rice, fruit and short-term industrial trees. Cultivation will also be expanded for plants used to make industrial materials and animal feed. Under the plan, aquaculture, which is a major activity in the Delta, will include more multi-purpose irrigation works and operate under strict environmental guidelines.

Small- and medium-sized industries will also be developed, and the Southwest seas will be exploited for the gas, electricity and fertiliser industries. In addition, eco-tourism and waterway tourism will be expanded, while Kien Giang Province's Phu Quoc Island will become an international tourism and trade centre. Can Tho City, the Delta's major city, will expand its industry, trade and services sectors to serve as a commercial hub for the entire area. By 2015, the Delta is expected to complete several targets, including inland water and road transport infrastructure.

3. The prospect of a new industry was born forecast due to climate change

3.1. Water industry

Severe water shortage, existing capabilities boom water wars between countries upstream and downstream; Currently, some places like Ho Chi Minh City is facing problems due to landslides severe overuse groundwater load

3.2. Construction industry

Vietnam is a country located at the downstream end of the river system should not be able to build dams to ensure water sources. However, the construction of bulk storage tank water used for many purposes such as flood prevention will be avoided.

3.3. Industry environment

Now if the problem is not well managed land plots level rise due to greater use of fertilizers and pesticides to produce rice, fruit trees, and marine pollution due to the use of food preservatives and too much aquaculture industry, not the health of people affected by the industry that yields will decline rapidly. So demanding industry environment applied science and technology and equipment to produce green

3.4. Industry forecasting meteorological forecasting

The meteorological disasters become more intense, so active in the industry equipped with meteorological monitoring, data analysis machines etc, will grow.

Urgent needs (2007-2010)

1. Strengthening flood and storm forecasting capabilities in Viet Nam

- Implementing urgent projects addressing flood and storm forecasting capabilities
- Implementing subproject “strengthening flood forecasting and warning capability for Cuu Long river delta” (under WB-4 project)
- Implementing Italian ODA project “Strengthening flood forecasting system for central Viet Nam provinces”

Source documents of the Department of Meteorology Vietnam; Ministry of natural resources and environment
NATIONAL Hydro-Meteorological service

Urgent project (2007-2010)

- Upgrading and providing new wind and air pressure equipment for 74 meteorological and hydrological stations along sea coast.
- Re-establishing 2 radio-sonde stations
- Upgrading/buiding 18 marine hydro-met. stations
- Upgrading 2 radar stations in Tam kỳ and Phù Liễn
- Investing to build 3 new weather radar stations in Sơn La, Đông Hà and Quy Nhơn.
- Upgrading NOAA satellite receiving and processing station

Source documentation of Hydrometeorology Department Vietnam;
Ministry of natural resources and environment
NATIONAL Hydro-Meteorological service

3.5. Food processing, storage and transportation

The article about the loss of agricultural prices in the Mekong Delta and emerging issues

※ Source article “**Farmers deserve fair price for Produce**” published in English newspaper "Viet Nam News" dated 27/06/2013

Harvest, as lower commodity prices and poorer farmers.

Where a watermelon this summer, farmers Mekong Delta sold to traders for 2000-4000 VND / 1 kg, dirt cheap prices only by a bathroom package. Price insufficient production costs. However, retail prices in the market in Hanoi, prices were pushed up to 25,000 VND / 1 kg makes both producers and consumers are becoming losers. The other agricultural products such as rice, coffee, rubber, tea, cassava and fell repeatedly.

In this context, technical accumulation and storage of agricultural backwardness and weakness of preservation during transport is emerging as the main cause of this phenomenon.

Therefore, the industry is expecting food processing, storage and transportation will become the industry can attract the most attention in this area.

3.6. The forestry sector

Enhanced eco-service in order to protect the ecosystem and disaster prevention is emerging as a policy problem

IV. Proposed policy response to climate change and implement solutions

1. Global trends in response to climate change

1.1. Overall assessment of the impact of climate change

1.1.1. Global climate change is unavoidable?

There are many factors causing the climate of the Earth. Among them, the nature of climate change is natural but inevitable climate change, an artificial, human-caused, the front can be prevented. What we want to emphasize here that go together to prevent climate change caused by humans.

■ Factor climate change in a natural way

◆ The Greenhouse Effect

The atmospheric gases such as water vapor, carbon dioxide, methane and carbon chlorofluoro absorbed and re-emitted infrared part of radiation emitted from the ground, which increases the temperature of the earth's surface and troposphere. This effect is known as the greenhouse effect and the gases causing the greenhouse effect are called greenhouse gases

◆ The conversion of solar energy

Solar power emanates not fixed. If you look at the temperature record of the Earth, you can see the change in 11-year cycles, and this is relatively consistent with the change cycle of the black spots sun

◆ Change Earth's orbit and the tilt of the axis of rotation

If the orbit and the tilt of the axis of rotation is changed, the amount of solar energy that the earth receives will change, and the energy distribution by latitude will change, leading to altered climate.

◆ Effects of Aerosol

When the volcano erupted emissions and ash into the atmosphere as small particles of dust, reflect solar radiation back into space, making the temperature drop earth surface.

■ Caused by human-induced

Since the industrialization process, with the surge in use of fossil fuels and increasing population caused a large amount of greenhouse gases such as carbon dioxide, methane, chlorofluoro carbon (CFC) emissions into the atmosphere, causing the greenhouse effect increases.

In addition, not only that human greenhouse gas emissions into the air are large numbers of small particles through agriculture and industry. These particles affect the radiation balance and is the cause of climate change.

1.1.2. Overall assessment of the impact of climate change

■ Climate change is affecting in the industry

Korea's climate varies from temperate to subtropical climate and so are a lot of changes in the industry. In the spring, autumn becomes shorter summers and longer winters. Thus it can be said for the textile industry, the demand for cape coat (Trench Coat) _san wearing products has decreased over the season and the series appearing each season (Seasonal good) can wear until winter

In addition, the air conditioner is typically known only use this in the summer but in September the highest temperature of the day continued on 20 degrees C and the time you use conditioner lasts until

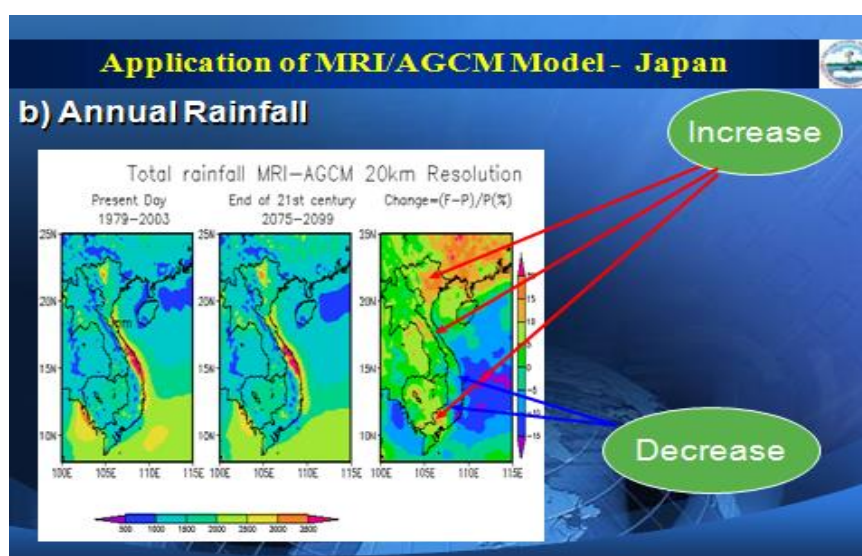
the spring season collection. Thus the demand for air conditioning is increasing. In addition, for products, tours are also shifting the travel programs on a variety of tourists increased and also tang_ Alaska State where previously difficult to access because of the weather too cold.

As the sweltering heat of summer continues, sales of air conditioners, fans, cream rising. Conversely, if the long rainy season sales of products such as dehumidifiers, umbrella, raincoat, rain boots, insecticides increased.

Thus climate change may have a positive impact, both at the same time have a negative impact on the industry

■ The impact of climate change in a number of specific areas

Climate change has brought both benefits and bring the damage, depending on the region. In the past when human civilization has not yet developed, such as the Great Before the Industrial Revolution, the damages and benefits are the same. But now the tectonic movement or deformation of the Earth's crust occurs in the context of industrial development on a large scale with the construction of large urban spread along the coast, making the region and its people suffered more than overwhelming or people getting the benefits. This shows the seriousness of the problem



1.2. The plan for responding to global climate change

1.2.1. Convention on Climate Change and the Kyoto Protocol

■ The United Nations Framework Convention on Climate Change

This is the National Convention was signed in June 1992 in Rio de Janeiro in order to cope with rapid changes in climate arising phenomenon of global warming due to increased use of fossil fuels. Members who join the National Convention is 188.

The main content of the Convention is set national statistics on greenhouse gas emissions, national planning related to climate change, research and development techniques reduce greenhouse gases and protect the gas absorption glass.

■ Kyoto Protocol

This is the protocol the parties signed the Climate Convention adopted in Kyoto, Japan in February 1997 as a means to commit to implementing specific climate change convention.

October 2004, the Protocol has satisfied the conditions for entry into force (55 countries have participated in the signing and the national emissions account for 55% of greenhouse gases) through Russia participated. Official Protocol takes effect from February 16, 2005.

■ The main content of the Kyoto Protocol

The content focus of the Protocol is applicable legal obligations for reducing greenhouse gases, setting emission reduction targets of developed countries (Annex 1 countries), select programs clean Development mechanism to reduce emissions causing the greenhouse effect. In this program include quota trading mechanism emissions reduction, CDM (Clean Development Mechanism), and JI (Joint Implementation)

1.2.2. Carbon markets and the Clean Development Mechanism (CDM)

1) The situation of the world carbon market and promote CDM

■ Kyoto Protocol officially takes effect

- ◆ A whole new market was born based on the official announcement of the Framework Convention on Climate Change (1992) and the Kyoto Protocol (2007), the carbon market is formed mainly at the national developed (Annex 1 countries).

■ Operation of carbon markets in the world

- ◆ Since the formation of Compliance Market principles of the Protocol on the sale of emission quotas (EUA) and certified emission reductions (CERs, ERUs), has developed (after 2006) extended the voluntary market on sale of certified emission reductions. In particular, the clean development mechanism CDM plays a huge role in promoting the development of the world's carbon markets for developing countries, while difficult to cut greenhouse gas emissions in the host country, can use use this mechanism to invest in developing countries where emissions reductions can easily by relatively low costs, reducing emissions and contributing to the implementation of the obligations of reducing emissions by country regulations. The developing countries to receive funding and support for science and technology from the developed countries to implement afforestation projects, greening, or the construction of sanitary landfills, collected benefits. Meanwhile, developing countries may be obliged to implement cuts in carbon emissions affordable.

■ The current situation of the world carbon market

- ◆ In 2007, the trading volume on the market record at 2,676 Mt CO₂, with a total value of 40 billion euros, an increase of 1.8 times compared with 2006. If standard values based on the EUA (European Union Allowance) s increased 70%, CER (Certified Emission Right) s increased 29%.

■ Analysis and evaluation of the carbon market Vietnam

- ◆ Experts expect international scale carbon market in the world in 2008 will grow by more than 56% growth over 2007.
- ◆ Vietnam now known as countries implement many CDM projects with developing countries, so that was very interested in trends of the carbon market. The writer has ever experienced preaching model of Korean green growth at the Ministry of Industry and Trade last year, when the question that the writer is getting the most executive experience of Korean carbon market and improve the ability of the carbon market Vietnam.

■ Basic eligibility of CDM projects

- ◆ Must abide by Additionality rules of the CDM Executive Board announced. In other words is the recognition of the new cuts are not part had been previously cut.

- Situation promote CDM projects
 - ◆ Since the signing of the Kyoto Protocol, CDM projects entering the rapidly growing trend
- Type promote CDM project
 - ◆ Renewable energy: 65%
 - ◆ Treatment and solid waste management: 21% (burial: 8%, bio gas: 7%, agriculture 6%)
 - ◆ The amount of Non-certified CERs CDM CO₂ (HKC23, N₂O etc.) Accounted for the majority (48%) overall CER certificates.

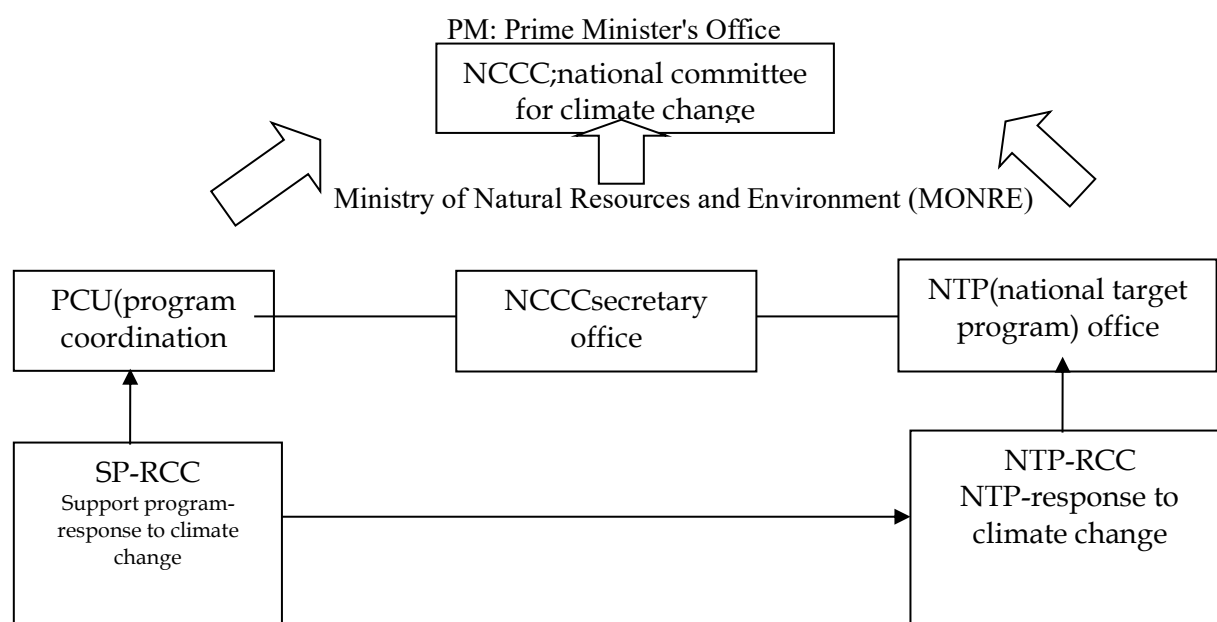
2) The danger and chance elements of the CDM project

- Impact factor 1: uncertainty about the price of CERs
 - ◆ CERs price is influenced by a variety of factors..
 - ◆ Emerging issues political, price volatility PHASE2 EU-ETS EUAs, Hot air transactional capabilities and nature of price fluctuations transactions
- Impact factor 2: Real balance demand and supply of CERs
 - ◆ The imbalance of supply and demand can be said to have made the value of CERs is down.
- Impact factor 3: Getting trapped carbon (Carbon Capture and Storage) and the recognition or non-recognition of the development of nuclear CDM.
 - ◆ CCS, nuclear development has the potential to reduce greenhouse gas high
 - ◆ When recognized as the clean development mechanism CDM, have the potential to cause a decrease of the value of CERs in the market for providing large amounts of CERs → reduced motivation to promote renewable energy CDM
- Impact factor 4: The ability to expand the CDM development policy nature (Programmatic)
 - ◆ CDM policies capable of implementing the center's local government become a new field of CDM projects with high potential cuts
 - ◆ If the expansion of the field is limited at present, to promote the implementation of the project will likely increase wildly.

2. Status of responding to climate change by the Government of Vietnam

2.1. System structure

Organizational systems to manage climate change in Vietnam in developing standards of advanced countries in the world, but in terms of governance and the results still have not been many points. First, if you look at management systems to climate change in Vietnam, could see the prime minister is head of Climate Change, Minister of Natural Resources and Environment is deputy chief and other departments including PCU office secretary (office secretary), and the office national target program (NTP: national target program office). However, the unit is operating in practice is SP-RCC



SP-RCC currently has approximately 10 employees and is a leader dispatching JICA experts. The task of actually integrating SP-RCC is the content is determined by NTP in the project's development departments, relevant agencies and support the implementation process, implementation.

The operation of this system is the main financial mechanisms to support climate change projects were selected NTP, and SP-RCC implementation is deployed units. Although the government has tried but due to the limited scale of foreign aid assistance, by all means limited bureaucracy in the implementation process has led to the level of response to climate change is felt in fact still lacking, not enough.

2.2. Response measures seen from newspaper

Source article "Strategic climate change policies needed; Submitted to the 7th Party Central Committee" published in the English newspaper "Viet Nam News" dated 18/01/2013

- Vietnam is not prepared to receive assistance
 - ◆ Mekong rice production; Weakness before climate change; Suffering damage such as flooding due to sea level rise
 - ◆ Compared with the serious nature of the problem, of which Vietnam aid received from international organizations, foreign governments remain relatively low compared to the scale of aid in climate change other countries around the world.
 - ◆ Therefore necessary to improve, improve the capacity of aid to be received as a legal mechanism to establish positive to attract more aid from the international community.
- Lack of budget to respond to climate change of government

- ◆ Federation of Labor and Social Sciences Institute; research budget for 1 million scientists only a few billion
- ◆ Recipient scale after 2010, \$ 500 million
- Not an effective response to climate change due to the lack of funds
- Development Solutions ensure financial resources for the project to cope with climate change
 - ◆ Establish a mechanism for the law, and the legal mechanisms ready to receive aid
 - ◆ Application of the principle of benefit contributions
 - ◆ Application of the principle of polluters bear the costs

3. Solutions to response with climate change, the delta of the Mekong River

3.1. Solutions to apply with climate change in the delta of the Mekong River

In terms of the Mekong Delta foreseeable climate change or reductions is difficult, so researchers looking for solutions to adapt the best ecological, environmental, economic, society to respond to situations arising is how cost effective.

Source article "Delta Rising sea levels put at risk" published in English newspaper "Viet Nam News" dated 24/06/2013

Ajali Acharya, the World Bank Viet Nam's environment cluster leader, said the report provided scientific evidences on which Viet Nam and development partners could help the country move along the low-carbon, climate-resilient, sustainable-development path.

- Advanced functions of the Mekong Delta Management Committee
 - ◆ In the 6 Mekong countries, China and Myanmar should not join claudicating
 - ◆ Needed to improve management capacity and strengthen the functions and powers of the Board of Management, production and information management, enhancing research and political leaders to strongly regulate the relationship between the member States.
- Selection and promotion of eco-service performance, bio-based adaptation ecological nature
- On the economic front, selection and implementation of strategic green growth, sustainable development
- In terms of society, improve the industry structure, establish and implement individual solutions and policies on unemployment and hiring Mekong region, which generated increased seasonal unemployment

3.2. Proposal for grant related industries and industry of the Mekong Delta

1) The basic guideline to develop the Mekong

Mekong Delta is the delta formed in sedimentary soil, cultivated land quite so fertile. However, the weak ground so easily eroded. There are many areas of bogs, wet areas so this place is also the treasure of ecosystems.

It is therefore important to choose green growth strategies and adaptation strategies to climate change (eco-system based adaptation) focused on ecosystem conservation can both be rich in natural resources, has to be can economic growth and rising incomes seeking profit. Need to avoid attracting industry toxic industrial chemicals or prevent the development could lead to pollution, destruction of ecosystems.

2) Prepare the green growth model with structural reform process industry and promote pilot projects Pilot

Vietnam in August 2012 chose green growth strategy (VGGS) approved by Prime Minister, and is currently preparing the implementation plan to implement the strategy. Regarding content, I will mention again in the climate change project with the possibility of cooperation between Vietnam - South Korea

V. Solution of Korean contributions to the survival of the Mekong Delta

1. The project on climate change has the possibility of cooperation between Vietnam - South Korea

1.1. Cooperation Project 1: Promoting implementation of green growth Mekong Delta

- Support Master Plan for Green Growth Strategy Vietnam



- ◆ Object
 - Ensure circulation (virtuous cycle) between economy and environment of Vietnam, establishing national position Vietnam in accordance with the expectations of the world.
- ◆ Content
 - Preparation of green growth model with structural reform process and industry promotion pilot project (Pilot Project)
 - May 8.2012 Vietnam has selected Green Growth Strategy in Vietnam (VGGS) approved by the Prime Minister, and is currently developing an action plan to implement the strategy.
 - KOICA Korean organizations have signed a memorandum of understanding MOU with the Ministry of Planning and Investment (MPI) to ensure budget \$ 2 million to support the planning and implementation of the strategy on the choice of copper (KEI)
- ◆ Preparation of green growth model and develop pilot projects
 - Research Promotion implement pilot projects in local units in order to see the paradigm of green growth are included in the overall planning
 - Make Recommendations research project pilot green growth adaptation to climate change in the Mekong Delta
- ◆ Contact point; Chung, Heuk Jin, advisor at ISPONRE; hchungmoe5@gmail.com

1.2. Cooperation Project 2 : Share development experience from Korea

- **Join advisor dispatching program WFK (World Friend Korea)**
 - ◆ Object
 - Enhancing cooperation between Korea and Vietnam through dispatching experts experienced advisors through NIPA Korea, KOICA.
 - ◆ Content
 - Suggest cooperation and dispatching expert advice in the fields such as agriculture, fisheries, environment, climate response to climate change
 - Request dispatching experts to the government agencies, research institutes, state-owned enterprises
 - Period of dispatching experts is calculated in 1 year and a maximum of 3 years
 - ◆ Contact point; Chung, Heuk Jin, advisor at ISPONRE; hchungmoe5@gmail.com

- Establish communication channels and use South - Vietnam
 - ◆ To Make personal development cooperation projects to cope with climate change in the Mekong Delta region, need to listen to collect opinions and make the exchange, sharing information in regular contact with the organization management of the Mekong delta region of Vietnam. Therefore, conducted and compiled the information provided mainly by Vietnamese and Korean to be able to exchange information through media networking sites and media
 - ◆ Viet-Han Times: Weekly news specialty agriculture, fisheries, environment, education between Vietnam, South Korea and two-way information exchange
 - ◆ Korea-Vietnam International cooperation information sharing center (vietko.net): Exchange information and share project plans developed in response to climate change

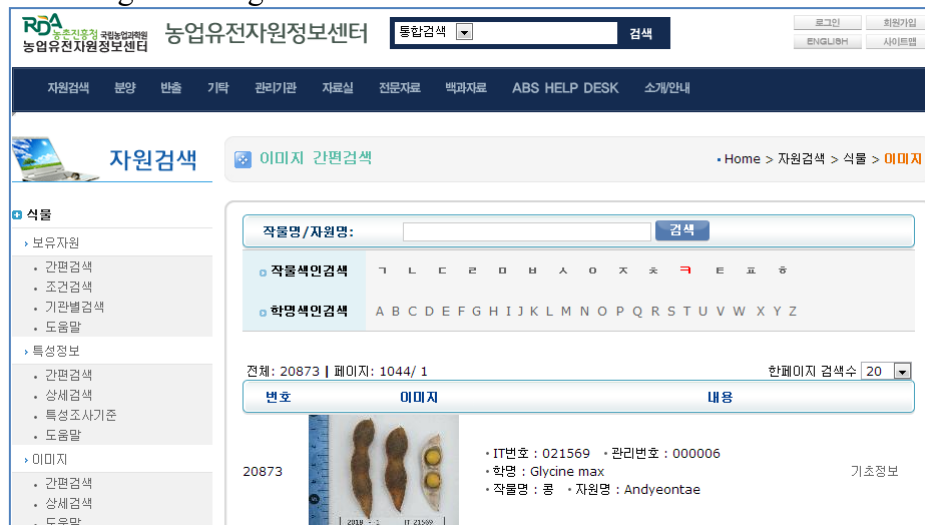
1.3. Cooperation Project 3: Disaster Protection Project

- **Early disaster warning system**
 - ◆ Object
 - Develop systems for early detection and response to natural disasters safely
 - ◆ Content
 - Ensure monitoring meteorological information
 - Develop monitoring system, automatic monitoring information on disaster
 - Develop early warning systems

1.4. Cooperation Project 4: Development agriculture adapt to climate change

- **Interaction with Information System Genetic Resources for Agriculture**
 - ◆ Object
 - Setting management system of agricultural genetic resources
 - Response to the International Convention for agricultural genetic resources
 - ◆ Content
 - Ensure Integrated Management Information agricultural genetic resources
-

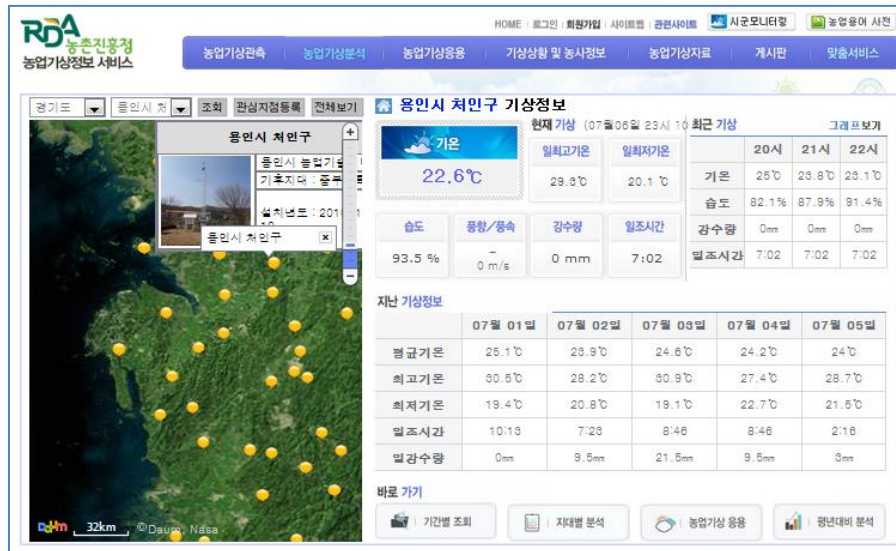
- Provides information Agrometeorological analysis through the internet
- Information tendency debate international conference related to genetic resources
- ◆ Website address
 - www.genebank.go.kr



< Information Center web Genetic Resources and Agriculture ngheieptruyen >

● Cooperation information exchange service for agricultural meteorological

- ◆ Object
 - Provide data analysis of typical meteorological, hydrological between years, the sector and the agro-climatic zones to promote a smooth implementation of projects, rural projects intimate relationship with weather phenomena such as natural disasters, disease observation, cultivation, livestock
- ◆ Content
 - Analysis between the meteorological and climate in agriculture, web services online 24/24
 - Provide ongoing analysis of meteorological information through the internet agriculture
 - Enhancing the practical application of engineering science Agricultural closely related weather phenomena
- ◆ Website address
 - weather.rda.go.kr



< Provide Agriculture meteorological information services >

1.5. Cooperation Project 5 : Developing aquaculture industries adapt to climate change

- **Research development of high quality breeds fit the Mekong Delta**
 - ◆ Object
 - Research findings and strategic stocking suit Mekong Delta in response to climate change
 - Perform research and industrialization to develop and protect the quality of breeds
 - ◆ Content
 - Research and Development breeds higher value consistent with regional Mekong Delta
 - Research and Development breeders and breed strategy for the future
 - Research on protection and management of the same
 - Combined with research and study abroad agencies and private business department

- **Modernization boats**
 - ◆ Object
 - ◆ Reduce greenhouse gas emissions based on the improvement of energy efficiency of vessel
 - ◆ Content
 - Improved features and energy savings by changing high-performance engines
 - Investigate the feasibility to improve the equipment and boats environmentally friendly
 - Implement pilot projects

- **Information systems of basin environment**
 - ◆ Object
 - Information of environmental monitoring data and watershed development database

- ◆ Content
 - Develop a database of satellite images Basin
 - Environmental investigation documents seasonal basin (water temperature, salinity, DO, etc.)
 - Provide information on environmental impacts of web-based GIS

1.6. Cooperation Project 6 : Management of water resources to adapt to climate change

● Development of water supply system Project

- ◆ Object
 - Develop new techniques for processing drinking water of the Mekong Delta with high salt content
 - Application of membrane separation technology (Membrane Separation) and microfiltration membranes (Membrane Microfiltration) used in water filtration are sedimentation, pollution
 - Develop the water treatment technology, multi-purpose equipment clean water dispersions in order to deal with natural disasters, disaster
- ◆ Content
 - Develop treatment system water supply line with Mekong Delta
 - Plans to save operating costs and research new technologies to address water resources, including the majority of the salt content
 - Build a system of cooperation between government / business



< International Forum on safe water supply and climate change >

● Water supply plant project

- ◆ Object
 - Development of water resources to adapt to the salinity of sea water due to rising sea levels
- ◆ Content
 - Construction of treatment plants, water supply to tackle the problem of water shortage in the large cities and rural areas
 - Develop water supply pipe
 - Develop water management system to manage and monitor the loss and leakage clean water sources

● Monitoring of water pipelines

- ◆ Object
 - Develop monitoring system based on GIS for monitoring an automated point loss,

leakage of water pipelines

- ◆ **Content**
 - Application of GIS Technology
 - Automatic monitoring of leaks, water loss based on the use of sensors measuring losses
 - Management of the water supply pipe through the integrated management regulations
 - Investigate the feasibility to project promotion
 - Promotion Pilot Project

1.7. Cooperation Project 7: The study of ecosystem changes due to climate change

- **Assessment of impairment of the ecosystem based on climate change generally Korea - Vietnam**
 - ◆ **Object**
 - Enhance capacity to cope with climate change by providing technical assessment and data collection analysis of ecosystem decline
 - Ensure economic effect on the development of technology and policy responses to adapt to climate change
 - ◆ **Content**
 - Develop database DB to assess impairment
 - Technical Information Program assessment of ecosystem decline
 - Calculate the parameters and denote the qua
- **Monitoring indicator species organisms and populations weakened by climate change**
 - ◆ **Object**
 - Implement monitoring to confirm the rapid changes of ecosystems due to climate change and prepare response measures
 - Selection and monitoring ecological resources sensitive to climate change
 - ◆ **Content**
 - Survey ecological resources
 - Survey species vulnerable to climate change
 - Survey species developed by climate change
 - Quantitative assessment of the integrity of the ecosystem based on climate change, from the data sources used as a basis for setting policy direction ecosystem management

1.8. Cooperation Project 8: Education and training business strategies of enterprises to respond to climate change

- **Educating about climate change adaptation**
 - ◆ **Object**
 - Provides general information related to climate change are scattered in each sector and government agencies
 - ◆ **Content**

- Integration of climate change information and provides a synthesis
- Observation to gather information: satellite, sensor, measurement information at the scene and so on
- Develop a database of information policy
- Apply methodological information in the analysis of the economics
- Policy support system
- Maximizes backup performance by regularly checking constantly factors affecting climate change disaster
- Reduce duplication and decision support in place through the link and integrate climate change information
- Support policy and specific action plans for each area based on climate change
- Industry development related to climate change

1.9. Cooperation Project 9: Industry infrastructure construction project

● Renewable energy project

- ◆ Object
 - Resource Development of renewable energy
- ◆ Content
 - Development of bio energy
 - Using Solar power
 - Research and development

● Establish multi-purpose equipment to respond to climate change

- ◆ Object
 - Research and Development and construction of multi-purpose equipment to serve the socio-economic activities of the Basin Mekong Delta
- ◆ Content
 - Building dams to ensure clean water sources
 - Research plans to prevent erosion Basin
 - Research and development plan to improve multi-purpose port
 - Preparation and planning design multi-purpose port
 - Construction equipment and facilities to ensure the safety
 - Establish equipment to deal with environmental pollution

2. Introduction of Green Climate Fund (GCF)

2.1. Background GCF

Green Climate Fund is the first financial institution specializing in supporting the development of measures to cope with climate change and reduce greenhouse gas emissions by developing countries. This international organization responsible for supporting the key role of developing countries in the field of climate change.

Pursuant formation: With "shared responsibility but differentiated value" on climate change provided for in the UN Framework Convention on Climate Change (UNFCCC), developed countries provide financial support to cope with climate change of the least developed countries (reduce + adaptive)

※ UNFCCC (United Nations Framework Convention on Climate Change): The Convention regulates the emissions of greenhouse gases humans to prevent warming of the Earth

2.2. Operation of fund

Setting up headquarters to manage fund operations and Korea, has become the headquarters of the Green Climate Fund as a result of the General Assembly vote

2.3. Finance size

100 billion annually by 2020 (Regulation obvious financial scale of the treaty at Cancun Summit in 2010)

VI. Conclusion

The impact of climate change to the economic life and the Mekong Delta is very serious in the long run. It is possible to foresee some serious consequences such as increased coastal area was submerged in water, erosion, saltwater intrusion caused by sea level rise.

However, the immediate shortages and weaknesses in infrastructure such as transport , roads , warehousing storage , transport , and the lack of mechanisms can quickly cope with price volatility the market is causing the impact.

Thus, the short -term, urgent need to invest in infrastructure, establish mechanisms can respond with lightning speed to market , the restructuring of the industry eco -system based adaptation and application self-cleaning ability of nature to develop green growth, technology research and development environment as clean as clean energy.

In the long run, should have to take the more radical policies such as population migration and economic restructuring due to sea level rise.

It can be seen in cooperation with the international community in the process of formulation and implementation of response measures to maintain the survival of the Mekong River delta is essential. We know that so far many international organizations such as the World Bank and the donor is active in supporting many ways.

Korea starting this year decided to support the overall planning Green Growth Strategy of Vietnam for 2 years. July.12 2013, Director of KOICA and the Deputy Minister of Planning and Investment has launched celebrations.

Anyway, the plan of the contribution of Korea to help maintain the survival Mekong Delta is presented in this article if the enormous contribution it would have been the greatest significance for the writer.

<Attachment>

Organization of International Cooperation in Korea to response climate change

■ **KOICA**

- ◆ Website: www.koica.go.kr
- ◆ Areas of Cooperation: Dispatching expert WFK (World Friend Korea), non-refundable aid (ODA)

■ **National IT Industry Promotion Agency (NIPA)**

- ◆ Website: www.nipa.kr
- ◆ Areas of cooperation: Dispatching expert WFK (World Friend Korea)

■ **Korea Environmental Industry & Technology Institute/ Vietnam-Korea Environmental Cooperation Center**

- ◆ Website: www.keiti.re.kr, www.ebasiacenter.or.kr
 - ◆ Areas of cooperation: Exchange environment and technology support for business investment environment Korea - Vietnam
- Contacts:
Representative Jung Geon Yeong
Vietnam-Korea Environmental Cooperation Center (Korea Environmental Industry & Technology Institute / Ministry of Environment)
Office : 15F, VIT Tower, 519 Kim Ma Street, Ba Dinh District, Hanoi, Vietnam
Tel : +84-42-220-8210 Mobile : +84-90-441-6869 Fax : +84-42-220-8211
Email : jgy21@keiti.re.kr dorisa21@yahoo.co.kr

■ **Korea Environment Corporation(KECO)**

- ◆ Website: www.keco.or.kr
- ◆ Areas of cooperation: Response agency pioneering national climate change
- ◆ Responding to Climate Change, set up and manage their national greenhouse gas, certificate management and greenhouse gas targets, mechanisms of carbon quotas, project clean development mechanism CDM and abroad and training of professional staff on climate change, green operating campaigns, less carbon, etc.
- ◆ Installation of the equipment base water treatment, installation and operation of monitoring equipment (water quality / atmospheric quality), remove contaminated soil, installation and operation of equipment and handling solid waste and recycling etc.
- ◆ Address:
- ◆ Vietnam Office of Korea Environment Corporation(Keco)
Add) 15F VIT Tower, 519 Kim Ma, Ba Dinh, Hanoi, Vietnam
Tel) 84.4.2220.8205 Fax) 84.4.2220.8206

■ **National Academy of Agricultural Science**

- ◆ Website: www.naas.go.kr
- ◆ Areas of cooperation
 - Agricultural technology transfer and joint research cooperation
 - Research Technological Development of agricultural production safety, establish evaluation systems and standards
 - Develop scientific and technical applications of modern technology in agricultural mechanization and energy saving technologies

- Ensure, conservation and using of the genetic diversity of agricultural resources and build national systems management
- **Korea Agro-Fisheries & Food Trade Corporation**
 - ◆ Website: www.at.or.kr
 - ◆ Areas of cooperation
 - Support projects distributed agricultural and fishery products circulation between Vietnam and Korea
 - Manage the safety of agricultural and fishery products
 - Support exchanges operate agricultural and fishery products
 - Universal green lifestyle
- **National Fisheries Research & Development Institute**
 - ◆ Website: www.nfrdi.re.kr
 - ◆ Areas of cooperation
 - As research and development model predicted oceanographic change in response to climate change.
 - Scientific and technical cooperation eco-friendly farming environment
- **Korea Institute of Ocean Science & Technology**
 - ◆ Website: www.kiost.ac
 - ◆ Areas of cooperation: Scientific and technical research marine environmental response to climate change
- **Korea Standard Association**
 - ◆ Website: www.ksa.or.kr
 - ◆ Areas of cooperation: Education and training related to climate change (climate change adaptation, greenhouse gas indexing etc ...), online training project e-Learning
- **Foundation of Agrr. Tech. Commercialization & Transfer**
 - ◆ Website: www.fact.or.kr
 - ◆ Areas of cooperation
 - Practices of Agricultural Science and Technology
 - Technology Transfer Agri-Food
 - Seed quality management
 - Support agricultural exports advanced technology abroad
 - High quality seed production and export support
- **Center for Eco-Smart Water Works System**
 - ◆ Website: <http://ecost.yonsei.ac.kr/>
 - ◆ Areas of cooperation
 - Technological Development of water supply systems
 - General Studies
 - Practical application of technology
- **Viet-Han Times**
 - ◆ Website: www.vnknwpaper.com
 - ◆ Areas of cooperation: Two-way transmission of information technologies related to climate change adaptation between Vietnam and Korea

■ Korea-Vietnam International Cooperation Information Share Center

- ◆ website: vietko.net
- ◆ Areas of cooperation: Two-way information sharing and international cooperation projects in the fields of information technology, education, environment, infrastructure related to climate change adaptation between Vietnam and Korea

■ Korean Fisheries Economy Newspaper

- ◆ Website: www.fisheco.com
- ◆ Areas of Cooperation: Provide investment information and market trends in the fisheries sector related to climate change adaptation between Vietnam and Korea

■ Korea Agriculture Newspaper

- ◆ Website: www.newsfarm.co.kr
- ◆ Areas of cooperation: Provide investment information and market trends in the agricultural sector related to climate change adaptation between Vietnam and Korea National

■ JoongAng Enviro-Energy News

- ◆ Website: jeenews.co.kr
- ◆ Areas of cooperation: Provide investment information and market trends in the industry related to environmental response to climate change between Vietnam and Korea