

HONDA-NSTDA

International Symposium on Ecotechnology 2008

Innovation and Entrepreneurship in Asia

本田財団・タイ国立科学技術開発機構 (NSTDA) 共催

エコテクノロジー・シンポジウム

「アジアにおける革新と起業家精神」



A Report of
The Honda Foundation –
National Science and Technology Development Agency, Thailand
International Symposium



HONDA FOUNDATION
財団法人 本田財団

For Publication

The present report is an account of all the speeches and discussions from the international symposium on Ecotechnology entitled "Innovation and Entrepreneurship in Asia" that was held in Bangkok, Thailand on the 28th and 29th March 2008. The symposium was co-organized by the Honda Foundation and the National Science and Technology Development Agency (NSTDA) of Thailand, which is fulfilling its leading role in the remarkable technological development of modern Thailand.

The policymakers, researchers and, scholars from Japan, Thailand, Nepal and Vietnam who were invited to this meeting were enlivened by the lively presentations and exchanges of opinion. The Ecotechnology concept for Asia was revisited in discussions and case studies such as "Resources and Global Environment," "Water, Food and Environment," "New and Clean Energy" and "What as citizen of the earth we could do together with the spirit of ecotechnology". We would like to thank all the participants for their cooperation, without which it would not have been possible to exchange such meaningful discussions throughout the symposium.

It is our greatest hope that the discussions and friendships cultivated through this international meeting will be effective in the mutual edification of Japan, Thailand and other Asian countries, and in accelerating the international understanding of Ecotechnology and the development of a society in harmony with the natural environment.

Yoichi Harada Managing Director Honda Foundation

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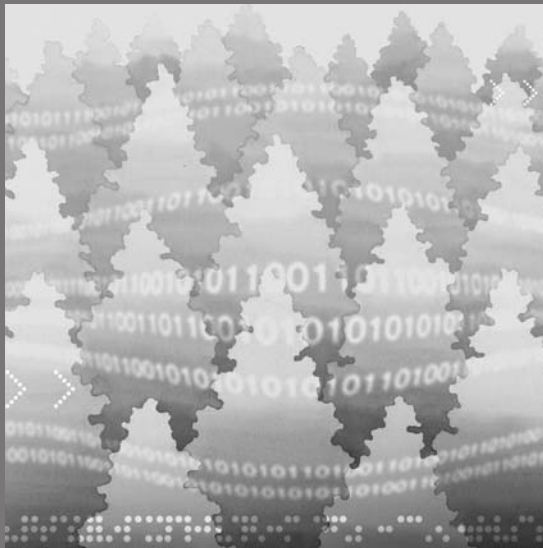
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Sakarindr Bhumiratana

President, NSTDA

Welcome Address



HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia

Welcome Address



Dr. Hirohisa Uchida

Director of Honda Foundation
Vice Chancellor, Tokai University

Since 2005, we have international symposium linking innovation and entrepreneurship for developing countries in Vietnam and India, and today we have this symposium in Thailand. As we can recognize, Asian countries are growing at an enormously rapid speed in industrial scale and economic scale and also trading activity. This means we are strongly dependent on each other, in daily life and also social systems. Economy, financial market and even our sense of values are linked to each other so tightly. For us, nurturing next-generation, young people and effective collaborations among Asian countries are inevitable and this is very important, when we recognize the fact of rapid advancement of innovation.

Now, I want to give some explanation about our foundation, Honda Foundation's history and mission. Especially the mission is based on Mr. Soichiro Honda's passion and philosophy. The establishment of Honda Foundation was in 1977 (See #2). Last year, we celebrated the 30th anniversary. And this foundation was laid by Mr. Soichiro Honda, the founder of Honda Motor Company and his younger brother, Benjiro Honda.

In 1976, there was an international symposium called Discoveries and that main topic was how to harmonize human activities with the global environment because this main topic

HONDA FOUNDATION (HOF)

History and Mission

Dr. Hirohisa Uchida
Board Member, HOF

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Establishment of HOF

The HOF was established in Dec.1977
by donations from Mr. Soichiro Honda
the founder of HONDA Motor Company,
and
his younger brother Mr. Benjiro Honda.

2

DISCOVERIES

An international symposium
"DISCOVERIES" (1976) ignited
the establishment of the HOF.

< Main topic >

"How to harmonize human activities
with the global environment"

➡ Eco-Technology

3

Mr. Soichiro Honda's Words

"I reached where I am now
just through technology.
If problems facing humanity
can be solved by technology,
I want to be of some use"

4

Mission of HOF

Realization of the founder
Mr. S. Honda's wish :

"I want to apply science and
technology for peoples' happiness"

< Mr. Soichiro Honda >

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What is ECO-TECHNOLOGY ?

(1) Ecology + Technology

(2) Human Environment Conscious
Technology

The ultimate goal is common :
Pursuit of science & technology benign
to Human environment

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is connected already with ecotechnology (See #3). And that was an ignition of establishment of this foundation.

Mr. Soichiro Honda has left so many vital words, maybe you know well (See #4). And one of them is, "I reached where I am now just through technology. If problems facing humanity can be solved by technology, I want to be of some use." The mission of our foundation is really realizing the founder Mr. Honda's wish (See #5). He said, "I want to apply science and technology for people's happiness." And today, we have Professor Kurokawa here; maybe he will give later a speech. And he very often says, "Innovation is technologies giving impact to change people's sense of values and society." Yes, there are two words. I mean I think this is quite same content.

Now I want to tell the human environment, usually we say environment, what it is. Usually, maybe we think, air, water, plants or animals, no, not only that. The definition of environment is any circumstances surrounding us that influence our growth or mentality and also sense of values. The elements are family, school, working place, culture, tradition, community, religion, country economics or political system, human rights, etcetera. Mainly we should say environment – better to say human environment.

And our foundation used this expression 'ecotechnology (See #6).' The first term 'eco,' what does it mean? Usually, we think ecology plus technology. Technology which considers ecology. But another definition may be human environment conscious technology, from this 'eco,' ecotechnology (See #7). Usually, I take this, the second one. Anyway, the ultimate goal is common, pursuit of science and technology benign to human environment.

Innovative technologies from Honda Motor Company, there are so many innovation and technologies (See #8). I want to show you briefly Mr. Honda's passion and philosophy with respect to many innovations. You can see on the left side, this is Mr. Soichiro Honda, the founder of the Honda Foundation, and 1951, his first production, Honda Dream (See #9). And in eight years, he took part in international motorbike race in Isle of Mann, United Kingdom. You can see his face here and here, just where was his Dream and he realized. This is Honda's air cooling engine series of automotives (See #10). The technologies are common from motorbike technology at the time.

And then later Honda produced the first Honda's water

What is Human Environment ?

- Not only components of nature such as air, water, plants, animals
- Any circumstances surrounding people that influence their growth and mentality : family, school, working place, culture tradition, community, religion, country, economics, political system, human rights etc
- "Environment" should be said : "Human Environment"

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Innovative Technologies from HONDA



Mr. Soichiro HONDA



HONDA DREAM 1951

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Challenge with a motorbike HONDA-DREAM in an international motorbike race, Man island, U.K. 1959

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HONDA's air cooling engine series – technologies from motorbikes



T350 with 30 PS 1952



N 360 1967



H1300 Coupe

10



HONDA CIVIC
The first water cooling Engine : CVCC-engine 1969

The CVCC engine was the first engine passed through the strict Mosky Law in California, USA with less emissions of exhaust gas in 1974. Any other engines were not permitted to be used in USA at that time.



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Integra



Life



S2000



Insight HV



Odyssey



NSX

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cooling engine, CVCC engine, in 1969 (See #11). This is a very, very nice engine. We should know. This CVCC engine was the first engine that passed through the strict Muskie law in California, USA, in 1974, with much less emissions of exhaust gas. Any other engines in the world were not permitted to be used in the USA at the time. And this is a very typical production of Honda Motor Company. Of course his dream and also challenge should be goal to ultimate level. The participation to F1 Grand Prix (See #13 & 14). That was also a very important step.

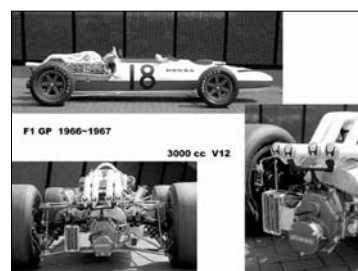
And as you know well, this is the development of ASIMO, humanoid robot by Honda Company. The first one, the second, third and the new one (See #15). And there is a very interesting story. The Honda Motor Company went to the Pope in Vatican to receive the permission of manufacturing humanoid robot, because in Christianity it is not permitted to make any so – human-similar machine, a robot. Of course, Honda is a worldwide company and they know what the global standard is.

Now, Honda is producing jet airplane, and you can see the word challenge catch your dreams (See #16 & 17). This is a very nice catchphrase. “The Power of Dreams,” this is a recent catchphrase of Honda Motor Company. In 2005 and 2006, in Vietnam, we had international symposium linking innovation and entrepreneurship for developing countries (See #18). At the time, Honda presented, for the first time, the fuel cell motorbike and hybridized electric bike. In Japan, it was not a lot, because of limited legal restriction in Japan. So this is the new Honda Fuel Cell car.

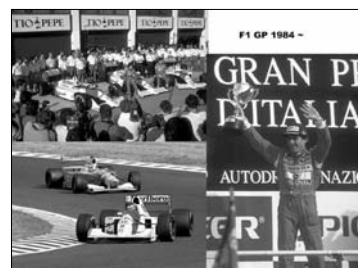
So thus Honda brought so many innovation or innovative technologies. So please remember three words: Challenge. Don't fear for failure. Catch Your Dreams. These are sources to produce innovation. I like these three words very much (See #19).

And the Foundation's activity in the field of ecotechnology, we have mainly three parts (See #20). The first one is ours, Honda Prize. This is just for recognition of remarkable achievement of person in the world. Every year, we are looking for some best person in many fields.

The second one is exchange program or international symposium and seminars, and today, for example, this is the right example, to exchange and to expand knowledge and experience.



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And the third one is grants: Honda YES, Young Engineer and Scientist Awards, to foster young leaders in Asia. It is started already in Vietnam and India.

Now, the philosophy of our foundation is based on ecotechnology in pursuit of harmony between man, science and technology (See #21).



Mr. Soichiro HONDA

HONDA SPIRIT

Challenge !

Do not fear for failure !

Catch your dreams !

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HOF's ACTIVITIES
in the field of Eco-Technology

- **Awards : HONDA PRIZE**
to recognize remarkable achievement
- **Exchange : International Symposia & Seminars**
to exchange and to expand knowledge and experience
- **Grants : HONDA YES Awards**
to foster young leaders

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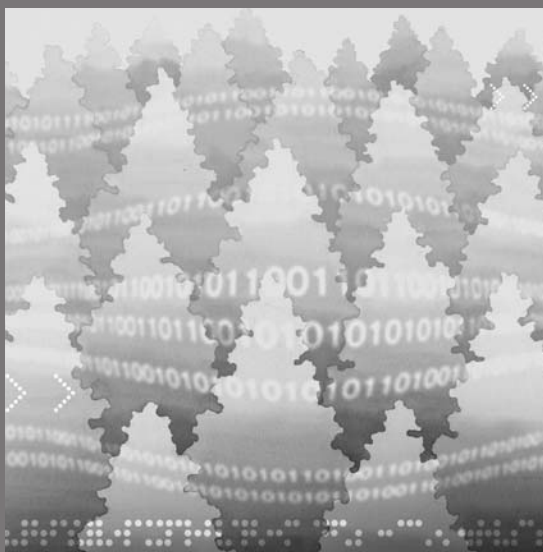
HONDA FOUNDATION

Philosophy of the foundation
ECO-TECHNOLOGY
in pursuit of harmony between man and science & technology

Thank you for your attention !

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Plenary Session



Session Chair

Atsushi Sunami

Associate Professor and Director of
Science & Technology Policy Program,
National Graduate Institute for Policy
Studies (GRIPS), Japan

HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Opening Address



Sakarindr Bhumiratana

President, National Science and Technology
Development Agency (NSTDA), Thailand

This symposium certainly is important to us, certainly important to Asia; I think it is very important to the world. I think you all realize – we all realize that climate change is drawing global attention like we have never seen before, as the world has recently faced a number of unprecedented issues and difficulties. This has been highlighted by the recent grant, we know, of the Nobel Laureates to the IPCC and, of course, the Ex-Vice President Al Gore of the United States.

It is certainly of importance to us to take note that this are all part of our responsibilities and our reasons to think forward in terms of what we need to do to resolve possible havocs that may change the environments and our living with the environment. Apart from the US, who is the biggest consumption of the world's energy and, of course, apart from the needs to see how we will move forward without utilizing as much as energy as we have in the past few decades.

The tipping point could occur in the areas in Asia itself with the development of subcontinents like India and China, and the needs for us to see that developing countries should have the same choice to live like the developed world with the same life expectancy, and the same kind of dreams mentioned earlier by our Director of Honda Foundation. The challenge is to do this with much more resource efficiency. We need to work together so that technology and intelligence can help us grow together and benefit together closing the gaps in this world, the gaps between also human and environment.

For Thailand, energy issue is being one of the main concerns for the government and obviously for the rest of us. We, as a nation, emit 1.13% of the world's net increase of atmospheric greenhouse gases, mostly through the use of energy. This accounts for over 67 million of nearly 6 billion tons of carbon. In emissions per capita, Thailand emits 1.3 tons per

head, slightly above the world average of 1.2 tons per capita. So, again, our challenge is to continue to live better, to progress economically and socially, at the same time hold our emission to below average of the world, for which hopefully the whole world will continue to decrease the average emission of this important greenhouse gas.

Rough estimate indicated that each 1% increase of our GDP induced nearly the same 1% – actually above just over 0.9% increase in carbon dioxide emission in Thailand. I do not think we can afford that and we need to do much to reduce the effect from energy, which would affect our environment for which these meetings will certainly us to see how best to move forward, and we look forward to some conclusion of this symposium.

Thailand has highest energy consumption in the transport sector, as we know well. And next is in business and then households ranks – the highest consumption is in diesel and petrol, next is jet petrol, while gasohol comes up as the lowest price energy but still with very small quantities.

The projections for the year 2011 is that we would like to make sure that – the projections for 2011 is that we will continue to increase energy consumption at the rate of about 6%. We hope to solve this by trying to switch over to alternative energy and using less carbon impact energy. Of course, we have to do this through a lot of energy efficiency improvement, at the same time improve our ability to utilize alternative energy for the reduction in carbon dioxide emission.

Thailand plans to encourage utilization of alternative and green energy to cope with rising price of fossil petrol and the impact on the environment. As a country of plenty biodiversity and natural resources, Thailand supports various R&D to turn bioresources and natural resource to application. The country's initial endeavors go to bioenergy and advance renewable energy, with lots of R&D research are done at various research agencies, not the least of which is our NSTDA, National Science and Technology Development Agency and our siblings, the Thailand Institute of Scientific and Technological Research.

Of course, we do this by working together with other research agencies and other government and private sectors to promote the use of alternative energies, clean fuels and our attempts at reducing the use of energies in production sectors, household sector and business sector as well.

At NSTDA, energy and environment stats are very big issues. The energy and environment takes over nearly half of all our research budgets and by producing a group of clusters on energy and environment, we hope to be able to direct our research towards those which create greatest



impacts to our socioeconomic sector.

We see science and technology as a possible solution, as the important solutions, we see that in all other sectors as well, not only in energy and environment, S&T must deliver alternates to current practice, not only to reduce cost and improve the bottom lines but also to make sure that we are greener and greener in our doing in the futures, not only to have less impact to the environment while improving our standard of livings, we must also close the gap socially as well.

So S&T is being asked to do this, but to be able to do that we must make sure that the society and the communities put very strong efforts in demanding that our future development will be with less resources, with more efficient energy, with closer various gaps that we have around the world, so that we all can live better and more sustainable.

Opening Address



Kiyoshi Kurokawa

Special Advisor to the Cabinet, Japan

The title says on ecotechnology, and subset states 'Innovation and Entrepreneurship in Asia.' All right, what is innovation? This is not invention or creativity. This is a part of innovation, but innovation is the creation of new social values. Sometimes it may be associated with the economic growth but may not. For example, you are very familiar with HTTP, Hypertext Transfer Protocol, and then WWW, World Wide Web. That was invention of 1992, but there is no patent, free of charge. That completely changed the world we live in.

You see WWW everyday. That is an invention by Berners-Lee and others. So innovation is the creation of new social value. But this social value has to be context-relevant, what are the contexts we face today. First is, perhaps, 2Cs and 3Fs. 2Cs are climate change, second 3F, what are they? Fuel, food and feed. That means there is a lot of food, but maybe millions of people dying just of starvation. On the other hand, some countries, we were talking about obesity. So the feeding is another issue. So like 3Fs and 2Cs and maybe water, of course. So that is the context.

Second, we live in a connected world. So you know what is happening through internet, become bilateral. YouTube, you can send your visual image, so everybody now begin to see the global issues. We know there is a lot of poverty. Many are dying in Africa and Southern Asia. But we did not see that. We travel a lot. So during the 20th century, we expanded our horizon of physical movement and physical contact, but this new century due to world wide web and connected world, we have expanded horizon for our intellectual and brain activity without not necessary just moving physically, right. But physical contact is very important too, because we are humans, social animals.

So that is what it is. So what are the contexts? One is climate change and 3Fs and water. You know what to do but it is very difficult to achieve,



to create new social values. How about poverty, and disparity, inequity throughout every society and throughout the world? That is the result of our economic animals – as human being. But this kind of disparity reaching to you is certain visual image, moves a lot of emotion over human empathy. That resulted in new development which we can call this also globalization, I can tell you this. It used to be many ODA activities to narrow the gap of those who have and those who haven't.

For example, Japan spent a lot of money to assist development of Asia and also African countries, taking off over last few, about 10 decades or so, but I think Japan fortunately achieved certain economic growth over last – since 1950s through 1990s. But not anymore. So that is Japan's issue. But to make that ODA as a political agenda, each nation, political leaderships have to deal with, negotiate with different stakeholders within your country. That is a political process which may take a lot of time and stakes as a politician, because if you lose in the election, you become nothing. That is what is happening in Thailand, now you have a new leadership, which you are worrying about what's going to happen.

Let's see globalized connected world, what's happened. It used to be an ODA. That is national – nation-to-nation, but we go beyond that when national border may become less relevant to solving this issue. Therefore, globalization 1.0, which means a lot of NGOs activity, in the worldwide a lot of NGOs have been emerging which results in a lot of commitment of common people as the volunteers, and part-time volunteers, and many NGOs go to Payao for preventing AIDS, or go to UNAIDS and Harvard and also in Africa. And interestingly more than half of NGOs are headed by women. Why is that?

Because when you see that misery and suffering, and poverty, that hits our empathy and our heart, right. But those who translate this into action tend to be women. The reason is that women have more soul into that suffering, human suffering than men. So a lot of NGOs, but many NGO tend to have a shared value but many have so much commitment, it is very difficult to negotiate with this bottom-up approach. So there is a top-down approach of national NGO, national ODA to bottom-up lot of action which is globalization 1.0, top-down to bottom-up. Sometimes bottom-up is sort of chaotic sometimes which is okay. That is globalization 1.0.

Now what is happening is globalization 2.0. Philanthropy comes into display, represented by, for example, Gates Foundation. Their annual budget is larger than WHO's. Now, they have a lot of business experience, so they are more strategic and more outcome-oriented investment strategy, so that this activity catalyzed the ODA top-down to bottom-up approach to move towards our common goals. That is more effective. So that NGO philanthropy, not only just buying some piece of art but more – giving to the more relevant issues in the globalized world.

But globalization 3.0, what is it? That is a tremendous movement by private sector. Because private sector has more stringent business oriented operations. But suppose Coca Cola or Pepsi Cola want to go to Africa or South Asia for business, but they have to develop local infrastructure to have clean water, for their production cost to become lower, and their sort of approach to this no such disparity and poor countries become more business relevant, but they had to commit to such activity for the common good. Otherwise this corporate value becomes less and less if they are just pursuing just market-driven profit, like MBA type. That becomes useless, because MBA-type may be taking some more miserable suffering from the poor.

So now with connected world a large fraction of global citizens begin to see the corporate value so that now 80% of corporate valuation becomes intangible asset. What kind of social responsibilities they want to pursue, what they want to provide the expertise to the global issue, climate change, energy saving, also CO₂ whatever the capacity they provide. For example, a lot of food suppliers are in the developed country but for them to provide food to the very poor impoverished people, what they can do? I mean they have to provide this kind of expertise to help them.

One example like Coca Cola and those other companies and also like Sumitomo Chemical may be the only one of few, very few Japanese big corporate establishment who really does this job. Now, Sumitomo Chemical Company has a very innovative product. They have a mosquito pesticide, and also a lot of plastic thread, bed net. Usually, if you impregnate this pesticide to kill mosquito for malaria, and then it lasts only for six months because of washing and rain that washed off all the pesticide from the bed net, but they just impregnated all the chemicals agent from stretch, impregnated everything into the thread of this bed net so that every washing from inside this pesticide is losing out. So this bed net works for more than five years.

So they just patented these ideas but gave all the patents to Tanzanian company for free. So now that is their two factory in Tanzania and one factory in Vietnam and one factory in China, and they are producing about 13 million bed nets each year, that is not enough. But by giving this bed net into African countries, incidence of new malaria went down by 80% in one year, but they gave all things to Tanzanian company and that is one of the major contributions of this Sumitomo Chemical. So that is globalization 3.0, what corporate can do to address these common issues, common goods.

Globalization 4.0 is that we have to really nurture the next generation of leadership, human capital, and human resource. Where are you going to do that? At university. So university has to become open to the global student body, and this is the global playground for future leaders. Is



Japan's university open enough? I do not think so. Again, that is a challenge. So this is globalization 1.0, NGOs; globalization 2.0, philanthropy and corporate philanthropy, which provides expertise to catalyze top down national ODA to bottom-up NGO. And globalization 3.0 is corporate responsibility, and globalization 4.0 is academic community's responsibility to the globalized world.

All right, so just I would like to mention one thing. Climate change. IPCC has been delivering their policy recommendation based on scientific analysis. Nothing happens until Al Gore with Hollywood producers came to this visual image, so that greater fraction of public sector becomes aware of this issue, because visual image has a very strong impact on the human behavior and human perception. And that is very much human, because if you see that dog, they do not feel much about visual image, dog uses smell. So that is human, visual image have more impact, that is what it is. So, therefore, because of Al Gore and this movie series and touring, that IPCC recommendation has become a politically relevant issue. Otherwise, nothing happens.

So you have to communicate and engage with the public, through your daily activity but also through the global community to certainly utilizing this new tool that connected the world. And that is the reason YouTube has a very powerful bilateral movement to the world. That shows you the mission of Soichiro Honda, as Dr. Uchida mentioned, Soichiro Honda, is not only a technician. He clearly states any technology without philosophy has no meaning. And his mission is not to make money or to be number one in the world but his motto is always for the better, for every people in the world.

And that is the reason Honda is very unique. And we like to – so we inherit and convey and share his spirit whatever you do in technology or invention or creativity, it is not enough. You have to be an innovator, create and deliver new social value relevant to the context we face and we are going to face. And to do that, you have to be entrepreneurs, which is out of the box of conventional wisdom.

You have to always think and behave out of box because you have to be different and do not stay within the framework established by your predecessor. This is already old, so you have to be unique and you have to be new and that is your challenge for the younger generation, we as older generation are just fading away but we would like to convey a message of Soichiro Honda.

Panel Discussion



Tran Ngoc Ca

Deputy Director, National Institute for Science and Technology Policy and Strategy Studies (NISTPASS), Vietnam

Many people may have a kind of hesitation or thinking that this is a bit too complicated or too theoretical background, but if you look around to the context that Dr. Kurokawa just mentioned, 2C climate change, and 3F, food, fuel and feed – I think that the current situation now in the world and in Asia, in particular, is only here. Nothing is too early, nothing is too theoretical, and nothing is too foreign to all of us.

You may look at every day newspaper. Something is happening already here. I looked at Bangkok Post today of the market and of the weather, agriculture is the backbone of our economies in Asia, Thailand, Vietnam, and India. We have to cut down on the export of price; Thailand is number one; Vietnam, number two; India, number three. All are facing surprisingly potential food shortage, three world's biggest rice exporters facing food shortage because of the over-exporting. And we only have to cut down the rice export, India did the same, maybe Thailand is doing the same.

So, our agriculture depends on weather, on the climate change again. And I believe that in Thailand you may know already that some conclusion, predictions by scientists that if the level of the sea waters is increasing by half meters or one meters, a lot of land from Thailand, from Vietnam, the countries that have a long sea coast will be gone. Actually, it is only here, we are facing this shortage of everything, water and problems. So I think that dealing with the environment is no more a kind of the faraway concept or whatever, it is in our daily life action, and if we do not do anything, that will be too late.

But what surprised me and what is more intriguing for me is that the ecotechnology concept is not dealing only with technology innovation or with environment. If you look at the presentation, if you hear – you close your eyes and you hear to the presentation, several words are coming up all the time, it is human, it is people.

And actually I liked the suggestion by Uchida-san actually that eco concept; eco environment should be termed more into the human environment because eventually whatever is coming up, it is coming back to people. Whatever we do, the politician, corporate sectors or NGO sectors, it is people. If people do not do anything, it does not matter.



Where you are sitting and what kind of organization you are working for, nothing would happen.

Look at what has happened to the Kyoto Protocol. Many countries signed and some guy did not sign it, and it is been hanging on and we still have a lot of complaining about it. Talking about this, my another reflection is that many people tend to think that, okay, all we have the kind of the contradiction between development and sustainable development, between growth and human development.

And I know often many people in many economies and countries, my colleagues and my friends; they say that it is very difficult to solve this contradiction. But the reality is showing that it can be done, and it should be done. It is not necessary to be a kind of contradiction. Corporate sectors, people, NGO, government can work together. Dr. Kurokawa already gave us some very good examples on how a company like Sumitomo Chemical did a very good job for people and reducing malaria in Africa.

We can cite many others and come back to the philosophy of the Honda ecotechnology or human technology, whatever we do we need to concern about would that new invention or innovation influence human brain or not and to what extent and how to influence the human brain. And that is the core concept, and I believe that this is very much close to our Asian culture.

I have the feeling that in Asia we are less individual like in US or in Europe. But we have more kind of community sense. And that community sense has been kind of serving the big one for our ecotechnology.



Sombat Teekasap

Vice Chairman, Environment Committee,
Federation of Thai Industries (FTI)

The point of interest that we are going to present is the ecotechnology concept, ecotechnology in Thailand, role of the Federation of Thai Industry in the ecotechnology (See #2).

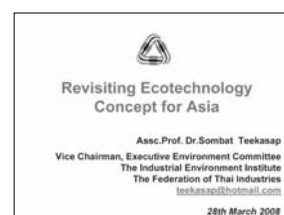
The ecotechnology concept, I think all of us know that there are a lot of concepts that we have to follow (See #3). For example, like the clean technology, the lifecycle assessment, the ecodesign, the triage and etcetera.

The ecotechnology in Thailand, we try to solve the problem of the sufficiency, which is followed by our beloved king (See #4). So it means to say that we have to do the sustainable development, which is the development plus the environmental protection. The sustainable production is focusing on the producer or on the clean production, pollution prevention; and for the sustainable consumption; we are focusing on the support, green marketing, the consumer environment and friendly products.

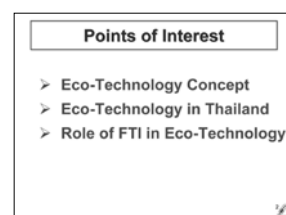
For the Green Procurement Policy of Thai government, the Thai government knows very well that the public sector is quite a large sector, last consumer of the products (See #5).

Our public sector is consisting of both – all of the central sectors, regional sectors and local sectors are major consumer and then we are setting the standard for environment-friendly goods and service, for those with the Green Label and those who still have not been able to get the Green Label but they have the potential to do so. The other one is those who are unable to meet the requirement at the beginning of the period. So, direct relation must provide benefit to all environmental friendly public sectors.

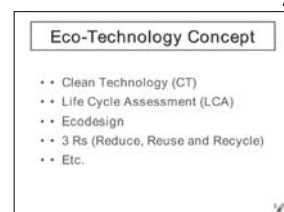
So with that, we have the 10th National Economic Social Development Plan that is in the year of 2007-2011 (See #6). They said that the public sectors as leader of the environmental friendly procurement of goods and services. So, we set the target, within the year 2008, we will make the 25% of the consumption with the green goods; and in the year 2009, 30% and in the year 2010, 40%.



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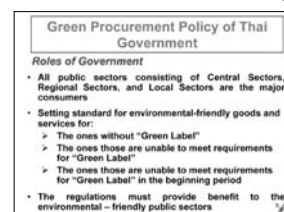
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30%; 2010, 40%; and 2011, it is 60% gradually.

So with the Ministry of Industry, we tried to modernize the industrial, so we will set up the three sector target which is the new wave industry, upgrading industry, and green industries (See #7 to 9). For the new wave, those who have the expanding capacity, according to the change of the world economic and social; for the upgrading industries, those who have the important economic system of the Thai economic system, and the national trade, including the value adding, supporting, utilizing internal raw materials, employments and regulating of the government policies.

For the green industry, we are looking to the environmental-friendly industry which we try to push very hard to set up this type of industry in Thailand. For the green industry, we set up the target for the developing of production technology that does not have negative effect on environment, which is also clean or green technology. The forecast on the developing or the designing of the product, those who are environmental friendly; setting up the standard and up-to-date monitor link system, and cooperate with international bodies including the building and motivation through the investment fund or tax to stimulate the direct investment from the other countries for this type of industry; providing a specialist from abroad to be consulted in the cooperation and technology transfer.

Trend of the industrial sector, now the industrial sector has adjusted production viewpoint and methods to be more environmental friendly (See #10 to 12). For example, like reduction in the use of the raw materials and use only the environmental friendly raw materials; reduction in energy consumption and use of renewable energy; waste reduction through the recycling; rebalance economy, social, and environmental aspect. The trend of industrial sectors, for example, like for the use of the raw materials, for example, like we use the alternative and natural raw material instead of the synthetic one.

Reduction in the material exploitation, we try to use the renewable energy or green energy in biomass, biogas solar power, wind power and hydro power, and we try to look more on the other technology. For the other techniques, the waste reduction to recycle – recycling, we try to do all of these activities, both public and private. For example, like the municipalities, now they try to set up the new plant for the waste management plant. We set up the Green Label, Eco Label in Thailand (See #13). For example, we have at least 5 type of label, so the first one is the Green Label. It was organized by the Thailand Environment Institute and we have around 20 products that have already granted the label.

For the hotel and services, food and beverage, we have the Green Leaf,

Industrial Modernization Policy

Aims to raise Thai industry's potential to compete in the world market and increase stability in national economic system together with establishing better quality of life and environment. The 3 targeted industries are divided as follows:

- New Wave Industries
- Upgrading Industries
- Green Industries

7

Industrial Modernization Policy

New Wave Industries is an industry that tends to expand according to the change in the world's economy and social

Upgrading Industries is an industry which has a potential in growth and importance in economic system and national trade including value adding, exporting, utilizing internal raw materials, employment, and relating with the government policies

Green Industries is an industry that is environmental-friendly, for instance, industries that relating with waste treatment and recycling and industries that manufacture Eco-products

8

Industrial Modernization Policy

Green Industries

- Developing production technology that does not negatively affect environment which is also called Green/Clean Technology
- Focusing on developing and designing products those are environmental-friendly
- Setting up standard and up-to-date monitoring system
- Cooperate with international including building motivation through investment funds or tax to stimulate direct investment from other countries, for instance, searching for joint ventures, research and development, building laboratories, establishing factories' models, and knowledge development
- Providing specialists from abroad to be consultants in cooperation and technology transfer

9

Trends of Industrial Sector

Nowadays, industrial sector has adjusted production viewpoints and methods to be more environmental-friendly.

For example:

- Reduction in use of raw materials and use only environmental-friendly raw materials
- Reduction in energy exploitation and use renewable energy
- Reduction in waste elimination through recycling
- Balance economy, social, and environment

10

Trends of Industrial Sector

Reduction in use of raw materials and use only environmental-friendly raw materials

- Utilize alternative or natural raw materials

Reduction in energy exploitation and use renewable energy or green energy

- Biomass
- Biogas
- Solar Power
- Wind Power
- Hydropower

11

Trends of Industrial Sector

Reduction in waste elimination through recycling

- 3 Rs : Reduce, Reuse and Recycle

12

Eco-Label in Thailand

Label	Quantity	Organizer	Sources
Green Label	20	Thailand Environment Institute	www.teli.or.th www.thaiecomarket.com www.thaigln.net
Green Leaf	118	Green Leaf Foundation	www.greenleafthai.org www.thaiecomarket.com
No. 5 Energy Saving Label	8	Electricity Generating Authority of Thailand	www.egat.co.th/thaieco/default.htm
EU Flower	7	European Commission	http://www.eco-label.com/default.htm
Organic Products	211	Department of Agriculture	http://www.doa.go.th/organic/service.htm

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that is organized by the Green Leaf Foundation. We have given to 118 hotels.

The other one is the Label number 5; it was organized by the Electricity Generating Authority of Thailand. We give the label for the eight products. And the other is the EU Flower that was actually organized by the European Commission, which the Thai producer has to register to – and we have seven products that have already registered. The other one is the organic products, which was set up by the – organized by the Department of Agriculture, and the quality of the product was 211 products that have already been registered.

For the role of the Federation of Thai Industry in the ecotechnology, we are doing the projects; we do the conference training courses (See #14 to 19). We have the FAN exhibition. For the project, we have all five. We are working with all five main organizations for signing the agreement and cooperation in the project of National Life Cycle Inventory Database Development. For example, like those who are in – success is the crafts industry.

The second one is the cooperation in the Green Technology. We do the cooperation in the pollution management development; for example, like facilitating environmental management, investment by polluting industry in Thailand project. We do also the development – promotion of primary and mining industry towards the ecotown projects, which is really active now.

For the National Life Cycle Inventory Database, we have done for some years – for the clean technology, we have continuously been doing it more than 10 years already, and we will continue doing that. For facilitating the environmental management investment by polluting industry in Thailand, we are cooperating with the German, the European Commission, and we have done some work on this.

The other one is development of the promotion of primary and mining industry towards the ecotown projects. We have finished the first phase and then we are going to the second phase now.

For the conference training courses that we have done, like in the year 2006, we made a conference on what industrialists gained from the Clean Development Mechanism (See #20 to 24). We have more than 1,000 participants in this seminar.

The second one is the personal potential development about the Life Cycle Assessment Training programs.

The third one is the main air polluting management training programs.

Role of FTI in Eco-Technology

- Projects
- Conference & Training Courses
- Fair & Exhibition

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Projects

- All five main organizations sign agreement in the collaboration in the project of "National Life Cycle Inventory Database Development for Glass Industries" (LCI-LCA)
- Collaboration in the Clean Technology
- Collaboration in the Pollution Management Development

For example:

- "Facilitating Environmental Management and Investment by Polluting Industry (FEMPI) in Thailand" project
- "Development and Promotion of Primary and Mining Industries towards Eco-Town" project

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Projects

"National Life Cycle Inventory Database Development for Thai Industries" Project



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Projects

"Clean Technology Adoption in Industry Sector" Project



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Projects

"Facilitating Environmental Management and Investment by Polluting Industry (FEMPI) in Thailand" Project



18

Projects

"Development and Promotion of Primary and Mining Industries towards Eco-Town" Project



19

Conference and Training Courses

- Annual Conference on "What industrialists gain from Clean Development Mechanism (CDM)?" (2006)
- Personnel Potential Development About Life Cycle Assessment (LCA) Training Program
- Main Air Pollution Management Training Program (SO_x, NO_x and TSP)
- Annual Conference under the theme of "From Corporate Social Responsibility (CSR) To National Sustainable Development" (2007)

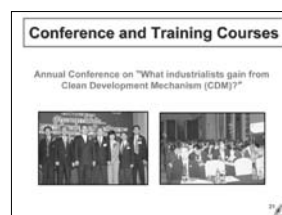
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Actually, we have been running courses like this for the whole year around. The other one is the annual conference under the theme from Corporate Social Responsibility to National Sustainable Development in the year 2007 which we draw a lot of crowd in here. We have almost 1,000 people participating in this seminar.

The conference and training courses that we have done are, for example, like the annual conference on CDM. We do the LCA training programs. We have the air pollution management training programs. We have the annual conference of the cooperation of social responsibility. And we also do the FAN exhibition. The Thailand – the Federation of Thai Industry has been continuously providing support and encouraging to organize the Eco Product Exhibition. For example, like in the year 2005, we had Eco-Product International Fair in Thailand (See #27). In 2007, we have Eco-Product Exhibition also in Thailand, and in 2008, we cooperated with the Vietnam to have Eco-Product International Fair in Vietnam (See #28 to 29).

And for the year 2005, we have three main organizers consisting of the Federation of Thai industry Productivity Institute; Thailand Productivity Institute and Asian Productivity Organization which was the host. And then we are also doing the seventh technology, for example, agriculture technology, automotive industry, cement industry and so on. For the year 2007, we have two day seminars on reduced global warming by the Eco Products. We also have the exhibition. And for the year 2008, we have 91 exhibitors from Thailand to exhibit in Vietnam. The total visitors for that fair are 98,469 people during the exhibition.



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Session Chair:

Atsushi Sunami

Associate Professor and Director
of Science & Technology Policy Program,
National Graduate Institute for Policy Studies (GRIPS), Japan

Thank you very much for giving us quite detailed programs and activities that Thailand is doing on implementing ecotechnology concept. Later on, we are zooming on to several areas of technologies and its specific issues, and ecotechnology in three sessions. And then we are trying to come back to the issue of how we are going to implement all these technologies – and ecotechnology concept, and especially in the industrial sector.

There was also a mention about how the government should play some active roles in procurement or regulations and so on and so forth which then goes back to the question of how, in a globalized world, each of these public policies that are separated by nation to nation can be coordinated and especially in the context of Asia as a area where we need to collaborate to solve actual environment – ecotechnology-related problems.



Tateo Arimoto

Director General,
Research Institute of Science and Technology for Society (RISTEX),
Japan Science and Technology Agency (JST)

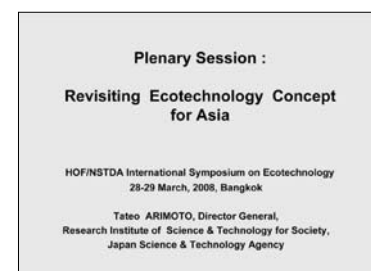
I have been involved in the Japanese science and technology policymaking as a governmental official about 30 years. And from a personal viewpoint, our Japanese science policymaking community, now they are facing a crossroad of the mechanism and their priority setting, etcetera, etcetera, because the world is changing and the rule of the game is changing within border and across the borders.

My personal view, for instance, I point out the full issues, one is the science policy. Now, the science and technology policy is changing to innovation policy. Another one is what Dr. Kurokawa mentioned. Until the 1980s, every government, except United States, promoted the National University System, national university regime, but now that university system is expanding, global – keyword is global university.

Another subject is the integration of the old traditional disciplines, physics, chemistry, and biology integrating to the new values and the new scientific field, including the ecotechnology and ecoscience.

And the final one is the human resources and human capital: how to promote such – educate such human capital space. Until the 1980s, government focusing upon the human development within borders, but now the – between the government and nations the – how to do the human – brain drain and brain gain that competition now is transformed to the brain circulation in the world. Anyway, I will come back again to my slide.

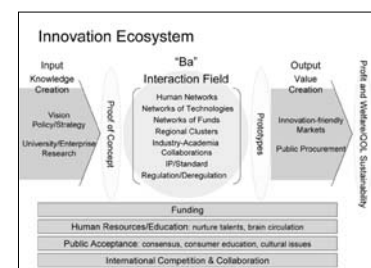
First slide is the goals of innovation (See #2). Dr. Kurokawa mentioned the definition and the scope of innovation. My personal experience, I have lot of the – attend the international conference on innovation as the innovation for growth, innovation for profit and welfare, Northern America and the UK focusing upon this side, but the European continent, gradually the – of course from the growth and the profit to the employment and social cohesions.



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Now, I have a confidence in Asia, of course in every country, they are focusing upon innovation for economic growth and profit, private sectors, but the Asian countries stressed on the sustainable development. So in between economic values and the social values, we need compatibility in between, using ecotechnologies.

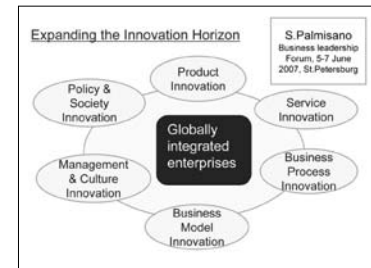
Three years ago, we Japanese innovation policy analysis institute – several institute, my agency JST, Japan Science and Technology agency as well as the NISTP, National Institute of Science Technology Policy, and the ESRI, Economic Research Institute, got together and proposed the Global Innovation Ecosystem, new concept. So the first circle is the National Innovation Ecosystem (See #3).

I stress, again, until the 1980s, every government focusing upon how to achieve the national innovation systems, but now after the end of the cold war as well as the world is flat using the expansion of the internet, that ecosystem is expanding: regional, Asian and European innovation systems. And finally the global level systems. Of course, those ecosystems consist of the science and technology and the human resource, human capitals, and the finals, and the – of course the end point – the social value and the market values.

But there still have been many gaps, public sectors and private sectors by experiencing how to reorganize the public policy to adjust those changing world, and a changing market.

And our final goal is the sustainable development in the world, but still we have deeply divided the social values and the economic values (See #4). But just this conference in global innovation ecosystems, the third international big conference, more than 400 people attending that meeting in Tokyo just two weeks ago. Japanese big name of the congressmen interested in this concept as well as the conference as well. Anyway, during the two-day conference meetings, not only we are focusing upon the technology and those innovation systems but also International Collaboration Framework. This is very important.

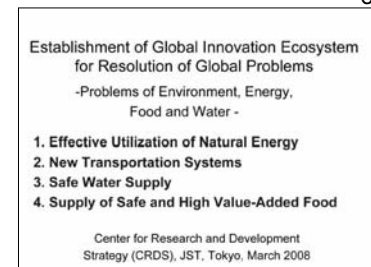
Of course, the International Collaboration Framework is – we have a lot of the frameworks and the mechanism policy levels, of course, the United Nations policy levels and the discussion levels at the Davos Conference, and working levels is the – of course this time the Asian production organization – productivity organization. This is one of the useful International Collaboration Framework, anyway, so how to achieve the final goals of the



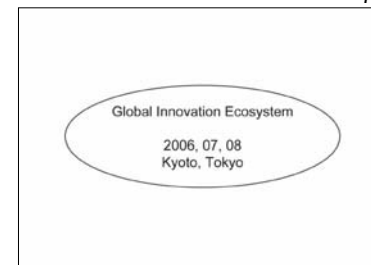
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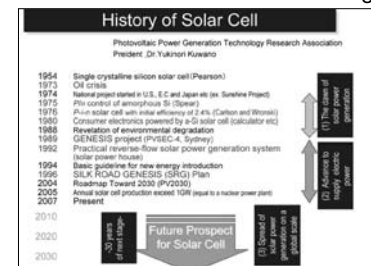
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sustainable development? Of course, there are many barriers – social barriers and economic barriers.

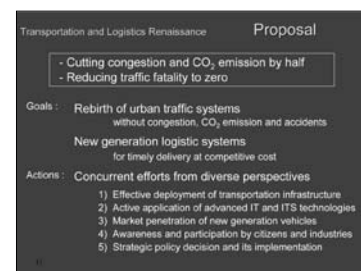
Again, I stress the new perspectives beyond the existing borders of the private company, university, academic disciplines, government, and countries, already some gentlemen have stressed the university and the private companies' corporate social responsibilities and NGO activities.

I can show you one, my experience (See #5). This slide is the last year – last summer, Mr. Palmisano who is the Chairman of IBM and the world famous innovation evangelist. Mr. Palmisano invited more than 300 world leaders to come together, including Dr. Kurokawa. At that time he stressed, now even the private companies, product innovation, service innovation, business process innovation, and business model innovation, this is all innovation model based on the Schumpeter, almost 100 years ago.

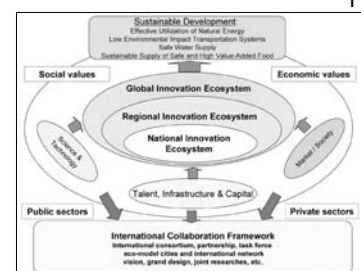
But now world is changing and the game is – Ludlum's game is just changing and focusing upon the sustainability, he stressed. Even the private enterprise focusing upon policy and social innovation and cultural innovation, this is one example.

Another one is the integration of traditional disciplines, in order to get new successful values, social values and economic values, as well as new academic fields, we have to integrate all the disciplines nanotechnologies, biotechnologies, information technologies using not only their theory and their experiment – methodology of modern science and technology but also the newly developing the computer modeling and simulation. This is the third-pillar, so-called the third pillar of the modern science.

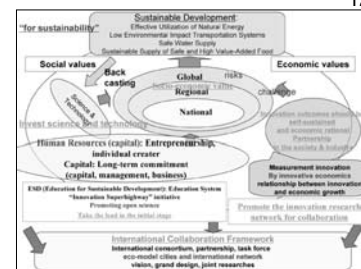
Japanese modernization and catch-up phase now the ending. We are experiencing more than 100 years catch-up phase and modernization. But as I had stressed, in the late 1980s, the world is changing; end of cold war, political viewpoint, and technical viewpoint. The internet is expanding and the world is flat. Now, we have to define the national vision and goals and social values. And we also have to reorganize and redefine the allocation of the knowledge and university and people, organization, etcetera, to adjust post catch-up phase and the changing world.



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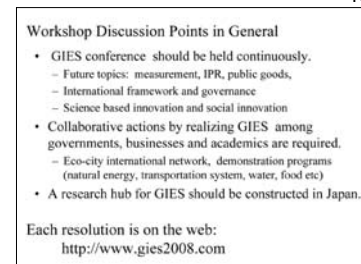
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Atsushi Sunami

I would like to first ask Professor Uchida about a notion of ecotechnology. Because I know you are one of the first intellectuals that came up with the concept and importance of ecotechnology 30 years ago, as a main sort of source of founding activity for the foundation of Honda and a sort of reflecting upon the spirit of Soichiro Honda.

That is still a keyword, as a sort of in today's Asian context. I am sure, as Dr. Ca mentioned, there was a conflict between economic growth and ecotechnology. How do we balance these two sorts of seemingly competing ideas? It is easy for us as Japan to talk about ecotechnology among, say, other leading OECD countries. And just sort of agree upon how important this new NLG technology and so on and so forth. But here, we know the importance to Asian context. We have to implement this.

In the case of Korea, for instance, now we have the Korean Secretary General in United Nations talking about the importance of climate change and so on and so forth. But my colleague in Korea is very concerned about how reluctant the Korean industry is to take this initiative on in Korea; is it case for other Asian countries, or is this what we have to deal with. I mean there are a lot of things that we need to talk about today. But first I would like to go back to Professor Uchida and see whether this concept of ecotechnology is still alive. Is this relevant to Asian context?



Hirohisa Uchida

Maybe you noticed, through these four presentations, all issues are connected with human, people, anyway. Nothing is independent of people. Therefore, if we think, for example, science, science itself requires universality or generality independent of human, of course. But on the other hand, please think of the development of robot. If you want to have a robot at home, what kind of robot will you need? One robot, you have one. And you program at night, okay, please call me up at 6 o'clock and then I go to somewhere and, okay, the next morning, you do not feel well, you have fever. But robot comes, please get up.

No, we do not want to have such a robot. We may need maybe a robot who or which understands our feeling, we human beings are not rational, I should say. Our feeling is changing time to time. Today, we feel well, but maybe next day not so well, and so today I say, yes, but next day I say, no. Today, I will say I love you, but maybe next day you will say, I do not love you, and so on. So, universality itself is very important for science, that if some result of science is transferred to technology, then the technology is connected to our daily life and the old system. So, technology should consider our emotion and feeling.

And the conventional science technology, I should say this point was not considered but maybe, you know, well, for example. As I told you, in the development of robot, this feeling of human is strongly considered. And then even in the field of medicine, tailor-made medicine is being just developed. Like that, any technology should be connected to human. This is a very important point; we have a global environmental problem. Do you know how many



biological species are on the earth? Nobody knows, but anyway 2 million or 4 million one says.

Who is responsible for the global environment, global pollution? There is only one very, very bad species, human beings. If we have one conference, a meeting with these species, they may conclude, we should annihilate one species of human beings, then it is all right, all global environment problems will be solved, but we human beings say we need sustainability. We need our next generation.

This is just egoistic, but this is true. This is also point if we say environment, it should be said rather human environment. This is true, I should say. Of course, we need biological balance too, but anyway we should know what is going on. And in ecotechnology itself, the introduction of this ecotechnology is not so easy because each nation or country is treated under different conditions. And I should say, first we exchange such information or examples, how we can introduce ecotechnology, or a typical example to a society and maybe such information should be first supplied to us.

And sense of values, this is also very important point in Asian field. Maybe we have received no sense of values within Asian countries. So, this point, I should say this ecotechnology, if we set, maybe we have very similar feeling to use this word.



Atsushi Sunami

Thank you. The question that each country, especially in Asia where each economies are very different at their stage of development, share actually the concept of ecotechnology, primary because of a lot of scientists from this region are working in a very, very similar platform. I would like to call upon Dr. Ca to come back and reflect upon this.

So, we do in this international conference type, we always talk about ecotechnology in a very similar level with the other scientists and researchers. But does this easily translate it in your own Vietnamese context? If you decide to do a work on NISTPASS and so on in the Vietnamese context, can this ecotechnology really have some influence on the behavior of the policymakers of the industrial sector and so on and so forth in Vietnam?



Tran Ngoc Ca

Actually, I think that the situation in Vietnam may be similar to some other country and the reason that politics – politicians do not like too much of theories. What they want is kind of blueprint. Okay, you talk about X, Y, Z. Okay, so what do you want us to do? Some kind of plans, something very specific. And if we as academics do not go beyond the theories or beyond the concept, nothing would happen, right.

So that should be translated into some kind of action and very specific things, very specific suggestion. And then they would take up on it, I believe that if we refuse this kind of ecotechnology concept or theory into action, we need more

specific kind of translation or kind of special mechanism for people to talk. And actually, I look at what Dr. Sombat presented on the case of Thailand. It is very much in Vietnam. It is only ecotechnology in there.

We talk about Green Leaf, we talk about Green Label, we talk about Green Production. And that is already in place, rather than we talk about general concept of ecotechnology, we have different kinds of design or planning for them to take upon.

And another remark I would like to make now is that we mentioned a lot about the Corporate Social Responsibility, CSR, and there is always kind of skeptical feeling about the corporate sectors. Do they do anything at all or they only run after their profit. When actually the reality shows that, yes, they do, if we can find them right mechanism for corporate sector to sit down and talk with the government, talk with NGO. And if we can design a kind of win-win situation, scenario, they will be involved and activate.

You mentioned about IBM's Sam Palmisano. His deputy Nick Donofrio, Vice Chairman of IBM responsible for innovation, is promoting strongly innovation agenda in Thailand and in Vietnam, and actually we work together with IBM and with NSTDA, I believe that many of our colleagues from NSTDA knew about this, on promoting innovation agenda in both Vietnam and Thailand. And, actually, we are promoting very simple thing like using ICT for food traceability, right. You talked about shrimp, Vietnam or Thailand as a shrimp exporter to Europe or Japan.

What we need to make sure is that the product that reached the end user in Japan market is clean itself. Who can justify this? How you know that you shrimp, it is clean. How you know that you shrimp, It is free of different kind of chemical. And that scheme that IBM is running now with NSTDA Thailand in experiment, of course, it very much caused a strong interest in Vietnam too. So, we got some kind of – our both ministers, say, that look and talk to NSTDA and collaborate with NSTDA and IBM in using that technology. And here what I say this is only ecotechnology.

So, I just want to sum up that, okay, the concept is right, but in order to make the right concept into right action, we need the right mechanism. We need very specific thing. Sit down, talk together with your neighbors, with your corporate sectors.

In our case actually, we work very closely with people from IBM, actually interestingly the man who runs this show is IBM Thailand. But he is actually responsible for also covering Vietnam sectors. So, he became our good collaborator between our ministry, NSTDA, and IBM. This should give you an example, how it can be done.

Sombat Teekasap

Actually, for the federation of Thai industries we have around 8,000 members. So, we work in three types of structure, for example, like we have the provincial chapter, so all of the industry in the province, they join together and work together. And the other thing is we have the member club, the industrial club, for





example, like we have the environmental management industrial club. So, we serve all the members, so all of this we have done for several years, and with that at the beginning the acceptance of the people of the industry seem to be low, but later on, once we tried to introduce the profit, the good things for them, it becomes a better way to work together and then that is much better now.

More than that, the government officials, the authorities also support us very well. They support, in both technology, they support in the system of the law and recreations and a lot of things. So, that is one thing that it helped a lot.

So it meant to say that the working with one engine is not enough, There should be several engines. This time, we try to collaborate with the universities. We tried to work with the industry also. It means to say that now we will have three parties at least, and actually there will be some of the NGOs working on this and trying to come into the scene, that is also the other good aspect that we are looking together. So for Thailand, we try to look the way to work together on several sectors together. And we also believe like Uchida-sensei had said that the human environment is quite very important. We know it very well that if the people do not accept the things that will never be done, so all of this is quite going in the same way.

And what I feel now is the – when we look into Asia, at least in my opinion there is big four. One is Japan, one is the China, the other one is India, and the other one might be Korea. In case of China and India, you have a lot of population; in case of Japan and Korea, you push very good technology forward.

So, if we can join – bring the Asia together that might be a big force for this. And, for example, like in Thailand, we have a lot of academic people try to working on this, but somehow we still do not have a good pronounce of our technology. Even we try hard and we do a lot of things, but still inside Thailand, not growing out of Thailand very much. So, this might be – if we can cooperate with the Asian people striving to work together that might be a big step to what the ecotechnology.

And the other things I know that Japan has a very high experience in environmental problems, for example, like the Kitakyushu, all of the disease that had happened with the technology. Some of this experience is still not transferred into the Asian people. For example, like in Thailand when we talk of some disease we still do not – really not inside, really not have a good feeling that it is the term that we have to work on this area. So, if Japan can help, the Asian people, the developing country people on this type of topics that will be really helpful.

Atsushi Sunami



I think it is a nice way of leading to this more difficult question to Mr. Arimoto. That is the cooperation and the role of Japan in this. Today, I think we have very distinguished Japanese scientists in the area of ecotechnology with us. And they have been collaborating for many years with Asian countries there. But repeatedly, the Japanese political leaders, former prime ministers and current prime ministers are talking about what Japan can contribute to the world is our

level of technology, our lead advance ecotechnology in the area of environment.

And again, the question is if Japan can deliver this sort of promises to the world and especially to Asia. But to me though, a lot of things that the Japanese government is not really active or not really doing enough in terms of collaborating or facilitating a lot of collaboration, especially in the Asian context, we are sending a special envoy to China, the former Chairman of Toyota to even discuss with the Chinese leaders about how we can help solve this climate change problems.



Tateo Arimoto

I can show you some examples here. I remember during this session Mr. Aho who is the former Prime Minister of Finland. He stayed as a Prime Minister almost 10 years and he made Finland innovative countries.

Last year, some international conference of innovation, he said to us very impressed words, innovation is not living with general public. In my understanding, innovation is disruptive change. General public does not like change. So, innovation is not living with society. Even in Finland, it is now facing some difficulties.

Mr. Ca mentioned the politicians as well as the academicians are conservative, but most conservative is my sector, governmental sector. In every country, they are deeply divided, their ministry of education, the ministry of the economy and trade and ministry related to transport. Of course, the general public likes stability. So in order to make a country innovative, we need innovative leaders. The number of leaders is very smaller than the number of general public, but we need leaders of the – which – who is acknowledging and recognizing the situation of times.

I mentioned the world is changing, and the world is – the game of the rules, private companies' competition and collaborations and even the public sector, the public policies beyond the borders that that games is changing. So, from the industrial sectors as well as the academic sectors and the governmental sectors, we need innovative leaders, of course, their next generations, how to produce, how to educate, nurture such innovative young people to lead us.



Hirohisa Uchida

I want to just show you some examples, what is happened in Japan. Some people pointed out that Japanese – in Japan, the economic growth was very remarkable through 50s to 70s, even 80s. And I will tell you what the background is. The first one, which is very important, is the government implemented a policy to increase the number of workers for manufacturing. But how, they increased the number of bachelor of engineering at main universities, in Japan, we have over 450, 460 or 470, I do not know. We have so many universities.

And at the time, they increased the number of universities and produced so many bachelors of engineers. The young people with the university education



were no more elite but high quality workers, and this was a very important point to increase the output products and the quality control. So, this was a very important point.

Sony, for example. It was called not Sony, but Tokyo Tsushin Kogyo in 1946. This is Mr. Morita, the first tape recorder and the first transistor radio; around \$500 at that time, very expensive, and small transistor TV. There was advertisement of this transistor radio at that time. So, Sony was also a very, very small company. Then they have become now a very big worldwide company.

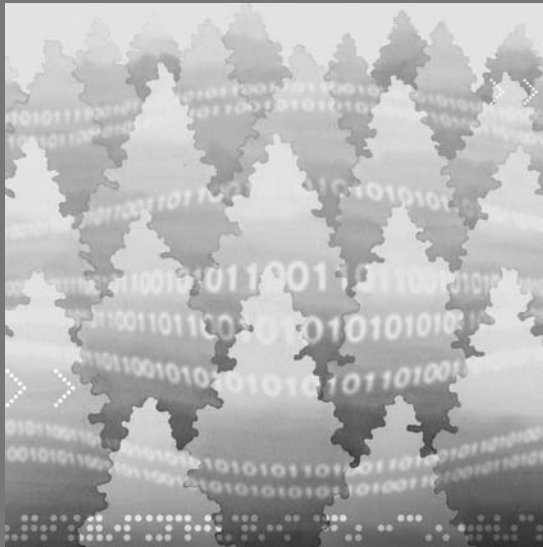
And this is Mr. Matsushita. Do you know what he did first? He produced this lamp. And this is the advertisement, right to left, National lamp for bicycle. Yeah, so that was the start of Matsushita. And on right hand, you can see his factory, very, very small factory, 1927. And this is a very typical Japanese style in Japan. This is one Japanese-style room; this is futon bed – their futon bed. And she has prepared an electric heater. She is connecting to the lamp. They produced very special connector here, not only for lamp but also for constant. This is a very typical scene at that time, I still remember this style.

As already in 1959, Matsushita Denki had in US, a very big company, right, and in the early 60s, 1964, they produced so many different types of things. These three things were so called modern cultural life or symbols: electric refrigerator, electric wash machine, electric TV. I still say electric refrigerator, and my students are laughing. Why I say electric, refrigerator is refrigerator or electric wash machine I say, but the students laugh again. For young people, washing machine or refrigerator is okay. Of course, I do not say “electric” TV but that was very, very important, three things for Japanese.

This is also an advertisement for MAZDA. MAZDA produced such a three-wheeled car. And he is Mr. Hayakawa, founder of Sharp. His name SHARP came from this pencil. He invented this Sharp Pencil in 1915, and of course at the time he had Hayakawa Metals or Hayakawa Denki factory, but he invented this small pencil and this was a sharp pencil, this name was adopted for this company, the first TV and German radio and vacuum tube.

So that is the Japanese industries, they started from very, very small company. It took 40-50 years or more long. That was one example, so how we can put sense or human factor in this technology. Of course in Japan, as I show you this is very typical Japanese style, this does not match, for example, for Thailand, but for us it was very nice style at that time, anyway. Like this, maybe the introduction of ecotechnology itself was quite different in each area, because lifestyle and human environment itself is quite different.

Session 1: Resources and Global Environment



Session Chair

Paritud Bhandhubanyong

Specialist, ADO Advisor to President,
National Science and Technology
Development Agency (NSTDA),
Thailand

HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Yoshifumi Yasuoka

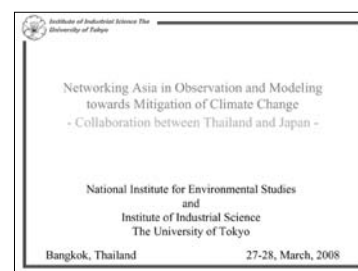
Executive Director,
National Institute for Environmental Studies, Japan

I would like to talk on the networking Asia in observational modeling towards mitigation of climate change. I would focus on the collaboration between Thailand and Japan first. Also I would like to focus my talk on the integration from observation modeling to mitigation. Integration is one of the key concepts to tackle with climate change since only monitoring, only modeling only mitigation, we cannot do, we cannot cope with their climate change. So the integration is very important. And networking is a part of the integration.

Let me start from the background (See #3 to 4). Of course you know this chart increasing in temperature. In global scale, the temperature is increasing last decade. And also we know the relationships between the increase in population and in CO₂ concentration. This chart implied something on the climate change. Based on these data the IPCC clearly stated that the warming of climate system is unequivocal.

It is evident from observation of increase in global average temperature and ocean temperature. And also climate change is very likely due to the increase in anthropogenic greenhouse gas concentration, IPCC clearly state in their both assessment report. Human activities are the source of the climate change. So we have to do by ourselves. This is very important. This is not natural phenomenon.

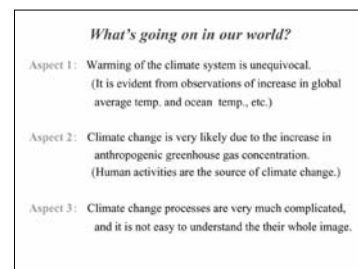
And climate change processes are very much complicated, sophisticated, and it is not easy to understand the whole structures of the change. What are the impacts? IPCC also stated that many natural systems are being affected by climate change particular temperature increase. Socioeconomic systems may be serious affected by climate change. We have different kinds of disasters or epidemics and many other events, all over the world. Of course, we know that all of them are not due to the climate change of course.



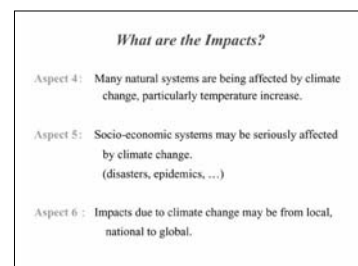
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This is cyclone Sidr attacked Bangladesh last year; many people are killed in this cyclone. All over the world, there are many cyclones, or typhoons, or hurricanes, all of them and not necessary due to the climate change as I mentioned, but according to the latest simulation of the model, heavy rain or heavy storm would be increased and heavy drought would be also increased. The variation would be large in the future.

What are the mission in science and technology? I pointed out four items, aspects. Information on climate change is insufficient that means we need strategic observation over the world. The changes and impacts in the future are not clear enough. We do not know the future conditions. We need model to simulate the futures, models for prediction or assessment should be developed and validated. Of course, these are the mission of science and technology.

And beside these two, adaptation or mitigation measures can diminish the climate change risks, so that means we have to develop the countermeasures for the climate change. These are the missions of science and technology. So today or tomorrow's symposium would focus on this point. My talk would focus on this point primary. And Professor Hanaki he would talk on this part later after my presentation. He would talk on the adaptation or mitigation tools for the climate change. I would talk primary on their modeling and monitoring. This would show their different aspect.

Toward sustainable world, we need to know what it was in the past, what is it, what it is at the present? We have to know how it will be in the future. And of course we have to know how we can improve our world. This would be observation, model prediction or assessment and countermeasures or adaptation or mitigation tools.

My talk is primary on the observation and modeling, but my major is remote sensing, their observation tool from space. So my talk is on this part, but of course I would refer to other aspect of observation. And today my talk is on Terrestrial Ecosystem. Of course we have to cover atmosphere, land, ocean everywhere in order to tackle with the global climate change. I will focus my talk on the Terrestrial Ecosystem monitoring and modeling.

I would touch on these topics today: South East and East Asia Satellite Observation Network (See #6). This is the collaboration between University of Tokyo, Thailand GISTDA and AIT, Asian

What are the Missions in science and technology?

Aspect 7 : Information on climate change is insufficient.
--- Strategic observation should be deployed.

Aspect 8 : Changes and impacts in the future are not clear enough.
--- Models for prediction and assessment should be developed and validated.

Aspect 9 : Adaptation and mitigation measures can diminish the climate change risks.
--- Ecotechnologies are critical elements in tackling with climate change.

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Institute of Industrial Science The University of Tokyo

☆ South-east and East Asia Satellite Observation Network
(Collaboration between UT, GISTDA and AIT)

☆ Integration of Observation and Modeling

☆ Ecotechnology Development Assessment for
Adaptation and Mitigation of Climate Change

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Institute of Industrial Science The University of Tokyo

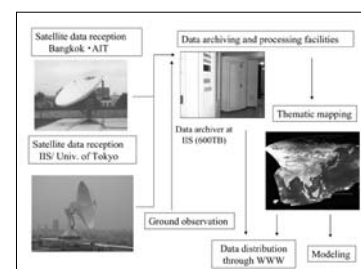
SEASON

South-east East Asia Satellite Observation Network
for Environment and Disaster Monitoring

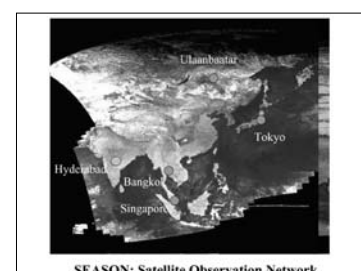
Institute of Industrial Science
The University of Tokyo

Collaboration with Thailand (GISTDA and AIT)

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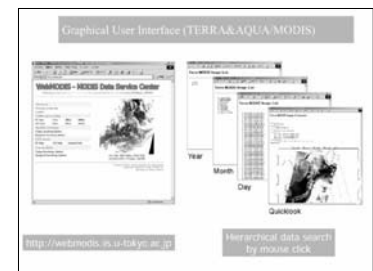
Institute of Technology. And also I would talk on the collaboration between Thailand and Japan, integration of observation and modeling. And finally I will touch on a little bit on the ecotechnology development and assessment for adaptation and mitigation of climate change.

Let me start from the first topic. The University of Tokyo has been deploying their satellite observation network in Asian regions (See #7 to 8). We named it as SEASON, South East Asia Satellite Observation Network for environment and disaster monitoring. This is the joint collaboration between Thailand GISTDA and AIT. We have installed two satellite data receiving antennas at AIT, a little north from Bangkok and also at Tokyo. We have two receiving stations. And everyday we cover the East Asian regions. And based on all of these data are archived at the University of Tokyo and they are around 1,000 terabyte, massive archive system. And all of the data is provided to everybody free of charge to the world. You can download the original satellite data from our website and from GISTDA site and from AIT site. It is free of charge.

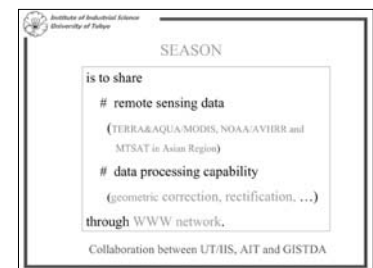
And of course we have been developing the algorithms to produce the schematic maps relevant to environment and disasters. This is the chart (See #9). This is the satellite mosaic map over this region. We have two receiving stations at Tokyo and Bangkok. And now this network is extended to National University of Singapore, Ministry of Natural Resources and Environment of Mongolia, Ulan Bator and also the new face is the Indian Institute of Information Technology, at Hyderabad. So at this moment we have five satellite data receiving networks and all of the data is provided to you free of charge.

Maybe you know the name of Google Earth. This is a sort of innovation, but you cannot get original data from Google Earth. Our system SEASON can provide you with original satellite data free of charge (See #10 to 11). If you visit our website, you can download data of NOAA-AVHRR, TERRA/Aqua MODIS, and MTSAT. This is a geostationary satellite data. Everyday these data would cover the whole region. So you can download data observed yesterday. If you visit our site today, you can download data observed yesterday.

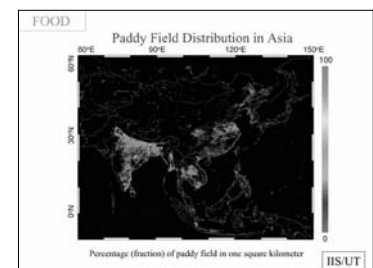
This shows another mosaic of the region (See #12). This is a 10 days composite. Of course if it is today, you cannot see the land from space. In that case, we would use tomorrow data. If tomorrow is cloudy, we would use the day after tomorrow data.



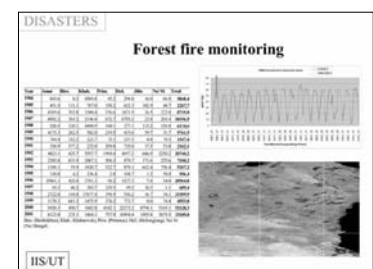
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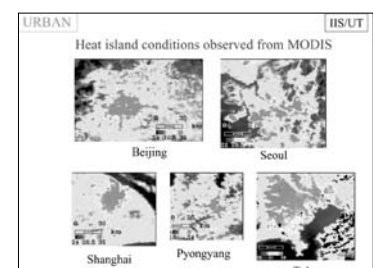
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And if we combine 10 days data, we expect to produce this kind of cloud free model. And all of these data are stored in a system and you can download them, of course this is huge data. So maybe somebody would give you claim if you want to download whole data, so please be careful.

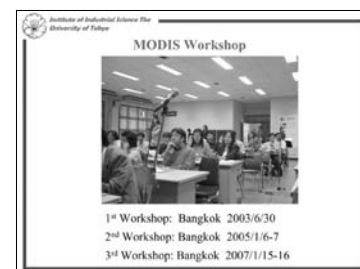
This is a forest fire monitoring data from 1984 (See #13). I am sorry they are too much – huge memory size, so this is another coarse image. This is the vegetation index showing how the vegetation is active in summer time green, in winter bluish. And over the water region, this is the sea surface temperature. SEASON is to share remote sensing data and data processing capability through worldwide web. You can use SEASON freely.

Let me show you some examples of the product related to the environment or disaster. This is the paddy field distribution map in Asian regions (See #12). We produced this kind of map every year. This color shows the fraction of the percentage of the paddy field area in 1 kilometer grid. In Thailand over this area quite a lot of areas in paddy field, also India.

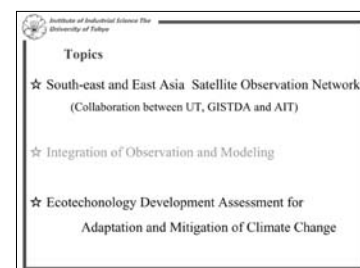
This is heat island map over the Asian megacities (See #14). The heat island is one of their key issues related to climate change. Of course, you can analyze the thermal condition over the city with the land-cover maps. Our correlation analyst showed that their thermal surface temperature is a function of the greenness of the area. If you plant much green, it would be better for you with respect to the heat island conditions.

This is the forest fire map from 1984 to the date (See #13). This is on day shot of satellite image. Many, many forest fire areas. And much carbon is emitted from the area. We have had our MODIS Workshop (See #15). MODIS Workshop is a name of the workshop with Thailand GISTDA and AIT. This is the photo of the third MODIS Workshop. This was held January last year. I myself is here. Here is Dr. Suvit Vibulsresth, the former Director General of the National Research Council, Thailand GISTDA. Many people are from Asian countries and all over the world.

I would like to switch on the next topic integration of observation and modeling (See #16). Maybe this is the prediction of the climate change up to 2100. This result is input to IPCC. Assessment for AR4, this product was provided by the National Institute for Environment Studies, the University of Tokyo Climate Center, the Center for Climate System Research and Frontier Research Center for Global Change. Reddish means high



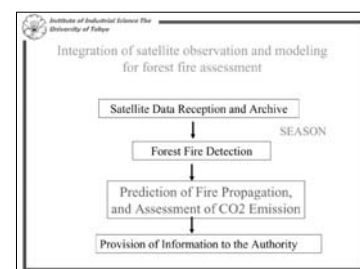
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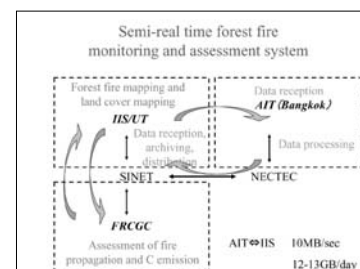
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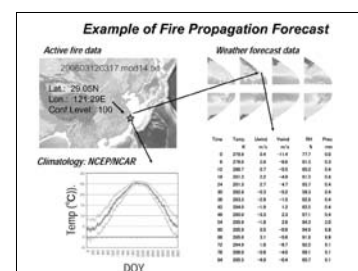
More local scale, we have their result based on their modeling, coupling of modeling and modeling. This is the forest fire map (See #17). This data is up on our website every morning. You can see the forest fire areas up to yesterday. So please visit our site. Many, many forest fires and the data obtained at AIT or GISTDA is transferred to the University of Tokyo. All data is transferred at midnight. The data observed today is transferred to the University of Tokyo tonight. And tomorrow the data is sent to the Frontier Research Center for Global Change. They have a model especially tuned for the forest fire. For example, this is one case of forest fire and they use the weather forecast data of 96 hours and we would simulate the fire propagation up to 3 days. And final result is how much carbon could be emitted from this forest fire. And this result is transferred back to Thailand.

This chart shows their players in this system, the University of Tokyo, Thailand GISTDA, AIT, and also the first fire control division Royal Forest Department, Thailand (See #19). These four are the main players in this system.

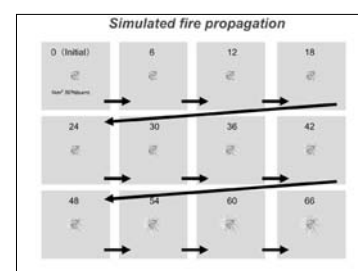
This is semi-real-time prediction system based on the monitoring and modeling (See #20).

My final part ecotechnology development and assessment for adaptation and mitigation of climate change (See #23). Of course, this system can be used for the ecotechnology. Beside these, first management technology would play a key role in tackling with climate change in terms of Terrestrial Ecosystem Management.

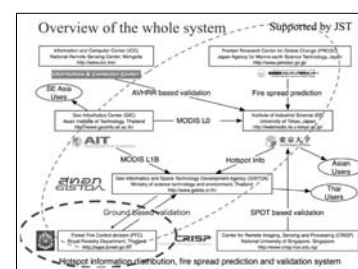
We have many plantation areas in Asian regions. Their conditions should be monitored and managed properly in order to increase the CO₂ absorption and reduced emission in forest areas for example. The last POP 13 value, the new scheme was started REDD, Reducing Emissions from Deforestation and Degradation. This REDD would be deployed all over the world. In particular in Asian regions we have many forested areas, so we have to concentrate on this project by ourselves. The forest areas should



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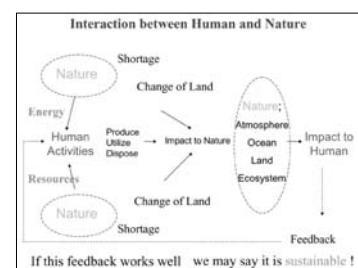
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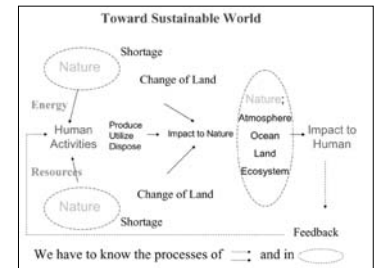


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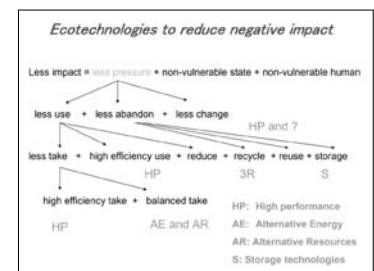
be monitored by satellite, by ground observation system, and the area should be properly managed. This is one example of the practical achievement in terms of ecotechnology in this field.

We have nature, human activities, as a source of the climate change, the IPCC declared that. And as a result, there would be serious impact to the society and human. There would be the shortage of the energy and resources. There would be the change of land. And there is a feedback from the human impact to the human activities. If this cycle, this feedback is sound, we may say that our system is sustainable, but if one part or multiple parts are had a damage, our system would not be sustainable. So we have to cover the whole cycle with monitoring, modeling, and mitigation tools.

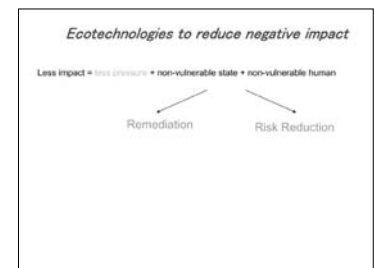
In order to reduce the impact, we have to decrease pressure or we have to keep the non-vulnerable state or non-vulnerable human. In order to do that, we need to decrease the takes and abundant or less change. So 3R technologies or high performance technologies or storage technologies would be indispensable. Ecotechnologies can contribute to these areas. For a sustainable world as I mentioned observation, model prediction, and countermeasures should be integrated. Our contribution, our means the science and technology societies, we have to contribute to this part through the integration of all technologies.



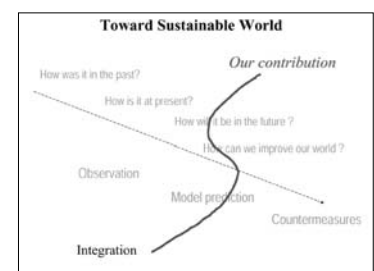
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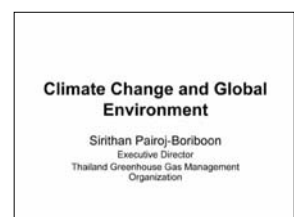
Executive Director,
Thailand Greenhouse Gas Management Organization (TGO)

TGO is a new organization to serve Kyoto Protocol on the climate change especially on mitigation measure and we do regularly approve the CDM project for carbon credit. And according to this session, I have some picture which is similar to Dr. Yasuoka have said. Another view to look at the environment especially in the view of our global environment, the world or our earth is shrinking by the way that our global population is increasing (See #2). According to the statistic during the past century our population, the world population is increasing, 70 million people are here. What is that mean? It means that we do need more resource, more land and more food. That means less land for lives on earth to comfort our living condition.

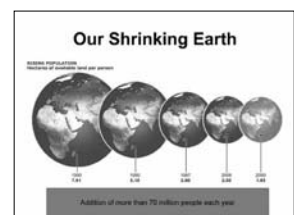
Another factor that shrinks our earth is the desertification and sea level rise due to climate change (See #3). Many country around the world has lost their land and become desert for example like China lost their productive land during 1950 to 1975 around 1500 square kilometer each year. And this figure in China twice as much by the year 2000. Same thing happened in Nigeria in Africa, the population increased you know from 33 million in 1950 become 134 million 2 years ago. That means their population increased four times during the past 5 decade. They lost their cropland by about 3000 square kilometer per year at the moment. By the increase of the population they need more food, more agricultural land.

And right now they are facing the problem of carry capacity of the land to serve their food production. The example for sea level rise that caused by climate change. The last century IPCC indicated the sea level rise about 15 centimeters. And by the end of this century, if we do nothing, it will increase about 3 to 35 centimeter. That means it will affect all the coastal area. This picture is from NASA (See #4). You can see the temperature, the climate in more than 100 years ago is animated, you know, pretty cool, and it is quite warm at the moment. And this one also similar to what we have said. The temperature rise and is similar to what greenhouse gas does increase (See #5).

Carbon dioxide increased, you know, by almost more than 30% during the past 5 decade and also methane increased two-fold during the past



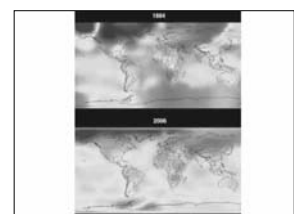
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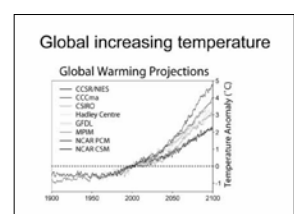
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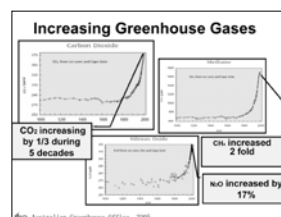
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50-year also nitrous oxide almost 20% (See #6). We have evidence many people including scientist at the moment some of them do not believe in the climate change, but according to the UNFCCC, they have agreed that do not wait until we make sure 100%. So we take precautionary principle, but some evidence indicated that we are warm.

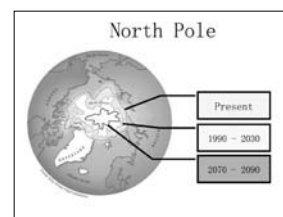
This is the Kilimanjaro Mountain in Tanzania (See #7). It is only 7-year the snow almost gone. This picture took at the same season that means in winter, 7 years apart. The same thing in Alaska (See #8 to 9). At the same place, 10 years apart the snow and ice in the stream gone. It is no way the same place 10-year apart. In Greenland also, we can have evidence (See #10 to 11). In 1992, the red one has been melted, but 10 years later it expands. This mean the water get warmer and ice is melting. You can see this picture in the winter in North Pole. At present, we predict that not at present the ice in North Pole is around this area (See #12). And they predict that in another 20 years it will decrease to this line. And by the end of the century, it will have this much level.

Coast erodes as the sea level rises and also from the cyclone. You can see the evidence from this chart. Only 5 years in North Carolina the same building (See #13). Even they have dune protection, but they can not stand it. And the shore has gone.

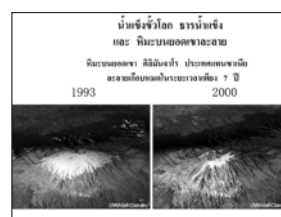
This is southern Thailand (See #14). This is aquaculture. The sea almost gets into the aquaculture pond and also the road to sea get closer to the road. This is Nakhon Si Thammarat also southern Thailand (See #15). Very fragile in this area is aquaculture, you can see and I think pretty soon it will be wiped out. At the moment in Thailand we lost more than 160 square kilometers of land in the gulf. We lost the land to the sea. This is not pictured yesterday, but pictured last year (See #16 to 17). We cannot get to the satellite. And it happened, you know last week the same again with the wildfire, with the forest fire in Northern Thailand and Burma and Laos.



6



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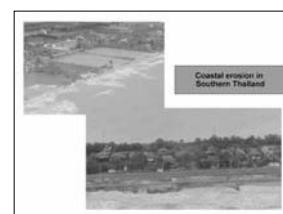
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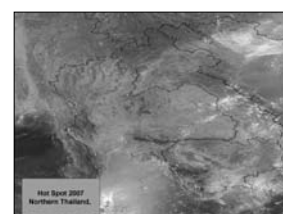
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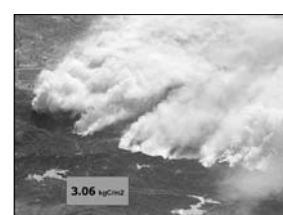
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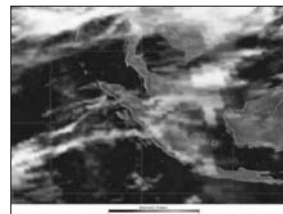


Forest fire is also take place more often due to climate change. Especially I think everybody knows that event of forest fire from Indonesia that almost every year it takes place and we get smoke from the fire (See #18). The reason is that Indonesia has very shallow coal layer. Once the fire get, it is very difficult to take it up. This is the event last year in the north of Thailand (See #19). This is Katrina in USA that attacked New Orleans (See #20). This is the temple in Thailand, in the south of Bangkok (See #21). It is already in the sea. This one used to be on land, but at the moment it was already in the sea.

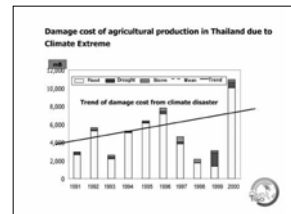
This one is showed by WHO information that indicated the climate change can cause death and mostly affect poor country especially in the topical area (See #22). This is the mortality rate per million people. This means 4 to 70 people per million that death by climate change. This one also data from IPCC damage caused due to major disaster (See #23). It is increased from 10 times, from 4 to 40 billion US dollar each year during the past 50 year. And also the frequency of major disaster increased from 13 times to 72 times in last decade.

Similarly in Thailand we have damage caused of the agricultural production increasing every year due to flood, drought, and storm. And according to the UNFCC and Kyoto Protocol we have taken action on greenhouse gas that is specify six gases. I will not go into detail, but this gas has been trade as the carbon credit. This is the world status on greenhouse gas (See #26). Carbon dioxide still takes the major gas, they contribute to global warming. At the moment almost 80% of greenhouse gas is carbon dioxide. Methane above 15% and then nitrous oxide. These three gases actually are natural. What we have is in natural, but human activity increase it, but the other two take only 1% is chlorofluorocarbon group and sulfur hexafluoride.

This is the data of the world contribution of emission of greenhouse gas (See #28). If we do nothing, the next 20 years, we will increase almost



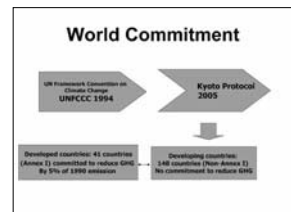
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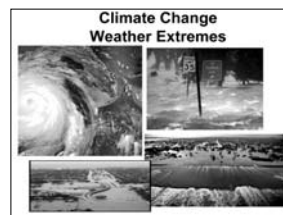
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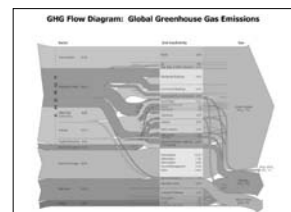
Greenhouse Gases in Kyoto Protocol and their Global Warming Potential (GWP)

Greenhouse Gases	Formula	100-yr Global Warming Potential (GWP) Carbon dioxide equivalent
Carbon dioxide	CO ₂	1
Methane	CH ₄	21
Nitrous oxide	N ₂ O	310
Hydrofluorocarbons	HFCs	140 - 11,700
Perfluorocarbons	PFCs	6,500 - 9,200
Sulphur hexafluoride	SF ₆	23,500

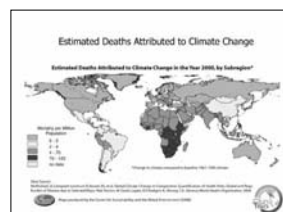
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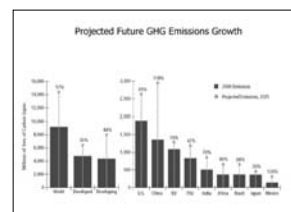
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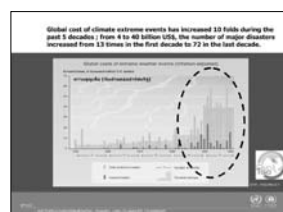
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2007 Reuter Top 30 GHG Emitter

Rank	Country	CO ₂ Emissions (Million Tons)	Change (%)
1	USA	6,053	+13
2	China	3,750	+32
3	India	2,047	+38
4	Russia	1,539	+41
5	Japan	1,205	+9
6	Germany	1,198	+16
7	France	660	+24
8	Canada	600	+20
9	UK	527	+10
10	Italy	450	+7
11	South Korea	391	+19

29

60% from the present. And at the moment we see US is the most contribution, but their increasing rate is not so fast as China (See #29 to 31). Japan is only 25% (See #32). Mexico is coming quite high. At this picture people may aware where Thailand is. Reuters has set 30 countries. Of course the first one is USA. And Thailand is still not, you know. We contribute greenhouse gas about 26% of the world – of the total, but if we classify or prioritize the country, we are on the 25th nation with increasing about 50% during this decade.

So come to this picture (See #33). If we do nothing, we will be here. We will increase 62% by the year 2020. At the moment, we contribute – the energy sector has contributed the most contribution of greenhouse gas, agriculture, life stock and waste production. I think that it is similar to the world picture. Kyoto Protocol has specified clean mechanism (See #34). Joint implementation and emission trade, we are doing it among the Annex 1 country or the industrialized countries.

Clean Development Mechanism allowed developing country like Thailand to voluntary participate reduction of greenhouse gas. You may know already. Just the picture to see that the carbon credit or the reduction, the commitment of at least one country, let's say you have to reduce 5 to 10 and non Annex 1 country like Thailand can reduce voluntarily (See #35). And this amount we can save to Annex 1 country. That means only two left for the Annex 1 one country to reduce at the home. Kyoto Protocol specified 50 types of activity and industry that can be CDM project (See #36-37). And this is the amount of greenhouse gas that has been reduced consider as a carbon credit that can be saved in the market (See #38). And those buyers are Annex 1 governments, carbon fund like World Bank and private carbon broker.

This is the CDM project that has been registered in the world (See #39 to 41). It is almost 1,000 projects at the moment. India is the most one, more than 300 projects. Thailand at the moment, 7 projects have been registered. Most of

2007 Reuter Top 30 GHG Emitter

	2007	2006	2005	2004
12 France	548	513	502	-6
13 Mexico	442	412	312	+10
14 Indonesia	333	323	312	+10
15 Australia	408	401	324	+20
16 Canada	328	322	301	+20
17 South Africa	308	317	312	+17
18 Iran	288	282	212	+47
19 Spain	288	281	228	+10
20 Poland	401	381	380	-10
21 Turkey	272	263	207	+10
22 South Korea	258	243	212	+10

30

Types of CDM projects in Kyoto Protocol

1. Energy industries (Renewable/non-Renewable sources)
2. Energy distribution
3. Energy demand
4. Manufacturing industries
5. Chemical industries
6. Construction
7. Transport
8. Mining/Mineral production
9. Metal Production
10. Fugitives emissions from fuels (solid, oil and gas)

36

2007 Reuter Top 30 GHG Emitter

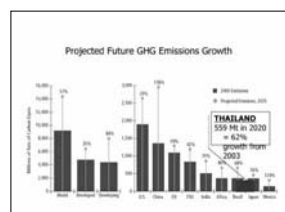
	2007	2006	2005	2004
23 Argentina	248	238	N.A.	+10
24 Pakistan	228	228	N.A.	+10
25 Thailand	178	205	N.A.	+10
26 Venezuela	168	142	N.A.	+20
27 Taiwan	128	120	N.A.	+10
28 Netherlands	128	120	212	-10
29 Nigeria	108	108	N.A.	+10
30 Uzbekistan	108	108	N.A.	+10

31

Types of CDM projects in Kyoto Protocol

11. Fugitives emissions from production and consumption of halocarbons and sulphurhexafluoride
12. Solvent use
13. Waste handling and disposal
14. Afforestation and reforestation
15. Agriculture

37

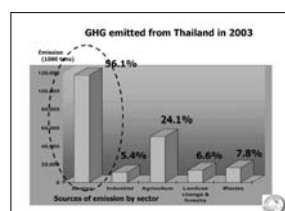


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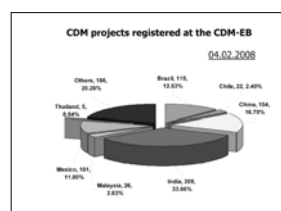
Carbon Credit Buyers

Annex I Government	Carbon Fund	Carbon Broker
<ul style="list-style-type: none"> United Kingdom : Department for Environment, Food and Rural Affairs Germany : GIZ Denmark : Ministry of Foreign Affairs Japan : MEDO EU countries 	<ul style="list-style-type: none"> World Bank as the manager of Prototype Carbon Fund and Community Development Carbon Fund The Netherlands European Carbon Facility Asian Carbon Fund Danish Carbon Fund Japan Carbon Finance 	<ul style="list-style-type: none"> Similar to the Broker in stock market, such as Asia Carbon Exchange by Singapore as a center for CDEs trading with service charge of 2% of the CDEs price Traditional Finance Service (UK)

38



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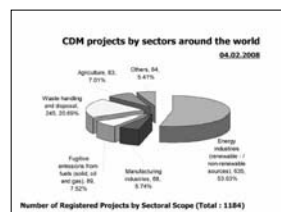
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Kyoto Protocol

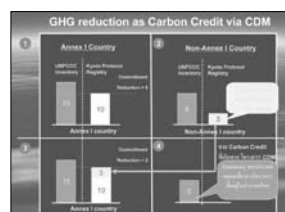
- Joint Implementation
- Emission Trade
- CDM (Clean Development Mechanism)

CDM allows the developing countries (Non-Annex I) reduce GHG voluntarily and transfers the reduction as Carbon Credit to the Annex I countries.

34



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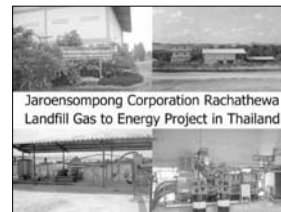
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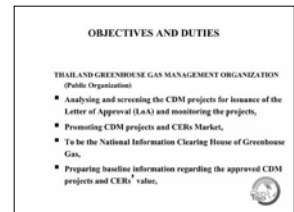
the project from energy sector and coming up is the waste to energy. We have approved 27 project with the total certify emission reduction about 2 million ton of carbon dioxide equivalent per year.

This is land fuel gas. CDM project consider as very win-win project (See #42). They can clean them and help clean up the environment and you can not identify the landfill that used to be very controversial project.

This is insulin biomass project to produce electric city, quite clean (See #43 to 44). There is still demand more than 1000 million ton that need in the market. My organization has been established last year (See #45). I have been working in this office about 3 months. Responsibility to analyze and screen CDM project for issue the letter of approval and to give the additional information clearing house of greenhouse gas and also to the capacity building and promoting, you know, technology and public outreach to help reducing greenhouse gas (See #46 to 47).



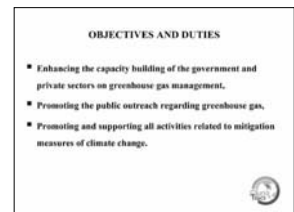
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Demand – Final Users		
Japan Government (NEDO)	Minimum	100 M tons/5 years
EU-ETS	Maximum	1,400 M tons/5 years
EU States (11 Government Countries)	Approximate	544 M tons/5 years
Japanese (Companies)	Approximate	221 M tons/5 years
Sum		2,265 M tons
Supply		
CERs issued		115 Mtons
CERs forecast from registered – CDM Projects as of now		1,030 Mtons

44



48



45



Keisuke Hanaki

Professor, Department of Urban Engineering,
The University of Tokyo

My topic here is CO₂ emission reduction toward low carbon society. It means I will talk about how you can regenerate your society to reduce greenhouse gas emission. First I would like to briefly summarize the important point of latest IPCC AR4 report (See #2). I am showing here four points starting with the climate change is very likely issue and then this one. And temperature rise more than 2 to 3 degree caused various damages. And the last point is related with today's topic.

In order to stabilize temperature increase within 2 to 2.5 degree in year of 2050, you have to reduce greenhouse gas emission by 50 to 85% from 2000 level, so it means we have to significantly reduce greenhouse gas emission mainly from carbon dioxide (See #3). This is one of the simulation results that is background of such number. This shows how you can stabilize temperature increase up to 2150, it is very far from now, but look at this. This is 2-degree temperature increase. We want to limit temperature increase within 2-degree and for this purpose, we have to maintain CO₂ concentration in atmosphere within 475 ppm. Currently concentration is about 370 or 380.

Next question is in order to keep carbon dioxide concentration within 475, how much we have to reduce emission of carbon dioxide and other greenhouse gas. This curve shows that example. We have to follow this line for 475. And here in year 2050, we have to reduce half from this level. This is very general idea why we have to reduce such significant amount of greenhouse gas emission from 2000 level. Actually we have already seen the top greenhouse gas emitter starting from US, China, and Thailand is number 26 or something, but now I am showing here per person carbon dioxide, because per person carbon dioxide reflect what your society behave and what is your society is giving environmental loading. Horizontal axis is year and vertical axis is per person emission as carbon (See #4).

US are here and Japan is this brown line. And the target of Japan or most of the developed country is about 70% or even

CO₂ emission reduction
toward low carbon society

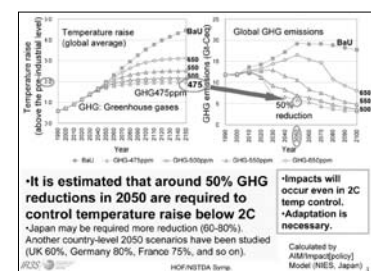
Keisuke Hanaki
Integrated Research System for Sustainability
Science (IR3S)
Dept. of Urban Engineering
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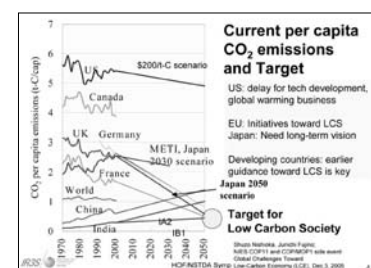
Summary of IPCC AR4
The 4th Assessment Report (AR4) of
Intergovernmental Panel on Climate Change
(IPCC), WG 1, 2 and 3 (2007)

- Climate change is very likely due to human activities.
- Temperature rise more than 2-3 degree causes various damages.
- Stabilizing temperature increase within 2.0 to 2.4 C in 2050 requires GHG emission reduction by 50 to 85% from 2000 level.

2



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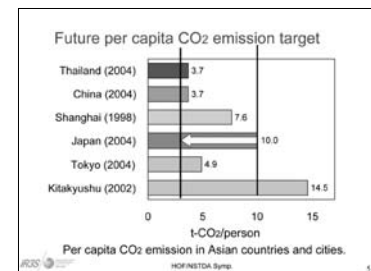


80% of reduction from this level. So we have to come down here. Right, this is target. So when you look at the behavior of China and India, their current level is already here. So we have to bring emission of carbon dioxide of China or India down back to this level in future.

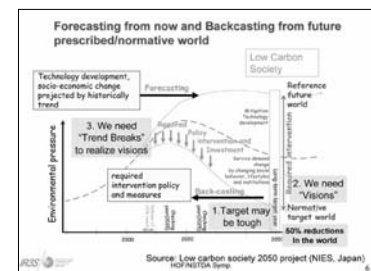
The next 3-year gives you more precise data. This one shows number of per person carbon dioxide emission as CO₂. And this figure also shows how different this number is from one city to the other city. There are two cities shown here in Japan, Tokyo and Kitakyushu. Kitakyushu is a city with very heavy industry. Tokyo has a very little industrial activity. It is very much commercialized and service-oriented city. So per person CO₂ emission is so different almost three times different, right, but the people's life is not very much different. And there are actually two different points, one is industrial activity of Kitakyushu is very high that includes steel industry and cement industry that consume huge amount of energy especially energy and the coal is used there.

And average of Japan is 10. It is very easy number to remember. 10 ton of carbon dioxide per person is emitted right now. And the Japan's target is about here, about 60% of reduction per person. And this level is below current Thailand and China level. I could not find the data of Bangkok per person CO₂, but I guess that per person CO₂ emission of Bangkok is greater than Thailand average. Right, I think – so in that case perhaps it is nearly same to Tokyo. Shanghai already exceeded Tokyo. Beijing also exceeds Tokyo. So it means that when you compare one city to the other city of very modernized city or industrial city, there is no more difference between Japan, China, and Thailand, and Korea, and these cities, right. So your situation here in Bangkok is very similar to the situation in Tokyo or in Japan. What we have to do in Japan and what you have to do in Thailand. This is a message of this comparison.

We know that our target is very tough, 60% or 70% reduction. To achieve this target, we have to follow so-called backcasting method (See #6). Usually when you predict future from now to 2050, we do forecast like weather forecast from today's performance, you predict next year. But as far as you are following this method, it is very hard to get such significant reduction. To achieve such significant reduction, you first have to set a target of your society. What is a desirable society is in 2050? I mentioned here low carbon society, and after you set low carbon society next step is you think, how you can get there from now? We have only 40 years and we have to reduce such amount of carbon and we have to change our society and by thinking that



5



6

- What is required for Low Carbon Society?
- Realization of desirable sustainable society rather than mere introduction of technology
 - Objectives include other than climate change countermeasure
 - Realization of recycle-oriented society
 - Realization of environmentally sound society
 - Realization of high quality of life
 - Maintaining high societal activities

7

- Strategy for Low Carbon Society
- Energy supply side and Demand side management
- Energy supply side
 - Fuel selection, Renewable energy (forest, agriculture and urban sector)
 - Electricity technology
 - Demand side
 - Household, Office & commercial, transportation
 - Urban structure

8

- Renewable energy in urban area
- Solar energy (Photovoltaic cell (PV))
 - Large potential, but high cost, harmonization with grid power needed.
 - Solid waste and wastewater
 - Urban demand "pulls" renewable energy

9

40 years is very short, you know, imagine if you construct one building usually building last 40 years or 50 years, so if you have a very low carbon dioxide emitting city in 2050.

Your construction now this year should take into account such low carbon type of building. I would like to go to society issue. What is required for low carbon Society? (See #7) One is realization of desirable sustainable society rather than mere introduction of technology. Just implementation of technology cannot achieve this kind of society. And the reason is shown here. Objective of such low carbon society include other factors than climate change countermeasure. If you set CO₂ reduction as only one target, it does not work. You can not reduce 70% or 80%. Your target should be more environmentally sound society or better society for quality of life. And then it comes to how to reduce carbon dioxide, otherwise people do not follow such countermeasure. That is an important point and also difficult point to achieve. So realization of recycle oriented society and environmentally sound society and we have to maintain high quality of life, high quality of your life, otherwise people do not like such society. And social activity should be high.

I would like to mention a little bit on technology side. This is a strategy for low carbon society (See #8). I am showing here free. Basically, you have to think both energy supply side, using cleaner energy and demand side, saving energy, simply speaking. And then changing urban structure or social structure to make your society with using low energy or lower material. This is example of supply side. Renewable energy in urban area can include solar energy (See #9).

Here in Thailand, you have big potential of solar energy. And solid waste and waste water can be converted to energy and then you can save fossil fuel. And here, I am showing here a little bit different issue, urban demanded pulls renewable energy. What does it means? It means that actually in urban area, you do not have much resource of biomass. In this case, natural biomass, you do not, but you have very big demand and such demand can raise demand of such biomass that can be grown. Biomass is grown in rural area and such utilization of biomass technology can be enhanced by demand in urban area. This is one idea.

If I touch upon one by one, household demand management include building improvement practice and household size (See #10). It means number of people family in one house is decreasing. I think it is same in Thailand, you know, in Japan

Household demand management

- Building improvement (insulation...)
- Air-conditioning and appliance
- Practice (Life style)
- Influence of household size (smaller family members)

10

Office and commercial sector

- Energy-efficient building
- Energy-efficient office machine, lighting
- Heating and cooling temperature
- Office hour practice
- Energy Saving Company (ESCO)
- Growth control
- Evaluation (ranking) by public sector

11

Strategy of countermeasures for various sizes of city

- Large cities
 - Efficient apartment house
 - Co-generation, District heating/cooling system in selected area
 - Modal shift of transportation in some cities
- Region-core cities
 - Apartment house and detached house
 - Railway and modal shift
- Middle size city
 - Detached house (Photovoltaic cell, etc.)
 - LRT (Light Rail Transit)
- Small cities (Low population in scenario A)
 - Detached house, efficient automobiles
- Rural areas
 - Utilization of biomass from forest and agriculture

12

CO₂ emission reduction by compact city

- Reduction from building
 - Effective heating/cooling by District heating system
- <Compact district>
- Reduction from transportation
 - Modal shift to railway
 - Short trips
- <Compact urban structure>

13

Low carbon society 2050 project

Vision A	Vision B
Vivid, Technology-driven	Slow, Natural-oriented
Urban/Personal	Decentralized/Community
Technology breakthrough	Self-sufficient
Centralized production /recycle	Produce locally, consume locally
Comfortable and Convenient	Social and Cultural Values

14

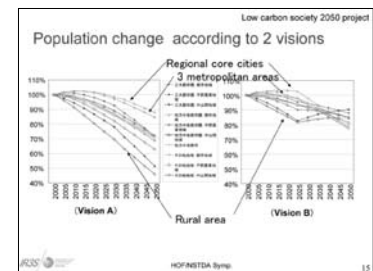


typical family used to be a couple with two children, so four members, but it is no more. There are many families with just one single person he is young person or aged person or a couple without children. So when family member becomes small in one house, energy consumption per person increases. So this is a social tendency that is happening in Japan. And I think basically in many countries, this is happening.

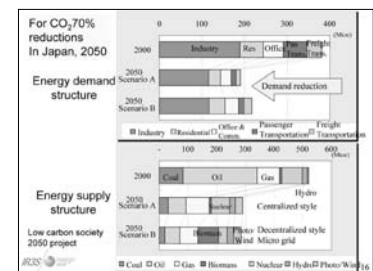
Office and commercial sector, there are various methods for having better energy efficiency (See #11). When you look at the city, we need a current strategy, it means what is effective to large city is different from what are effective to smaller city (See #12). For large city, we try to enhance people to live in apartment house, usually apartment house is more energy efficient than detached or separated house and cogeneration district heating or cooling system in central business district busy area, and model shift of transportation, it means when you drive a car by yourself CO₂ emission is much higher than train system. So moving people from automobile use to train use is this method.

And if I go to middle size city perhaps in Thailand, Chiang Mai is one of these scale cities. Bangkok is obviously large city. So such middle-sized city, railway system is not easy, right, because population is not much. So one possibility is light rail transit, not very heavy one. You have to see low energy consumption in detached house. If you go further to rural area, utilization of biomass from forest or from agriculture and you can use it for energy use. That is possible in rural area here in Thailand.

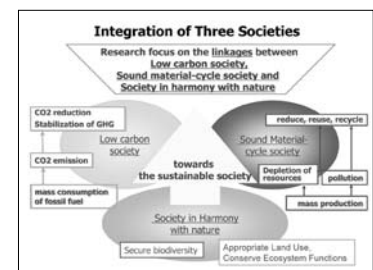
Have you ever heard about the term of compact city? Compact city is a city where density is high and size is not very big. Tokyo is not compact city. Bangkok is not compact city as well. Compact city is a city where many building are located, you know, rather small area, not very distributed. It means transportation is not needed very much. You do not need much transportation, right. And by having such building, you can also save energy consumption (See #13). So this is idea of compact city, but actually having compact city or changing existing city to compact one is very, very hard, right, because this is very social issue. People are living there. So you have to ask or force people to move into the city. Actually, it takes more than 100-year I think. This is the reason why I said 2050 is not far. It takes 100 years. It is a long-term urban planning actually. You know in urban planning usually we look at 50 years or even 100 years, but we have to take into account this kind of compact city.



15



16



17



18

This is the introduction of one project called Low Carbon Society 2050 (See #14 to 15). This project is done by Ministry of the Environment in Japan. We are assuming two different societies in future. Actually you cannot predict what will happen in future. Vision A is, you know, like this image, right it is very busy modernized city and there are a lot of competition. And other Vision B is more peaceful. Actually people live in countryside also.

In Vision A, people live in big city and very tough competition. This is the basic idea of two cities. This is how population changes with Vision A and B. The point is in Vision A big city and small city has big difference. Big city can maintain population, but small city has much less population. So energy saving in small city with lower population density is difficult. Usually when population density is high, energy consumption per person is low.

In this project one of the purposes is to demonstrate the possibility of CO₂ reduction by 70% from 2000 to 2050 (See #16). So one idea is first we reduce energy demand by, not shown here, 40% to 50%, from this level to this level, right. And either scenario can show the possibility. This is a demand reduction. Bottom figure shows component constituent of energy. Fossil fuel discharge carbon dioxide, but nuclear power or biomass discharge almost zero. So implementation of biomass in the very bottom or maintaining nuclear activity is one of the key issues to reduce carbon dioxide emission.

We are thinking about integration of three different types of society, low carbon society and sound material cycle society (See #17). Don't use too much resource and do recycle. And then society harmonizes with nature. Protection of natural resources is of course important. So you have to think CO₂ emission and the material consumption recycle and the protection of natural environment.

In the past, these three issues were showed as separately, but we have to get them integrated way to have better society. This is a last message from me. Reform the current society to low carbon society is necessary in every country including Thailand and China. And we need technology and social and economic option is necessary and integration of such society is necessary.



Question from Paritod Bhandhubanyong (*Session Chair*)

May I start with Professor Yasuoka? You talk about the networking observation modeling toward the mitigation of climate change. I would like to ask you to explain more on the model, the prediction. And in prediction what we concern this about accuracy of the prediction of that model? What kind of change will happen in future especially in terms of climate change? Would there be some kind of standard or rule or law on the unit of observation or the size determination of the area or the space when you do the observation modeling? You have to determine that kind of size and then you have to set up the station, so that you can have the highest accuracy as possible.



Yoshifumi Yasuoka

Your question is on how to harmonize the observation and modeling. It is very tough question for me to answer, because so far the monitoring people and modeling people we do not have the collaboration. These two sectors were independent. So now we have to harmonize two systems right now. Let me point out two items. The first one is the difficulties in predicting future with the current observation data, because in order to predict the year 2100 under the high temperature conditions, we do not know that the parameters are still stable in that condition. Of course, we know the parameters in the past. So there is not extrapolation, there is interpolation.

In the future if the temperature increased by 3 degrees or 4 degrees, the ecosystem parameters would be changed in nonlinear fashion. In that case the current model would not work. So we have to continue the observation and the improvement of the modeling. So we have to deploy the new design of the monitoring in that case. That is one point.

The other point is of course the current model is based on the latest information up to now. Still we do not know the real world of course. The observation system in the past is not based on the most modern modeling technologies. So their conventional monitoring system is based on the conversational modeling technologies. I would say there is discrepancy between the monitoring and modeling up to now. So we have to design the monitoring and modeling system together. That means the integration. But still their data obtained up to now is important and valuable. Modeling up to now is valuable.

The monitoring would provide only data, not information. According to my definition, the information is different from data. So what is the difference? According to my definition, information is data plus knowledge or model. Even though you have the same data. If your knowledge would be different, the live information would be different. If you have very modern knowledge, your information would be different from the information who have very old knowledge or model. In that sense we have to – in order to get the effective information, we need to have the good model and good data. So we have to improve the monitoring system to get good data, good quality of data. And at the same time, we have to improve our knowledge or model based on the data up to now, but anyway the intuition is very important and education is very important.



Question from Paritud Bhandhubanyong (Session Chair)

Thank you very much. You also talking about the REDD, the Reducing of Emission from Deforestation and Degradation. For me personally this is also very important activities and need international collaboration or cooperation. Is there some kind of international movement on the REDD and how effective is that?



Yoshifumi Yasuoka

It is started half a year ago, very modern one. And they have in some trials or negotiations among the countries who are interested in REDD framework. In REDD, we have to produce very precise map of forest and change of forest, so it depends on the good quality of monitoring system from space and from ground. We have to combine the ground observation with space observation together. And in Asian regions most of the areas are cloudy, so we can not trust on the optical range sensors. So the microwave range sensor – I am sorry this is quite technical one, but now the US NASA; European ESA, European Space Agency; or Japanese JAXA; and also Thailand GISTDA, we are quite keen to use the modern microwave remote sensors. In Japan, we have PALSAR on both ALOS, the new satellite system. There are several microwave sensors. So in US framework or European framework and also Australian framework, we need to collaborate to fully use these sensors together. Their spatial resolution would be less than 10 meters on the ground, very high spatial resolution. And we have to monitor the plantation area or deforested area by the illegal logging or the forest fires. So we need to deploy a very precise of monitoring system based on the ground and space. Anyway, this achievement had just started, so we need collaboration together.

Question from floor

I can add about the possibility of CDM issue in recent, right. I did not mention about possibility of CDM in urban countermeasure. There are several possibilities, but reality is not very easy. One of the big potential of CDM project is transportation system as you know, but so far CDM in transportation sector is very much limited such as bus lane or flyover, right, not overall transportation improvement for example in many of the cities maybe I can include Bangkok by improving transportation, you can reduce carbon dioxide emission, but big question is, you know, he knows very well. Big question is how you can evaluate reduction from baseline? If we do nothing, how much CO₂ is emitted? And you have to predict in future, it is not easy to, you know, show such baseline, because in CDM, amount of CO₂ reduced is equal to money. So it means you have to be very, very precise to evaluate and method should be very transparent. Because of that many of the potential CDM project does not work. And one of the examples is transportation and the other example in solid waste management is you mentioned that methane recovery is landfill. It is okay because you can measure how much methane you recover and you can convert



it to money.

How much greenhouse gas, but the other method is by improving landfill method from anaerobic one to semi-aerobic one or incineration, you can avoid methane emission from landfill site, but again it is not easy to evaluate methane. That is actually not emitted, right. And the other more realistic possibility is energy saving in building. That is possible and there are business called ESCO, I mentioned very briefly, Energy Service Company, but the problem is usually ESCO is applied to one small building or two small buildings and CDM, you know cost much for procedure, so not many company are, you know, positive to CDM business, but we think there are many possibility. I think maybe you have some comment on possibility of CDM in Bangkok.

Question from floor

I have a question for Mr. Sirithan. In your presentation in 2000, you are talking about the agricultural loss due to the climate change is about 8 million baht or something like that. In the agriculture, it is about 200 plus million US dollar. It is very huge considering the rising of the price of the rice right now and what is Thailand government policy to remedy this problem in case in terms of climate change something like that. What is the scale of that policy? How high is the budget that government decided to invest in terms of remedy the climate change that have the impact on agricultural production of Thailand?



Sirithan Pairoj Boriboon

That is difficult, but at the moment the existing government gets the climate change policy as one of their priority. And any budgeting this year – if any projects that do not comply with that policy, it will be revised. And my minister, the Ministry of Natural Resources and Environment also have the priority of climate change policy. So all budget go to this field. I can not tell exact figures, but it is more than 5,000 million ton. And for the whole – we have the national committee on climate change management chaired by the prime minister and we do also have a national strategic plan for climate change. In that plan, they specify all activities and projects for the next 5 years, but they did not specify how much the budget would be, but we do have the roadmap to go in the next 5 or 10 years.

At the moment, we do – not my office, but office of transportation, but in transportation do the – study the baseline carbon dioxide contribution from the surface. And it is supported by Japanese government. And I think probably it would take early next years, it may finish. There is only one CDM project at the moment is a PRT project, the one that used, you know, special bus for special lane.

In terms of any saving in the building is quite difficult, because we do have law that certain size of building has to make any survey. I do not remember the figure. Then we do have standard by law can not do the CDM project unless you

can reduce further than the standard. In Thailand at the moment we focus for the government support to do the programmatic project. This means small project binding together and become the big one, because from now on we think that like pig farm – most of the pig farm at the moment already small. The big one already do the CDM project.



Question from Tateo Arimoto

Do you have any plan to expand this research or the evaluation to other cities? I mean the big cities in Asia for instance Thailand, Bangkok, and the Chiang Mai and Phuket. Because in Japan, Tokyo and Kitakyushu are very impressed – even those two big cities three times for target. I think my personal observation here, so far the reduction target focusing upon the industrial sectors and household sectors and the transportation sectors, not a different viewpoint at this. This viewpoint is very important in order to make the local government and local community and general public to make aware about the seriousness of the reduction of the CO₂ emission and how to change their lifestyle to get this goal?



Keisuke Hanaki

Actually, there are two or three points to answer. One is whether we can do comparison among cities, even internationally. There exists one study done by IGES, under Ministry of Environment. They studied Shanghai, Beijing, Seoul and actually they tried in Bangkok and some Indian cities, but so far what are published is comparison among Seoul, Beijing, Shanghai and of course many data available in Tokyo.

One difficult point when we evaluate such per person CO₂ for city level is – it gives a little bit very uncomfortable impression, you know, Kitakyushu is very high. Actually Kawasaki City is higher, so it gives very bad impression, but reality is people living there and Tokyo taking same lifestyle, you know, people take train, even train in Kawasaki, but because of the industry it shows very high value. So just putting the ranking number one, two, three may cause misunderstanding. But the other point you mention is really true. When local government set a kind of plan of reduction of carbon dioxide and other gas such knowing the breakdown is very, very important and after knowing the breakdown, breakdown means sector, local government sets emphasize in which sector they will fight with, for example in case of Tokyo industrial sector is almost nothing. Therefore, main target is building and household, because of that Tokyo Metropolitan Government wants to introduce cap-and-trade system for commercial building. So it means Metropolitan Government set reduction target to each of the big building including University of Tokyo. And if we cannot satisfy, we have to buy permission from other building. It is a cap-and-trade system. The reason why Tokyo Metropolitan Government proposed is very big part of CO₂ in Tokyo comes from such office, but for each individual house, it



does not work, because of that there is a kind of campaign they are doing to reduce house. The conclusion is very important information to know, which is a main contributor for each city.

Question from floor

Professor Hanaki, may I ask one question concerning the CO₂ emission and technique for the city? The evaluation – the reason I ask is because when we started the biofuel campaign some 7-8 years ago, I got a discussion with professor from Baylor University in US that told me that using the sampling technique by flying over – used a plane flying over the city in grid pattern and then collect the sample at the end and then analyze for the carbon dioxide concentration in all greenhouse gas concentration in all green house gas concentration in air sample. Would that technique be effective to do all or would there be better technique for CO₂ evaluation for the city?



Keisuke Hanaki

I do not think it is very effective method because there are lot of mixing in atmosphere, and usually as you know evaluation of carbon dioxide emission is done by amount of consumed fossil fuel and that is the reason why usually emission sector is divided into energy sector and industrial sector, it means food by fuel right.

But when you divide such CO₂ emission to household sector, commercial sector, transportation sector actually it is very difficult, then how you can know how much CO₂ is emitted from your house from statistical data actually it is not simple and there are some error actually and minister of environment set up a kind of guideline how to evaluate that for local government, but actually consultant company are working hard to evaluate that and they can make money from that.

Question from floor

This is Sarvar Mustafa, student from Asian Institute of Technology. I would like to ask one question to Professor Hanaki. Regarding establishment of local society if we think that reducing carbon level is a political commitment and to execute that political commitment market has definitely a very, very strong role. Now my question is if the society's desire is different than the political commitment then market how can respond to this low carbon society establishment. So my specific question is how market can respond to government regulatory or incentive scheme or to look into the society's aspiration to put forward establishment of low carbon society.

**Keisuke Hanaki**

How much economic mechanisms can decrease carbon dioxide emission. It is like this so if such economical or theory of economic can reduce carbon dioxide down to 80% reduction it is a very ideal, but actually we do not think so. Besides such economic incentive or mechanism is we need political system that can change institutional system right, so that can increase – of course that will include economical aspect including taxation system and trading system, but that alone is not enough, you have to change perhaps policy of urban planning for example. There is a lot of discussion in Japan on how urban planning can decrease carbon dioxide emission. One is how you can control well – one example is big in house with very low performance, you know building code is one method right. These are different from economic incentives. So you have to combine everything together, but you are right it is not easy, but we have to make it more concrete or clear one by one.

Session 2:

Water, Food & Environment



Session Chair

Morakot Tanticharoen

Director, National Center for Genetic
Engineering and Biotechnology (BIOTEC),
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HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Toshio Koike

Professor, Department of Civil Engineering
Executive Director, Earth Observation Data Integration & Fusion
Research Initiative (EDITORIA), The University of Tokyo

My topic today is making on the water resources management in Asia. We have a very serious common problem related to water environment. We have very heavy rainfall event and then we have a very serious flood and landslide disasters in this region. Heavy rainfall plus very fragile mountain according to the tectonic zone the Pan-pacific tectonic zone and European Alps and Himalayan tectonic zone. So both serious environment cause serious disaster.

Basically, we have a lot of rain in Asia, but the variability of the rainfall system cause serious drought in sometimes. Rapid increase of the population, the water scarcity is a serious problem in this region. And rapid growth of the economic and the social activities they cause water pollution and ecosystem degradation especially in Thailand, Myanmar, Bangladesh, India and Pakistan (See #2). The water pollution is a very serious problem. Under this vulnerable condition in Asia, the climate change impact on the water cycle cause also the very serious problem. You know as I mentioned, we have a lot of rainfall this is global rainfall map in June and we identify two very clear rain belt one is along the tropical zone, inter tropical composite zone and the other one is Asian monsoon system. Under this system more than 60% of the world population live by using this water basically rice production feed such a huge number of the population.

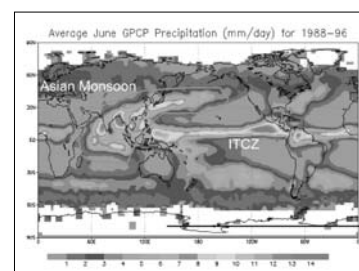
This is the IPCC rainfall report, I worked as one the editor of the IPCC assessment report for following the Professor Hanaki and this is one of the very big the impact in the world also the well being impact myself. By using the various number of the climate model and simulation we reach the consensus, the global warming caused by human beings (See #3). This red color zone shows result of the computer simulation by including the anthropogenic effect. Blue one shows without anthropogenic effect. We have a clear difference and the red one followed the observed temperature increase. This is our result.



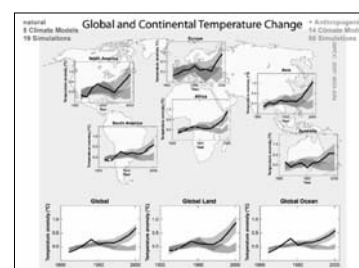
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Through this global warming, we worry about the water cycle or change. Heavy precipitation event frequency increases very likely more than the 90% reliability. And area affected by drought increase also is very likely more than the 66% reliability. Intense tropical cyclone activity increase is also very likely. This is our scientific result. You know the IPCC did not implement the science itself, but collected, achieved the result and agreed among the participating the scientist and submit the agreed result to politician. This is the IPCC process. So this is our agreed result.

So what do we need, the water related environment is really vulnerable and plus the climate change impact we need of course science and technology and we need international cooperation framework for addressing these problems and we need people who work together.

I have been working with the Asian scientist and operational sector persons for long and I would introduce these science and technology and now international corporation frame very briefly. So I introduce Asian monsoon rainfall system (See #10). What generate this rainfall system is the air temperature difference in summer over Eurasian continent and Indian Ocean. Summer in the northern hemisphere, the air temperature over the Eurasian continent higher than the air mass of Indian ocean and the difference of the air temperature force the wind from south to north but due to the high speed rotation of our planet of earth, force make the wind from east to west in the southern hemisphere and west to east in the northern hemisphere and from the Arabian sea, Bay of Bengal, South China sea, East China sea a lot of the water vapor is supplied and heavy rainfall happen in India, Bangladesh, Indochina peninsula, east part of the China and Japan. This is the Asian monsoon water cycle system.

Where is the hot spot in over the Eurasian continent. You know the upper troposphere from 5,000 meter to 10,000 meter the hot spot is located in the Tibetan plateau. That area is also wettest area in the world. The hottest and the wettest air mass is generated over the Tibetan plateau. So we need to understand what happened there. Then I visit there more than 20 years ago I found very active water cycles over the Tibetan plateau. I took this picture in 1991. This elevation is 5,300 meter. I found very active cumulus nimbus system not only this one. I was surrounded by this kind of the very big tower this moment. This is a very activated the water cycle. What happened the associate with this system huge amount of the energy is released you know the water vapor condense to cloud. Cloud is liquid water at that time

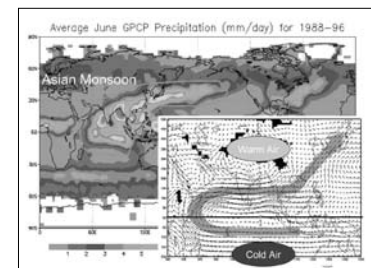
Extreme Weather Events in late 20th century, human contribution, and future trend

Phenomenon ^a and direction of trend	Likelihood that trend occurred in late 20 th century (typical post 1980)	Likelihood of a human contribution to observed trend ^b	Likelihood of future trends based on projections for 21 st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	Very likely ^c	Likely ^d	Virtually certain ^e
Warmer and more frequent hot days and nights over most land areas	Very likely ^c	Likely (high) ^d	Virtually certain ^e
Warm spells (heat waves): Frequency increases over most land areas	Likely	More likely than not ^d	Very likely
Heavy precipitation events: Frequency (or proportion of total rainfall from heavy falls) increases over most areas	Likely	More likely than not ^d	Very likely
Area affected by droughts increases	Likely in many regions since 1970 ^c	More likely than not	Likely > 90%
Intense tropical cyclone activity increases	Likely in some regions since 1970 ^c	More likely than not ^d	Likely > 66%
Increased incidence of extreme high sea level (includes storm surges) ^f	Likely	More likely than not ^d	Likely > 66%

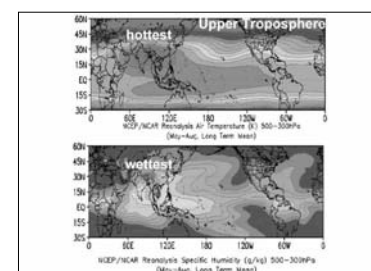
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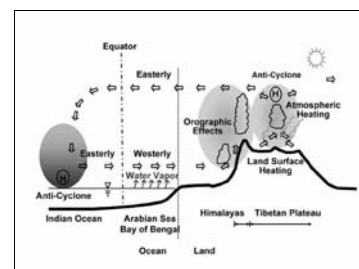


latent heat rays and atmosphere is heated up. This is the physical mechanism of the hot spot over the Tibetan plateau.

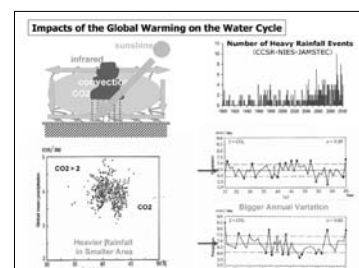
And how to generalize such kind of hot air mass, in spring now it is happening the very strong sunshine heated up the surface of the Tibetan plateau the 4,700 meter above sea level and due to the convective system heated up the atmosphere over the Tibetan plateau, and on the other hand this is the equator then over Indian ocean is winter, so very cold air mass is generated this difference of the air temperature generate this kind of the circulation and as I mentioned originally cold air mass but over the Arabian sea, Bay of Bengal, South China sea, lot of energy and moisture is supplied and this wet air mass due to the aerographic effect of the Himalayan mountain the cloud and heavy rainfall is generated and at that time large energy is released, latent energy is released, then this Asia monsoon system is activated.

This is the rainfall source of Asia. We are making a maximum use of the rainfall for agriculture or industrial or the city use but in sometime heavy rainfall causes flood in other times the big variability cause the draught disaster. We understand this mechanism and we need to improve our predictability of this system. So with regard to the global warming you know the global warming process the short wave radiation and long wave radiation. The long wave radiation assumed by the carbon dioxide and lower part of the troposphere is heated up this is the greenhouse effect. But the next step is much more important for water cycle. So this heated up the lower level of the troposphere increase the downward long wave radiation then surface is heated up and hot air mass is generated and evaporation is more activated so hot and wet – Shall I make a question? Wet air mass or dry air mass. Which is heavier? Which is lighter?

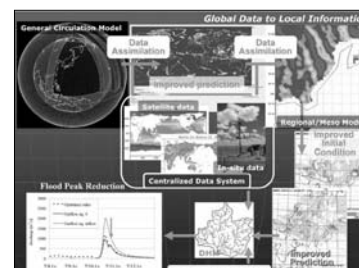
Dry air mass is heavier. Professor Hanaki learned the chemistry when he was high school student. The same volume, same pressure, same temperature, specific number of the gas molecule exist this is above Avogadro number, you know, and this is very specific. Anyway so the dry air mass is nitrogen and oxygen, the average weight is 229.6 gram and wet air mass the H_2O is 18, but same number of the gas molecule so in that case is heavier nitrogen and instead of the heavier nitrogen and oxygen water molecule is included that is wet air mass. That is why wet air mass is lighter. So then lighter air mass is generally hot and wet air mass is lighter then the lower part is unstable become unstable then this kind of the convective system is activated. So then all troposphere is heated up, this is global warming and associated with this convection. It now replaces stronger heavier



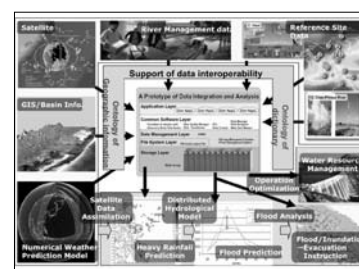
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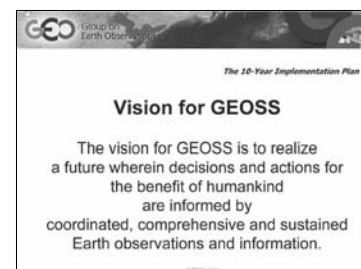
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rainfall happens and in wider region. This is downward wind. The dryer region is generated.

So this is the basic physics by using a super computing. We can estimate these phenomena in at the end of 1980s. This is the result of the 1989 and the horizontal axis is rainfall area in the world and vertical axis is intensity of the rainfall and carbon dioxide current and doubling the carbon dioxide concentration. Heavier rainfall in smaller narrower region. So super computing also predict this phenomena. In the middle of the 1990s super computing cover is increased. This is in the Indian summer monsoon rainfall year-by-year valuation is predicted. Average of the rainfall increase. This is very good signal for India, but also at the same time the valuation, the internal valuation also increases. So heavy rainfall year and dry year that valuation increase. This is very tough signal for water resources management. And this is the more current result at the beginning of 2000 by using assimilator of the heavy rainfall, number of the heavy rainfall event predicted from 1900 to 2100 for 200 years (See #11). So after 2030 the increase of the heavy rainfall is predicted.

This basic physics is supported by using the super computing. This is our current knowledge. We can predict the change of the global climate and also we can predict global weather system. But we need much more local information. For example in the flood, we need information for evacuation instruction. Or for reduce the flood peak, we want to optimize the dam. Such kind of information is really local. We need to improve our modeling activity, observation in the modeling activity from global scale to the very, very local scale. This kind of the science and technology should be improved. Professor Yasuoka mentioned observation and modeling the integration is really tough. But that should be done.

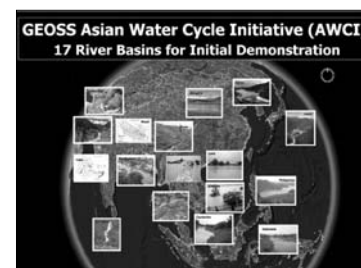
We have been working in completion with Professor Yasuoka to develop the data integration and analysis system by combination of the modeling output and satellite observation institute observation and to transfer from the data and information global scale to local scale. For that purpose we need information technology. We need to cooperation with IT people and also the science observation community and operational observation community and space agencies and GIS community and modeling community. Then all of the data and information can be integrated by the system. In the University of Tokyo, we developed one terabyte data storage and this data integration system. This can provide the local prediction of the rainfall and also the flood and evacuation information or the dam operation optimization system.



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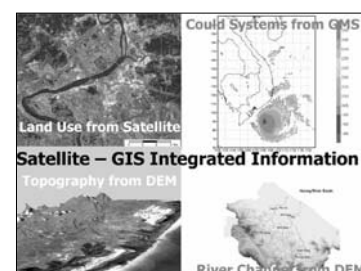
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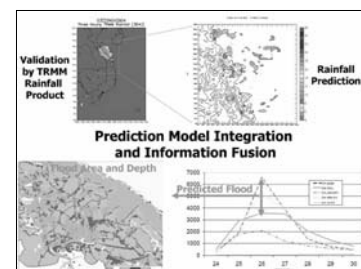
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This is science and technology. Very fortunately by the leadership of the international political leader established. International Cooperation Framework that is the Global Earth Observation System of System by the ministerial level leadership (See #14). This system was established in 2005. Various observation are going to be converged and the use of information for sound decision making to the nine societal benefit area, from disaster to biodiversity, are now establishing.



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The vision of this GEOSS is to realize the future feeling, the decision action for benefit of human kind informed by coordinated comprehension and sustained observation and information (See #15 to 18). Under this framework, we established the Asian water cycle initiative in cooperation with the many countries in Asia. That is to promote integrated water resources management by making use of the information from GEOSS and addressing the current water related problem in Asia. Through the series of the discussion and cooperation we establish this initiative. At this moment, 17 river basins were proposed as a demonstration project. Professor Kara mentioned a theory cannot move the politician, but some visual achievement we need. We are taking demonstration approach for showing the visible result even though the small is scale. If we can show the effective and the visible achievement to society we can push forward.



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We also implement the capacity building program in corporation with United Nation University or UNESCO etcetera. This is the result of the application of this system to Vietnam, the Hon river basin in Hue city. Satellite data, meteorological data, GIS are collected and rainfall prediction by using a satellite data and then global model output and it is improved by using this system. Heavy rainfall is predicted well and by using this information the flood is predicted and this flood is transferred to the inundation area, flooding area. By using this information the operational sector there, National Hydrogen Meteorology Services can provide the evacuation instruction. This kind of the demonstration project is now on going. We have now science and technology, corporation framework and people work together. So, shall we step forward?



Thongchai Panswad

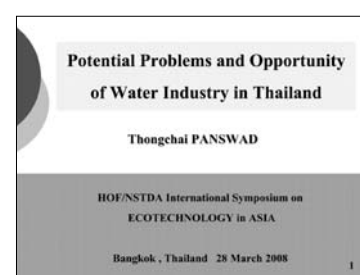
President,
Thailand Environment Institute (TEI)

All over the world there are three problems (See #2 to 3). One is too much which is the flood problem, and the other one is too few which is the shortage and too polluted. You may have water, but it is too polluted so you can not use it in the water there. So it is the scarcity of water in effect. So we have water and we have waste water from industrial sector, from community, from agricultural and with that waste water we have to discharge into the environment. Of course, you have pollutants organic matter, POPs, pesticides, BOC, TDS which is salt, nutrients which is again phosphorus etcetera. This cost environment to be degraded and with that kind of degraded environment you have scarcity of water in effect. You can not use water there because it is too polluted and then it is polluted you have problem with food and drinking water. So we have to find out, find way to solve the kind of problems.

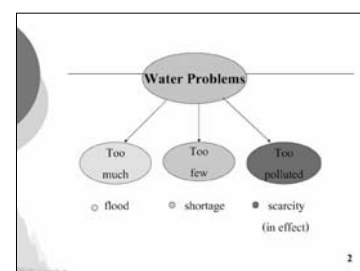
This is just some data showing the surface water quality in Thailand (See #4). You can see from the picture here that the red one which is very polluted one. The condition here is better, but if we look at brown one or the orange one, you can see that the degree of the polluted poison is expanding. So over all the water quality in Thailand is not getting better it is getting worse. So we have to find solution to solve it.

The measures done by the governments so far, they have tried to solve problem from the industrial sector and they have laws (See #5). They have enforcement to put individual wastewater for the treatment plant at each factories which we have. I think we have done a very good job in this kind of sense. And some industrial estate, of course you better off not to use individual waste water treatment plant so we have a central plant. Now we have a joint treatment, the domestic waste water and also the industrial waste water which is very complicated one, but we try to solve the problem of the industrial and the domestic all together in one shot.

For the domestic waste water we have several central sewage



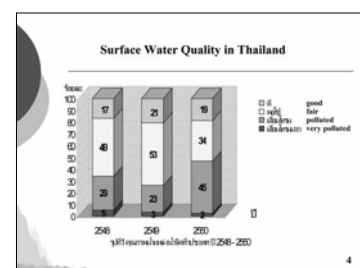
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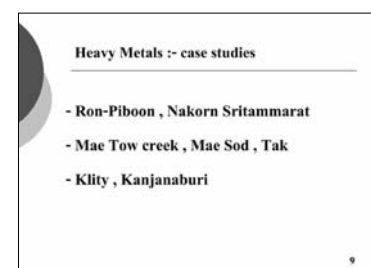
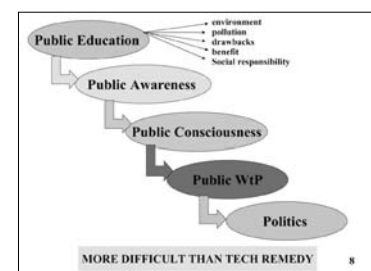
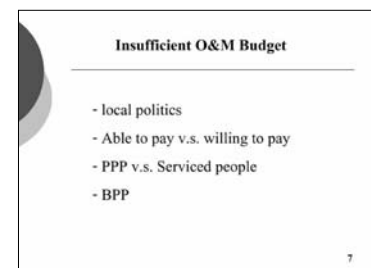
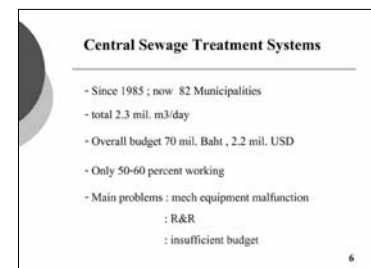
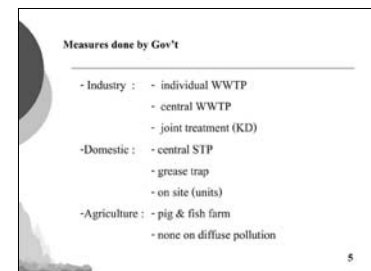


treatment plants nowadays (See #6). I will tell you about that later and being not so rich country we cannot afford center plant all over the country and from some of the research here locally, we found out that the waste water from the kitchen is the major contributor of the pollution. Actually from the restaurants, so we have the government comes up with regulation to put the grease trap to the waste water of the restaurants and household. The government also tried to emphasize or tried to encourage people to use onside units to treat the waste water, all kind of waste water from the household sources.

Regarding the agricultural waste water their regulations and enforcements on the pig and fish farms. They are supposed to the treatment or recycle the water or the waste water in this kind of activities. For the big firms they even used the biogas system and generate electricity out of that kind of waste water. But for the agricultural, there is one main concern about the diffuse pollution. The diffuse pollution is the thing that you cannot find the sources individually. It is spread about all over the area. For example, when I used the fertilizer and is spread out and when it is spread out, it is very hard to do any kind of remedy or treatment. So far we have not done much or even none on the diffuse pollution. Before I came here I was told that there will be some people, the researchers from Thailand or from Japan in this room too. So I think you can see that the problem of the agricultural waste here is on a diffused pollution is very important. There is not much done there yet. So it is a challenge to the researcher to find out, to come up with the solution to solve this kind of problem. It is very, very difficult to rectify this problem because it is spread all over you cannot pinpoint where it is.

For the central treatment plant system that we have in Thailand, we have started doing this since 1985. This is not very long ago. Now we have 82 municipals, municipalities that have center plants. Totally about 2.3 million cubic meters per day that we are treating our waste water, that overall budget about 70 million baht, about \$2.2 million. But unfortunately only about 50% to 60% of those plants are working now. The rest of them are not working.

What is the problem? The main problem is that much equipment malfunction. A lot of equipment put in there is not working. Why is it not working? Because they are not repaired and there is no replacement. There is no such scheme in the process. Why they do not repair, why don't they replace the equipments because they do not have enough budget. Why don't they have enough budget? Insufficient operation and



management budget, why they don't have enough budget? Because of the local politics. The politician do not like the idea of collecting fee from the people because they will not be elected the next time, which is I think it is typical all over the world. But is very, very severe here.

We have about 80 plants in Thailand that are only about three or four plants that can collect the fee from the people. Imagine that when you can not collect a fee you have no money and when you have no money you do not have the – even the fuel cost. You do not have the money to pay the power bill to run the pump. So there is no chance at all considering that. So like to talk about – able to pay and willing to pay of the citizen.

The waste water fee is not that much. If we talk about investment the interest you come up with something like maybe 15 Baht per cubic meter. This is not a lot, but the government said if you collect 15 Baht, we have difficulty trying to convince people. So they tell about only operation and maintenance is maybe only about 2 Baht per cubic meter. 2 Baht per cubic meter is very, very little. So the ability to pay I think is there. But with only 2 baht per cubic meter fee they do not pay. So the willing to pay is not there. Their ability to pay is there, but willing to pay is not there.

In Thailand you can see people hopping on the motorcycle from places to places, It cost you 10 Baht or 15 Baht just 100 meters. But to pay your waste water 2 Baht per cubic meter they do not do that. They do not pay it. So it is not the technical thing. It is a social thing.

And then I probably like to talk about usage of PPP and the service people. PPP is the Polluter Pay Principle. We tell them that you are polluters. We provide you the service, we provide you the treatment plans. So you are supposed to pay for the fee that we – for the service that we give you. If we use this concept the PPP, the people in the service area are asked to pay for the fee. But people outside the service area are not asked to pay the fee. But the people outside the service area, are they polluters or not. They are true, because they are still discharging the waste water into the stream. So in that sense they are also polluter. What I am trying to say is when you want to collect a fee from the people you should not collect the fee from the people in the service area only. Because the people outside the area are also the polluters

If you collect the fee from the whole population, you set up two Baht per cubic meter you can reduce it only 50 satang, which is

Ron-Piboon

- arsenic from open mining
- arsenic poisoning
- skin cancer
- Remedy : - stop operation
 - water supply system
- Problems still there

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Mae Tow creek , Tak

- Cadmium from zing mining and smelting
- Itai – Itai
- rice field Cd = 0.3 mg/Kg uncontaminated soil
- Local contamination : 3.4-284 mg/Kg soil
- Current remedy : - sludge dredging
 - soil erosion control via vegetation cover
 - now better situation
 - monitor program

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Klity , Kanjanaburi

- Lead from mining and smelting
- Remote Karen villages, contaminated stream
- Lead poisoning
- Remedy Attempt : - stop since 1998
 - sediment dredging

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Potential Opportunity for Entrepreneurs

- wastewater treatment processes
 - KSF
 - simple to operate
 - sludge disposal
- Site remediation
 - biological
 - physico-chemical
- water systems

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Eutrophication (algal bloom)

- Toxic , low oxygen (mass death)
- in several lakes and reservoirs
- Coastal areas ; Sriracha , Hua-Hin , Samut Prakarn , etc.
- 90 times in 50 years, more frequent and serious in last 10 years
- Cause :- nutrients (N and P)

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very little. In that approach you can I think it will be easier to convince the people to pay fee. More people pay lower rate fee, but at the end you get more money and from that you can make profit. The profit you can expand your plans to even build more plants from that kind of scenario. The BPP which is the Beneficiary Polluter Pay Principle, the people outside this community they are down streams. The river water quality downstream from the NECD will be better. They are the beneficiaries.

If we talk about that kind of concept the people downstream should be paying for the fee of the people upstream too. Thinking like that you will have more people who are supposed to pay the fee and you can collect more fee and then you can have profit and you can expand your project. After some years you have enough money to invest into all over the city, all over the country. And the pollution will be solved.

But, like I said this is not a technical thing, it is the social thing. I agree with Professor Hanaki who gave a lecture earlier that chemical solution is not the only answer. The society will be the one who will have all the answer for the solution. If you want to convince them to join you paying fee whatever in the water fee, power fee whatever. You have to have the public education, tell them about environment, tell them about the pollution, the drawbacks of the bad environment, of the polluted water. Tell them about the benefit of having good water, and tell them about the social responsibility that they are supposed to have. And then you can create the public awareness and from that public awareness you can have public consciousness. Then public consciousness you have public willing to pay.

See the technical thing is there. You can find it in internet or anywhere, but this is very difficult. And engineers – I am engineer, engineers are not very good at doing this. And once you have the public willing to pay, you can convince the politicians to come up with the fee collection scheme. You can proceed with that kind of step that I talked about. It is more difficult than technical remedy.

I will give some examples of the heavy metals, the case studies in Thailand which is Ron Piboon, Mae Tow Creek and Klity, Kanjanaburi (See #9 to 12). Ron Piboon in Nakhon Si Thammarat down south of Thailand you have arsenic problem from open mining and you can come up with the arsenic poisoning, the skin cancer. So far we have stopped the mining in that area, but you still have the water supply system. Because the stream is polluted with arsenic so the government comes up with

Biological Nutrient Removal (BNR)

- Fairly new to this region.
- Some already in use here ;
BMA :- Yannaawa (Korean company)
- Jatsajak , Phuket municipality
- Problems (for BPR)
 - too low organic matter or carbon (BOD)
 - high temperature impact

NEW RESEARCH needed

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Challenge or Innovation

- New organism strains?
- New process?
- Introduced (external) carbon sources

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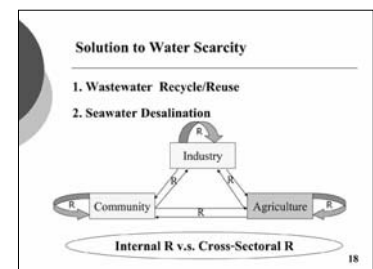
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VOC

- Volatile Organic Compounds
- New concern ; carcinogenic (cancer)
- Hard to handle
- Lack of data
- Mostly from industry , Some from domestic uses
- CHALLENGE

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1. Wastewater Recycle /Reuse

1. Not much done in Thailand , yet
2. Potential, esp. in Industry Dominated Areas ,
e.g , Lampon (north) , Mahtapud (east)
3. Plants need nutrients and water. Reuse Potential
4. Indirect reuse already in place, naturally
5. Even for potable (drinking) consumption

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water supply system the new supply system for the people in the local community so that they do not have to drink the water from the stream. But the problem is still there. The arsenic is still there.

The Mae Tow Creek, you have cadmium from zinc mining and zinc smelting which cause we know that the cadmium cost itai-itai disease which is very infamous in Japan. The rice field cadmium is about 0.3 milligram per kilogram of uncontaminated soil. But the local contamination of cadmium in the area is about 3.4 to 284 milligrams per kilograms soil. So it is very, very pollutes and very, very dangerous. It is about 1,000 times the normal concentration in other area. What we have done so far is we do the sludge grading, grade the sludge, the cadmium around the area. We controlled the soil erosion by having the vegetation cover. Now the situation is better, much better. But the problem is still there. The cadmium is still there.

The Klity in Kanjanaburi province we have the lead problem from the lead mining and smelting. It happens in the remote occurring villages. It has contaminated the stream that people there have to use and come up with the lead poisoning, lot of people are having this kind of problem. So far we stop the operation the zinc mining and the zinc smelting since 1998. We did also the sediment scratching. But again the problem is still there. All these three cases, the problems are still there.

The potential opportunity for entrepreneurs (See #13): If you are entrepreneurs you have the business chance, by come up with waste water treatment processes to solve this kind of problem. But key success fact that is it has to be simple to operate and come up with the kind of mechanism to do the sludge disposal. And mediation is a biological, physical, chemical. This is business chance if you know how to do this to solve the problem, because the problem lies in those three sites is still there. And people over there are still suffering from the heavy metals.

Eutrophication or the algal bloom: if you have fertilizer, you increase the growth of the plants (See #14). If you put a lot of nutrients or the fertilizer into the stream into the lake, you will cost algae bloom. You have a lot of algae in that water body and some algae are toxic and algae will consume oxygen at night time and increase. It results in the low oxygen in the water body and you have the mass death of the fish or aquatic lives. It happens now in several lakes and reservoirs in the costal areas in Hua Hin and other place in Thailand. We found out it happened already 90 times in 50 years and more frequent, more serious in the last 10

I. Wastewater Recycle /Reuse (cont'd)

- 6. Some industries do not need high quality water ; Reuse Potential with not so high treatment cost
- 7. KSF : - hauling distance and cost
- laws and regulations

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II. Seawater Desalination

- 1. Costly ; Economy of Scale
- 2. Seasonal abundance v.s. scarcity of fresh water
- 3. Year to year abundance v.s. scarcity
- 4. Main operation cost :- power!
- 5. In places where raw or fresh water is high priced (water shortage area) , this excessive cost can offset the perceived high cost of DESAL process.
POTENTIAL!

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years. The cost of this is the nitrogen and phosphorus.

So, one of the solution is a biological nutrient removal (See #15). This is the best for the treatment process. It is fairly new to this region, some already introduced here like the Bangkok Metro Authority Administration we have a plant called Genova plant constructed by Korean company and Jatujak which is also the BNR plant and Phuket municipality use also BNR plant. It is already here but not very much but not so many. The problems for the biological phosphorus removal for this region, the organic matter or the BOD in waste water in this region are very low compared to Japan or to America. The BOD of the waste water there is about 250 or 300 but over here it is about 50 or 80 only. Very, very low and believe it or not the BOD is good for this kind of process. We need the BOD, we need the organic matter to remove the nutrients. When we talk about the BOD as a bad aspect but in this kind of process the BOD is required. But unfortunately we have very, very low BOD or carbon salts in our waste water. So the BPR does not work very well here. And also the temperature is very high and we found out that if the temperature is high it requires, it has some effect on the Biological Phosphorus Removal process.

So we have chance to do some kind of research to solve this kind of problem. It is a challenge or innovation for scientist here (See #16). Can you find out the new organism to treat hydrogen and phosphorus, new process or find another carbon sources from wherever from – night soil, from solid waste, from industrial waste water and use as the carbon source for this kind of process. This will be kind of challenge to the scientific world in this region.

This is the VOC, the Volatile Organic Compounds is new kind of new for the country (See #17). It is new concern because it causes cancer. So far we have not done anything on this VOC yet. But new parameter is very hard to handle, is everywhere and we do not have much data on it. The VOC come mostly from industry and some from domestic uses. And it is very, very dangerous because it causes cancer and it is very hard and the normal water supply system and normal waste water system cannot solve it, cannot remove it. So it is a challenge that we have to come up with solution to alleviate this kind of problem. We found VOC contamination in surface water and underground water in the industrial area.

So the potential now we think that it is come from industry, they dump maybe not dump but the kind of maybe spill or leak the VOC and VOC go into the ground and to the underground water. We pump out underground water for consumption you are in dangerous position.



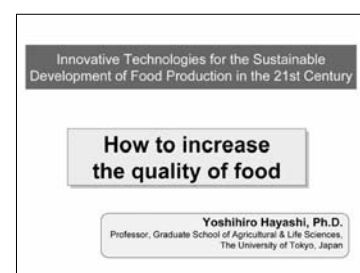
Yoshihiro Hayashi

Member of Science Council of Japan
Professor, Global Animal Resource Science, Graduate School of
Agricultural and Life Sciences, The University of Tokyo

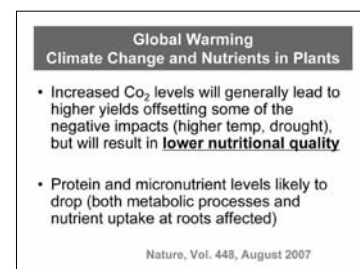
Last year Nature reported that the global warming usually as increased CO₂ level will generally lead to higher yields of setting some of the negative impact that for example higher temperature (See #2). However, this will result in lower nutritional quality. This is a big problem. Amount of production is not a problem, but the result in a lower nutritional quality. Protein and micronutrient level likely to drop, so both metabolic processes and nutrient uptake at root affected. This is a big problem.

GIES symposium was held in Japan, just two weeks ago in Tokyo (See #3). So we invited three foreign researchers. One is from United States, Dr. Howarth Bouis, who is the director of HarvestPlus Challenge Program, an International Food Policy Research Institute. The second researcher was Dr. Apichad from Kasetsart University and the third researcher from Pakistan for reporting agriculture problem of Pakistan.

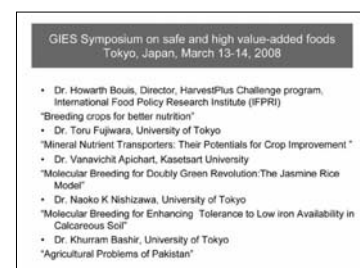
Now in the developing countries the problem is some kind of mineral including the calcium deficiency. A severe situation we have in the world then also Dr. Bouis reported that now they are thinking to conduct as some kind of the program for producing mineral rich crops in the world (See #4 to 5). Dr. Apichad from Kasetsart University reported how to produce as jasmine rice, more jasmine rice in Thailand (See #6). So, I am talking about as quality of crop. We have a two kind of crop, two kinds of qualities. One is just a – quality means just to produce the safe food, another one is to produce more taste food. I am talking about the two meaning of quality. So maybe this is a very important in Thailand according to the Apichad report. Jasmine rice is a kind of very good flavor rice the production area is very limited, but using as transgenic techniques he is now thinking to produce a jasmine tea in more areas not only in limited region. For this, two strategies he has defensive breeding. This is one of the strategy. Another one is offensive breeding. This means the transfer of quality.



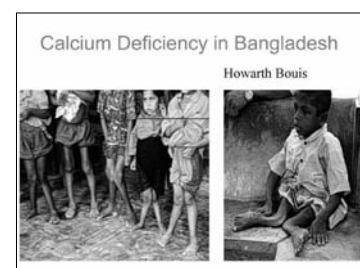
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Now I would like to introduce as some strategy conducting in Japan (See #7). One of the biggest problems is decrease of the population in rural areas. Professor Hanaki reported that as population in rural area will increase after 20 maybe 30. But I am very pessimistic. Because in Japan most of people are living in rural area, do not like to live local areas because now many hospital and traffic situation for example public bus disappearing especially in rural area. This is one of the reasons why they want to live in urban area, not rural area. Our problem in Japan is how to develop an agricultural system in aging society.

So for this we are now improving as new techniques, using of robot as a next generation production system (See #8). One is a sort robot here and this is harvest robot here. I hope this kind of technique will assist us in the rural area. Even if as aging society will progress in more severely.

Japan is a good at robots technology. Now we are thinking to develop robot farm techniques. For example to future IT technology and robot technology already we are remoting a remote control helicopter, measuring the growth of crop. So auto control spread of fertilizer is also developing.

Harvest recording data of not only as quantity, but also quality of crop automatically. In future we needs as automatic rice planting machine and automatic farm tractor. So this is also automatic. This is the second strategy.

The third strategy is just to improve the innovative technology to produce a new variety of crop (See #9). Already we developed new variety. For example, this is AYAMURASAKI, containing the functional pigments and anthocyanin. So we now produce many kind of product.

In Japan many people know that Japanese rice is very sticky. But sometimes Japanese people want to eat as curry using like Indica rice. For this Japan already improved very "not sticky" rice, so called "Curry-Mai" in Japanese. And to improve the new green tea containing functional pigment also. High lycopene tomato already we produced and new silkworm for producing as medical materials.

In my laboratory, we now start producing crop based edible vaccines as a promising a new agricultural product (See #10). Many people know as advantage of edible vaccine. Edible vaccine is just avoidance to stress for animal, of course not only animal, but also for human beings. Reduction of labor cost,

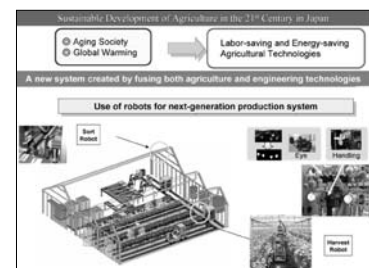
Schedule of Product Releases Howarth Bouis		
Crop	Nutrients	Release Year of Initial Lines*
Sweetpotato	Pro-vitamin A	2007
Bean	Iron, Zinc	2010
Pearl Millet	Iron, Zinc	2011
Rice	Zinc, Iron	2012
Maize	Pro-vitamin A, Zinc, Iron	2013
Wheat	Zinc, Iron	2013
Cassava	Pro-vitamin A	2014

* Approved for release by national governments after 2-3 years of testing

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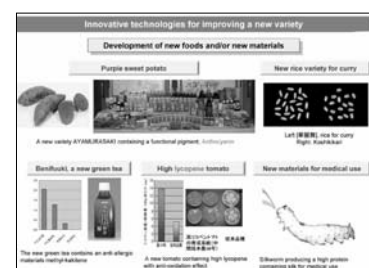
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transportation and storage cost and purifying cost etcetera. Cheap and easy in edible vaccine production.

We are using a specific monochromic antibody to purify the CTB as a Cholera toxin B subunit, ascaris (See #11). Ascarism is a kind of nematoda infected in intestine. Using as a *Oryza sativa* var. japonica. So this is a procedure of how to produce a transgenic rice (See #12).

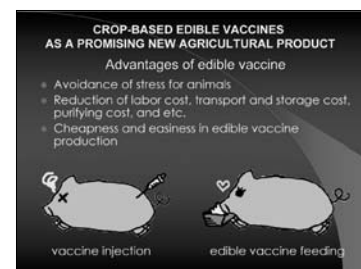
Iron is the essential element for plants growth (See #13). But iron is not available in alkaline soils. As a result plant died in alkaline soils, due to iron deficiency. She used transgenic techniques for new variety (See #14). This is a wild type and this is a transgenic. This is a long case of success, this is the second case of success this is a transgenic and this is wild type. We can see the very clear difference.

JIRCAS is one of the National Agriculture Institute which has found grape gene, resin to dry and sort damaged by the collaboration with international research institution (See #15). Much collaboration we have now with institution located in abroad. This gene is a very resistant to dry or salt damage okay. Japanese people want to get safer food. For this we want to identify a locality and exact variety of the crop. For this, we are now developing a DNA technology (See #16). This is the name of Japanese rice, "KOSHIHIKARI", "AKITAKOMACHI", "SASANISHIKI" and "HITOMEBORE", very famous variety. But we can identify. So people can get exact information of the rice.

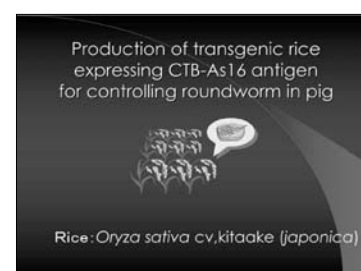
So this is very important to protect as intellectual property. Intellectual property was protected in industrial production. But in agriculture field, unfortunately we have no good system for protecting as intellectual property. For this, the technology will contribute in future.

This is tailor-made medicine (See #17). Now we are thinking tailor-made food production to know as individual characterization and so many polymorphism the people has. But of course crop has also has variety and many polymorphism showing. How to make a good adjust, how is just a tailor-made for each person. For this, molecular technology will also contribute in near future.

Now we are thinking agriculture should contribute for protection of global warming. But maybe we can not avoid global warming. We are now thinking about adoptive agriculture technology. Even if temperature will increase four or five degree, if we can produce more resistant crop, it is okay. For example, this



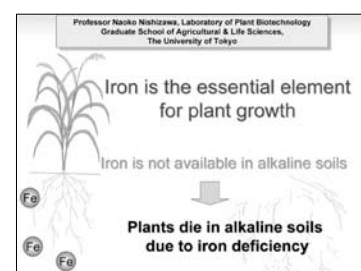
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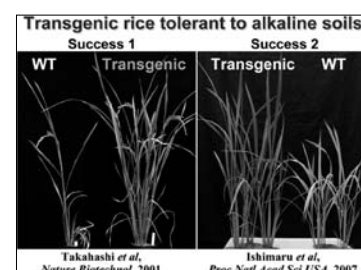
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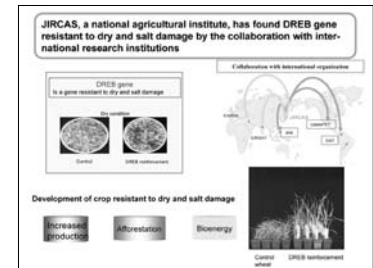


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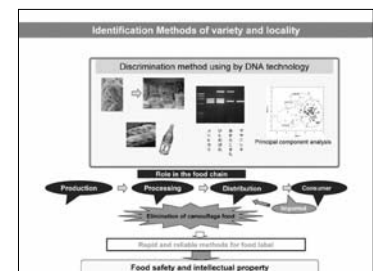


is a one case (See #18). Now in Kyushu Island, variety “HINOHIKARI” is a major rice, but this is not very sensitive against the global warming. Now we have already prepared new variety, “NIKOMARU” resistant against the high temperature. Very interestingly, it was obtained from the stock of our agricultural variety in the institution.

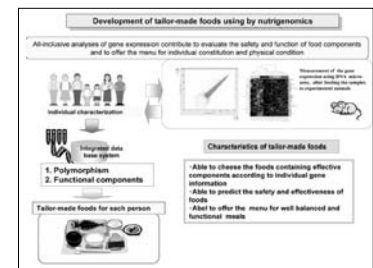
In northern part of Japan, for example Hokkaido, it is very difficult to grow rice. Japanese agricultural researchers have many experiments how to produce a resistant to cold climate. This new variety was produced from the stock of the crop. It is resistant not to high temperature, but resistant to low temperature. Maybe this is one of the solutions in future about how to get more adaptive crop from our resources.



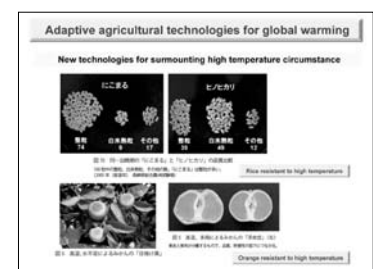
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Luu Duc Hai

Head of Environment Faculty,
Vietnam National University, Hanoi

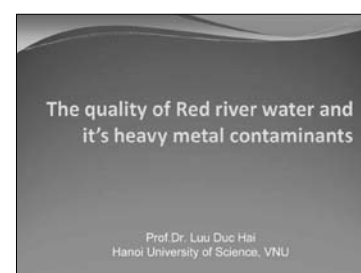
First of all I want to tell some data of Red river and second the quality of Red river water and the third, research of heavy methane contamination of Red river water.

Red river is the biggest river in the northern Vietnam (See #3 to 7). It is 1,149 kilometer. Among this, 520 kilometer is in Vietnam territory. Red river have total discharge about 18.35 billion cubic meters per year and have mean flow above the 2,640 cubic meter per second. But the river flow is not stable, increasing to the 20,000 cubic meter per second on rainy season and decrease for 700 cubic meter per second on dry season.

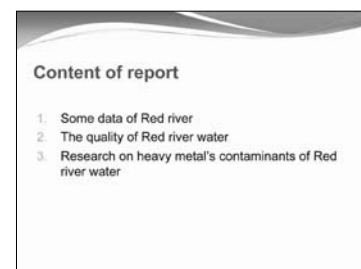
The water has a red color, contain average above the one and half kilogram for every cubic meter. Red river provides water for more than one million agricultural hectare and water supply more than 20 million population is the north of Vietnam. The capacity of hydropower project in Red river is more than 3,775,000 megawatt. Most of the big city and most of the big industrial areas in the north are situated in the riverside of Red river.

Red river come from the China-Vietnamese border, come to the west river of this as main and it have many branches. The main impact on Red river in water environment, first of all I think is industry and water waste from the many, many industrial project in our country, from the city like Hanoi city, from the solid waste and from domestic waste water. The quality of Red river water is discussing by analyzing that for five water monitoring. There are five water monitoring stations in our country from the border to the sea. The quality of water on that river is – and its branch decrease from our head and the river branches to costal area. As you know main impact water on river head and their branches are clean now, but the water has pollution in coastal zone area and in the near side big city and industrial zone.

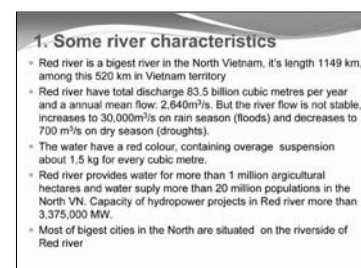
I bring you some research, our research on heavy metal contamination on Red river water (See #8 to 17). We sample the river water. We take the sampled river water and to separate it to



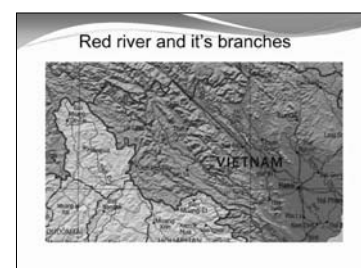
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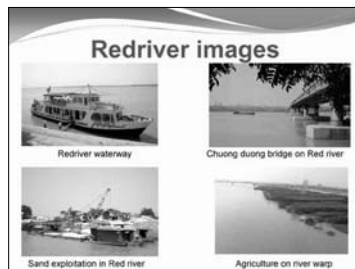
water for control and water for analyzer. For river water for analyzer we separate it suspension and for analyzer and water for analyzer for mineral for suspension for analyzer, we do mineralogical and chemical analyzer for mineralogical and chemical composition of the suspension. And for water we do chemical composition and we take statistical analysis. Chemical analyzer for the determination of chemical composition of water. We take automate absorption analysis for heavy methane important as zinc, cadmium, arsenic and others. We take the environmental analysis for many characteristics.

This sample come from the river head, come to the sea. You take it from mainstream of that river. This is the sample process I have to tell you sampled water for control and analyzer. You separate suspended for analyzer and water. You took a mineralogical and chemical composition and chemical composition only for water and started to analyze.

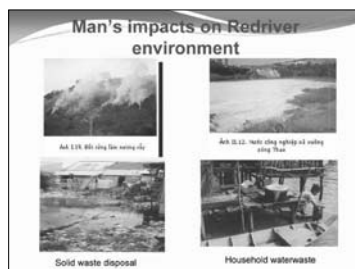
Though it is said the heavy metal contaminant of Red river, it is not so high. It is below on Vietnamese environment standard. But in heavy metal contamination of Red river in suspended it high, but you have a standard for suspension. Heavy metal contaminant of Red river water has a tendency to concentrate on suspended and 100 to 3,000 times more than the contaminant in the water. It means that suspend is meant as for the heavy methane in Red river water. Every heavy metal has a special behavior. In Red river water one can not concentrate on suspended while



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2. The quality of Red river water

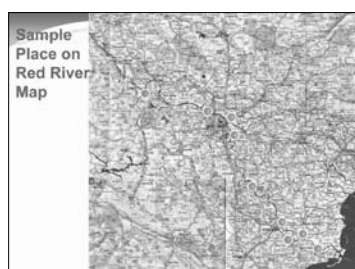
- The quality of Red river water is discussing by analysing data four fixed water monitoring stations : Laoai, Lamthao, Thuongcat and Namdinh.
- The quality of water on Red river and it's branches decreasing from riverhead and river branches to coastalzone areas as results of man's impact. Water on riverheads and their branches are clean, but water has a pollution symbol in coastalzone areas and in the near side of big city and industrial zone.
- Our environmental principle is "an end to the water discount sale" - costs to the water environment need to be reflected in production prices. Important tools in this process will include technological and social innovation.

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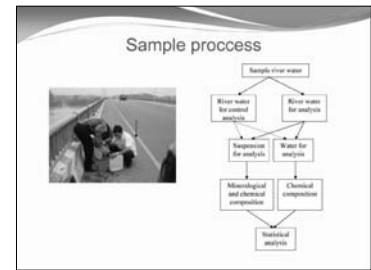
3. Our research on heavy metal's contaminants of Red river water

- Sample place's selection
- The sample's taking process
- Analysing methods
- Heavy metal's contaminant of Red river water
- Heavy metal's accumulation on Red river

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Analysing methods

- X-rays and Differential Thermal analysis for determination of material and mineralogical compositions of suspension
- Chemical analysis for determination of chemical compositions of water : K, Na, Ca, Mg, SO_4^{2-} , PO_4^{3-} , SiO_2 , Al_2O_3 .
- Atomic absorption analysis for heavy metals of suspension and water : Fe, Mn, Cr, Cu, Pb, Zn, Cd, As, Hg
- Environmental analysis for pH, DO, BOD, COD, Temperature, salinity, e.c

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Heavy metal's contaminant of Red river water: in water (ppm)

No. Samp.	Fe	Mn	Cr	Cu	Pb	Zn	Cd	As
5	0.804	0.573	0.002	0.002	0.001	0.079	-	0.01
6	0.762	0.487	0.001	0.001	-	0.069	-	0.008
7	1.086	0.758	0.003	0.002	0.001	0.078	-	0.01
8	1.062	0.65	0.001	0.003	0.001	0.076	0.001	0.012
9	0.815	0.441	0.002	0.001	-	0.080	-	0.011

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Heavy metal's contaminant of Red river water: in suspensions (ppm)

No. Samp.	Fe	Mn	Cr	Cu	Pb	Zn	Cd	As
1	4.262	1.012	78.7	89.7	145.7	23.1	2.4	1.1
2	4.314	977.3	63.4	84.4	99.2	18.5	5.8	0.9
3	3.848	965.0	91.5	82.6	91.9	18.8	1.8	0.5
4	3.533	898.5	93.1	79.5	86.0	16.4	1.6	0.3
5	3.898	779.1	85.4	78.0	67.4	14.2	1.0	1.2
6	3.713	886.9	96.3	81.6	65.4	16.5	1.8	0.5
7	3.896	921.0	92.8	83.9	68.6	22.6	1.3	0.4
8	3.649	916.5	92.8	93.1	88.1	17.8	1.2	-
9	4.252	1.007	93.9	104.3	107.6	17.3	1.8	0.1

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Heavy metal's contaminant of Red river water

- Heavy metals contaminant of Red river water have tendency to concentrate on suspensions, 100 – 3,000 times more than their contaminant in water, it means that suspension is main transportation agent for heavy metals in Redriver water
- Every heavy metal have a special behaviour in Redriver water, one can concentrates on suspension, while the other dissolves to river water, but we can see the tendency to accumulate HM on coastalzone sediment and water
- In general, Redriver water isn't polluted by heavy metals, but their contaminant locally higher than environmental standards

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Conclusions and remarks

- Red river is an importal water resource of North Vietnam, it's decreasing quality will seriously impact to millions peoples and economic activities of North Vietnam
- At that time, the quality of Redriver water is being correspond to environmental standards
- Heavy metal's content and it's behaviour of Red river water are importal environmental issue in the future.
- For the environmental protection of water quality, we must concentrate all human effort and all our sources, technological, legislative, economic methods

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the other discharges to the river water. But we can see the tendency to accumulate heavy methane on coastal zone sediment and water. In the end, I can say that Red river water is not polluted by heavy metal. But their contaminant is locally higher than environmental standards.

Red river is an important water resource of North Vietnam. Its decreasing quality would seriously impact to millions of people and activity on North Vietnam. At that time the quality of Red river water is being corresponded to environmental standards in general. Heavy metal content and its behaviors of Red river water are important environmental issue in the future of our country. For the environmental protection of water quality, we must concentrate all human effort and all our technological and legislative and economic method and others for clean water sources in future.



Session Chair:

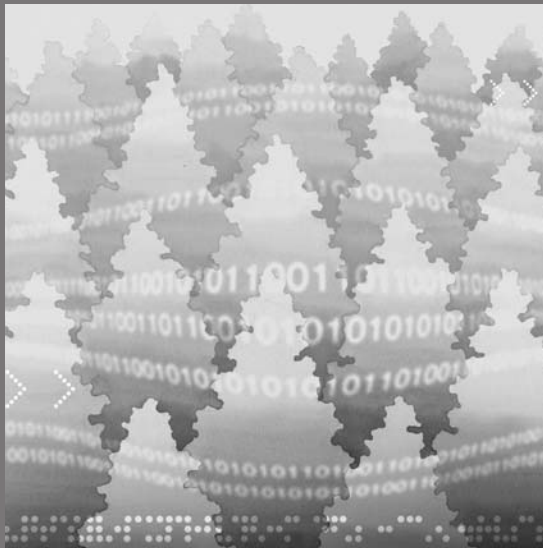
Morakot Tanticharoen

Director, National Center for Genetic Engineering
and Biotechnology (BIOTEC), National Science and Technology
Development Agency (NSTDA), Thailand

You heard today a lot about the technology development, but I think we have to address somewhat we call the public understanding, public perception in particular for modern technology. Professor Hayashi speaks a lot about the modern technology like molecular techniques for breeding or the sensitive word is Genetic Engineering or GMO. I am not sure that all of you, even Professor Hayashi is optimistic about this technology or not because in Japan I think you still you know sensitive to this kind of technology. This is the one point that you try to develop the technology how about the public perception. Secondly its not only you get a higher productivity, the higher production, but how about fairly distribution. You are talking about urban and rural area, you talk about well food versus fuels, you know because it is already happened. When America use a lot of corn for ethanol, we are suffer about the price of corn for our animal feed.

And also I got struck when Professor Hayashi's remark when he talk about intellectual property. You can use the intellectual property to protect the industry, but not for agriculture, not for farmers. As well as Professor Thongchai talking about fee, everybody has to pay for the fee. You can have pollution from agriculture as well from the paddy field, and also from the industry. Also farmer has to use the water for agriculture. Do the farmers and industrial people have to say at the same rate?

Special Lecture



HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Kiyoshi Kurokawa

Special Advisor to the Cabinet, Japan

Let me start with first slide that should do. Yeah okay incunabula (See #2). What is incunabula? Incunabula is a Latin, which means printed books since Gutenberg first made book to until 1501. So that covers about 50 years of European culture and they are about 40000 printed books incunabula in the world.

Incunabula is a Gutenberg's invention of printed technology, which is imported from China through very stable Islamic culture at that time. And I think Gutenberg really wanted printing the Bible, so that more sort of people has access to what Bible says, as a message of Jesus Christ. So he has a completely sound good intension and of course, at that time not many people can read that Latin of Bible, but at that time Europe went through hundreds of years of dark age, because everything is according to the message coming from church, which is message from the Jesus Christ, but who knows what is the truth, so you have the doubt, but then German version of printed books come into existence in Europe, which hundreds year later resulted in the completely different events that is religious revolution that means what churches says may not be true, so you have the doubt what your professor teaches you.

Now incunabula, therefore as a consequence when the information spread out to the larger public domain, all the establishment up to that point become very fragile part, so they are very much scared of information spread out to the public, so that they could maintain the power. That is the politics, right. So incunabula, now we are facing really incunabula since one of the major developments since industrial revolution, which is internet, and flat and connected world. So we are beginning to see the tremendous change in the economic paradigm and the way we think and behave.

In this globalized world last two Nobel Prizes in 2006 and 2007 really represent the consequence and some of the countermeasures converting global market place (See #3). One is last year IPCC headed by Dr. Pachauri and his entire science

Innovation for Development

Honda Foundation
Bangkok

March 28th, 2008

Kiyoshi Kurokawa, MD

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Incunabula

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Nobel Peace Prize

2006 Grameen Bank and Mr Yunus

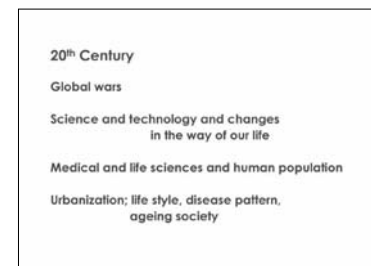
2007 IPCC and Mr Albert Gore

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community, delivering the warning to the climate change and what kind of policy recommendation could be undertaken by political leaders, but has been ignored for years, why is that?

Then last few years Al Gore and his associate made a world tour with visualizing sort of picture of really emerging global warming and the consequences and that raises the public awareness in the globe - much wider scales of public like incunabula, in printed books, 500 years ago and raising public awareness make this IPCC recommendation politically viable, so that all of sudden even President Bush started saying climate change is real. That happened last January, last year and even Schwarzenegger become a champion of the United States, not as a terminator, but as a champion of climate change. So they received Nobel Prize, good deal.

But also global economy after which started after the end of Cold War 1991 make disparity between those who have and those who haven't (See #4). In fact due to the global economy, marketplace economy, percentage of poverty went down from 40% in 1985 to 40% now primary due to the reduction or economic growth of the Asia Pacific, but during this 25 years world population also increased by 50%, so that actual number of those who have categorically poor, less than dollar a day or less remain more less the same, not really a major reduction 40% to 20%, but actual number is still remain very high particular in South Asia and Africa. But how to convert this thing, we see Mr. Yunus, when Bangladesh became independent nation in 1971, he was the economist, he is academics. He went back to his own country Bangladesh and become a sort of assumed the professorship in one of the university, as a economist, but tried to learn why Bangladesh is suffering from this and he went to like poor village and see the real world of this Bangladesh. He really tried to help them and struck his heart, so he left academics and he started Grameen Bank for microfinance and local women, which is quite disadvantage at that culture try to help them to become independent. And this is the first time because these poor women nobody, no bank would finance them and this is the microfinance and that become a very successful to encourage them to become independent and self supportive. Now this microfinance mechanism has spread out to more than 60 countries and this has become one who is not only volunteer or not donation, but self confidence in their way of life. So that is a result of this Mr. Yunus with high aspiration for common good. These two represents one of the major aspects of globalization.



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Let's briefly look back the 20th century and what is most



characteristics of 20th century compared to any preceding centuries human spent over the last, so maybe hundred thousand years was global war. Somehow human is the only species in this animal kingdom of planet earth who get involved with excess unnecessary killing. But that managed to become global, used to be more regional but they are so stupid just to expand all the things, World War I, World War II, and Cold War. But during that time science and technology changed the way of life. Science and technology rapidly advanced during last 100 years. For example, just remember Einstein discovered this $E = mc^2$ in 1905, you remember just only 100 years ago.

But who imagined we are talking about nuclear as a clean energy, but he thought about this $E = mc^2$ only 100 years ago. And also in December of 1903, Wright brothers made the first manmade flight over 10 seconds, but now we are flying everywhere just 100 years.

Human population grew from 1.6 billion, compare to 100 years ago. It is now 6.6 billion. Four times! In fact, do you know, what was the human population 2000 years ago when Jesus Christ was born? Estimate because this is just estimate no registration, 200 million. And it took another 1000 years to reach 300 million, alright. So that means many cannot live beyond age 5. And 500 years ago, when Da Vinci wrote Last Supper, was 500 million. But then rose very rapidly to 1.6 billion 100 years ago now 6.6 billion. We have too many. And urbanization. Even this 6.6 billion, half of this world population now lives in city last year. And everybody live longer. Longer life means you get more disease which is unique to the age like Alzheimer, alright, aging society.

All the social system has been built over last 100 years of maybe less than 100 years healthcare. Social security is not compatible with this kind of aging society. In fact, in Japan, aging society by definition when your population 7% or greater reach 65 is the beginning of aging society when it reached 14% it is by definition become aged society. Japan reached this 7% to 14% over 26 years of span fastest so far and now 21% of Japanese are 65 or older. Very aged society. But also many rapidly developing country like China, Korea and everywhere now when you are economically affluent women also get involved in some work not stay 100 times as housewives, so they become more independent and baby birthrate goes down. So that is the fact.

In China, in fact went into this reached 7% few years ago and it is expected China to reach aged society 14% of the population in 23 years. Many other countries like Chile and other country is

projected to go to aging society to aged society in about 20 to 22 years much faster, so it is coming.

So the challenge is as a consequence of 20th century is rapidly growing human population, urbanization, aging, and disease pattern (See #5). Who pays for this? Energy and climate change. Everybody needs energy to live, space to live and feed and water to live, environment and natural resources and water, food, sanitation and pollution. And also some natural resources are scarce not renewable and rare metals and there is a lot of fight for that, for survival and no such disparity remain very large.

In fact, last year the Forbes magazine published a list of billionaires and there are not so many billionaires maybe 10-20 years ago, but so many billionaires now. It is amazing. There is no Japanese last year among world's wealthiest person top 100. In 1970, maybe 10 Japanese, but now zero. Now about 14 Indians and many Chinese, what's happened? And this is amazing because two brothers are very famous; Indian Ambanis – Ambani brothers, you know them? Their father started some industry, you know, that is good they inherited and the brothers got fighting each other. But I think they become so wealthy they are number 14 and 16 or something. He built his own house in Mumbai which is 40-storied, the 40-storey house. I was not sure what he wants to – utilize this thing, so I asked my friend let me just see I just cannot think somebody even wealthy that is fine, but build his own house of 40 storey and he said, 'No, no, no, that is wrong 60 storey.' Well, but that is what it is and then I told you poverty and food and hunger three Fs and two Cs climate change, food, fuel, and feed. Human security become a issue, in fact global warming with more impact on those who are more poor and also developing part of the world and there is a lot of immigration and tremendous sort of a human security become a issue.

In fact, many UN agency and affluent countries knows the issues. And in fact in year 2000, Millennium Development Goals initiative was launched 5 years later led by Jeffrey Sachs and his associate with all the sort of social and natural scientist developed eight goals (See #6). And the goals are these five eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women and reduce child mortality; improve maternal health; combat HIV/AIDS, malaria, measles diseases; ensure environmental sustainability and develop a global partnership for development whatever the measure it may have been in year 2000 the goals for every country was to half this number by year 2015.

Challenges of the 21st Century
Rapidly Growing Human Population Urbanization, ageing, disease pattern
Energy and Climate Change Environment and Natural Resources Water, food, sanitation, pollution
North-South Disparity Poverty, food and hunger (3Fs) + 3Cs Human Security

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Millennium Development Goals
Eight goals
Goal 1 : Eradicate Extreme Poverty and Hunger
Goal 2 : Achieve Universal Primary Education
Goal 3 : Promote Gender Equality and Empower Women
Goal 4 : Reduce Child Mortality
Goal 5 : Improve Maternal Health
Goal 6 : Combat HIV/AIDS, Malaria and Other Diseases
Goal 7 : Ensure Environmental Sustainability
Goal 8 : Develop a Global Partnership for Development

6



So this year is the midterm of these global development goals, Millennium Goals and which seems to be lag quite behind at the moment. And this is very important year for Japan to host in early July G8 Summit and they have to really work on that and also Tokyo International Conference on African Development which they launched with the UNDP and World Bank in year 1993 this is the fourth time. And there is a lot of attention to Japan, what kind of leadership they are going to show but I do not see much of the leadership from Japan, terrible. But at least Japanese Government seems to launch focus on Millennium Development.

Goal four about child mortality and improve maternal health and that four, five would be the focus of Japanese government initiative for TICAD in late May in Yokohama and also global health should be one of the top agenda in G8 Summit. In fact, the last G8 Summit hosted by Japan 2000 is characterized by three things; Japanese Government as a host of G8 invited for the first time in G8 Summit African leaders to G8 Summit in Okinawa. Second, Japan's initiative really persuaded G8 head of state to work with G8 – United Nation to launch this Millennium Development Goals. Third is Japanese Government really committed to launch HIV/AIDS, malaria, other diseases tuberculosis at that time. Two years later this was Japanese Government initiative to launch global fund which perhaps, you know, specifically addressing HIV/AIDS, malaria, tuberculosis which is headed right now by Mr. Rajat Gupta of India as Senior Director.

But nobody knows about it even in Japan. Because Japanese government and ministries are not sort of mindset is not to let global public know what they do. The good thing is they have to publicize, but they do not. Because their tradition do not let the public know what they do.

Over the last decade or so, innovation becomes a mantra. Everybody says innovation is a key. But whenever I ask what innovation is, nobody knows the real answer.

So, I say innovation is creation of new social values, which is compatible with the context of that age which facing global challenges like global warming and food and starvation human security (See #8). And creation of new social values certainly technological invention and creativity is a key factor but that is not enough. Key financing, how to make business, how to deliver your product or service to relevant audience is a real innovation. To do that, you need entrepreneurship, out-of-box thinking and behavior and commitment. So innovation power is almost equal

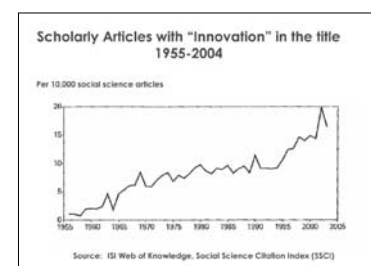
Innovation = Creation of New Social Values

Innovation Power almost equals National Competitiveness

- US Initiatives and Policies, eg. Innovate America (2004)
- European Initiatives and Policies, eg. Lisbon Strategy (2000), Aho Report (2006)
- Japan Initiatives, eg. Innovation25

-'Innovation' is everywhere!
--'Innovation Mantra' per K. Kurokawa, Science, April 13, 2007

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to national competitiveness. US initiates policy like “Innovate America” Report in 2004 and some are already implemented as a policy and European initiative is Lisbon Strategy and Aho Report which is Mr. Esko Tapani Aho, who became Prime Minister in 1991. When Russia disappeared and all of a sudden Finland went to 10% reduction in economic growth and he became Prime Minister. And he really focused on the entire educational system – education from primary school to everything that is the reason like Finland became a very competitive and innovative country 20 years later. And in fact, his principle is now facing the globalized world all the children have to be able to address every problem they will face in the future. So not teaching what has been taught in the past, but let them face and also be able to solve issues in collaboration with his colleagues that was the principle of the primary education.

And in fact, I met with some professors in Finland few months ago and one of their kids go to primary school in Finland, but he was amazed even he is academics the kids love to go to school, so even weekend they want to go to school because they are always challenged and they enjoy this sort of courses and all the material given to them. But in Japan just completely opposite. Old paradigm, male chauvinist tries to implement some old fashion teaching system to kids, so they are fed up with this. In Japan’s initiative, Innovation 25, the key is out-of-box individual. So, I think this final report was the entire cabinet approval of this thing, but we have to nurture out-of-box individuals. This is the first time in Japan. Innovation has become everywhere like a mantra, but my definition is creation of new social values which often associated with the economic values but may not be like as I told you worldwide web has no economic value for those who provided this. But on worldwide web there is a tremendous new business like Amazon and Yahoo and everything.

Innovation was more like term of business and business management and economics. And as you see that because this is a table taken from the ‘Handbook of Innovation’ coauthored by Richard Nelson of Colombia University, and if you see that in social science articles innovation has not changed like it has not appeared. There is no increase until mid 1990s. And all of a sudden, there is a sudden surge of innovation everywhere there must be some reason for that.

Three major reasons for innovation mantra (See #9). One is globalization, world has become flat and connected world and world economy, market driven world economy, but sustainable development or constraint for growth become one of the major

Three Major Reasons for Innovation ‘Mantra’
-Globalization: The world has become ‘flat’ Connected world
-Sustainable development or Constraints for growth
-Disparity between those who have and have not



issue. And in fact, after the end of war – Cold War in 1991, in 1992, there was first real summit for sustainable development which led to the delivery of Agenda 21. So, we knew that acid rain, environment, Minamata everything and that cannot be sustainable but it can not go to the top political agenda because of Cold War. If you remember during Cold War both East and West has more than 1000 nuclear head missiles, inter-ballistic missile which is just crazy, right. But we can not stop it. That is the reality of politics and stupidity of human which still continues. But disparity between those who have and who have not existed but we never realized as a matter of our own. Because we have not seen that real sort of poverty and we never faced with them in the visual impact but with TV screen, Live and also internet you begin to see that as a reality as a part of your life and sometimes it stuck your empathy.

So innovation by definition is the change, innovation does not go alone with stability (See #10). But majority of people want to be stable. So innovator is completely out-of-box, eccentric and crazy. But then these English are wrong we have to say extraordinary people. That is what Koizumi-san said – Japanese said when he was Prime Minister they said, “he is crazy,” but somehow this is something wrong and he asked some foreign press guide and they said, “No, no, Koizumi-san, you are not crazy or eccentric. You are extraordinary.” So “extra ordinary” is the right word for him. And in fact, if you look back the history extraordinary persons always are those who may change like Nobel Prize in science and new business and politics and ordinary people are just suicide or very smart people which lies on this Gaussian curve can not change the world have to be out of this Gaussian curve.

Innovation is to create new social value and science and technology and the engineering is a very important factor but not enough. You have the social system regulation, deregulation and finance and every part of this innovation you need entrepreneurship. Entrepreneurship is something always trying to challenge something new. And this is very important those who have been recognized as innovator has a very high spirit for common good in that time. So like 100 years ago even common good you see only your own people, but now you see many global issues, so you are heading to address and try to solve this common good that is global poverty, security, climate change, whatever you have. So innovation has, in that context, relevant. And that is the spirit of Soichiro Honda even in 1940s he want to make motorcycle fastest in the world but safe. But he said any technology and engineering without philosophy has no meaning

Innovation is 'Change', thus does not go along with 'Stability'

Innovation is to create new social values

- Science, technology and engineering
- Social system: regulations and deregulations
- Entrepreneurship

and he always aimed this has to be good for every people in the world. As far as Honda people keep that spirit, they will do okay. But once they tend to forget once organization become bigger, everybody become salaried man. That is the end of it or at least beginning of end of Honda.

Constraints for growth or challenge for the 21st century are growing human population, climate change, climate crisis, environment deterioration pollution, water and food and other natural resources (See #11). And perception by the general public widen about such disparity, sense of inequality, frustration, violence identity. Is the society sustainable? By the way I told you about many billionaires in the special issue of Forbes Magazine, in this Ambani brothers who build like 60 storey house which is extraordinary, but his vision may not be correct, but he is wealthy at the moment. But let me at least tell you in the commentary to this book, special issue there is a two-page commentary by Jeffrey Sachs with whom I am working very closely. But he wrote an essay, it is the consequence of global economy but somehow he does not like such a billionaires it is not fair they should do something and he said, 'Just remember if they remember and they do something for the poorest one billion people in the world,' I mean that is a good message.

So key word in globalized world – key words for innovation include personalization we will go through this collaboration and innovation (See #12). You have seen it last year and recent INSEAD report that also says innovation but completely different paradigm of collaboration and personalization. Also up to 10 years ago, we hear many times international, international but we do not talk international anymore just often we talk about global. Why is that? We have to think about why. There must be some reason. We all of a sudden start using global rather than international. And also we start talking about “human resource development,” but now quite often we use “human capital.” Why is that? And we have also we hear like civil society, social entrepreneurship like Mr. Yunus. And also think locally and act globally. Up to 10 years ago, we are talking about global marketplace economy. So, we say think globally, but act locally. Because local decision may reflect a lot of local culture and way of government and corporate and governance and value, that is unique to everybody, but economic is another one. So, I think it is maybe open innovation, don't hide your asset, but expose it through internet and there is a lot of inputs they are not just asking for money, but they are making some a sort of joint collaboration for fun. Good example is Linux software. All the engineer and computer software guys joined this and just make

Constraints for Growth or Challenges of the 21st Century

- Growing human population
- Climate change/climate crisis
- Environment deterioration, pollution
- Water and foods and other natural resources
- Perception by the general public of wide North-South disparity
 - Sense of inequity, frustration, violence, identity, etc.

---Is Our Society Sustainable?

11

Key words in Globalized World

1. Personalization
Collaboration
Innovation
The Economist Intelligence Unit, 2007
INSEAD, 2007
2. International vs Global
3. Human resource vs Human capital
4. Civil society and social entrepreneurship
5. Think locally, act globally
6. Wikinomics

12



the best software and finally beating up Microsoft. Now Microsoft agrees to open up all the resources, that is pressure from the peer.

Why is that? In fact, Christopher Freeman of University of Sussex and one of his disciples Carlota Perez were from Venezuela. And when he analyzed for the last all the human development since industrial revolution he identifies what is the big bang, the seeds of new paradigm of technological revolution. He identify then that led to the entire social economic change in that paradigm which lasted about 40-50 years and they followed by another next big bang which really changed the paradigm. And in fact according to hypothesis, their analysis, one is industrial revolution which is James Watt in around 1769 with not the combustion engine, but also James Watt which is hydraulic but which lasted and this is really replacing sailing boat to a sort of engine-driven machinery, manufacturing, and transportation. Which then allow many canals to develop throughout Europe and the range of trade and the import-export and also business become all of a sudden very much expanding at that time. But which was then replaced by iron and railway and this become a sort of social infrastructure but the new engine become iron and railway. And because Stanford and all these guys make a lot of money taking a chance on this new paradigm of technological revolution which was then replaced by steel like Bessemer steel this is the more pure iron which has a much strength so that allow the building, big bridge, big structure and become mega cities like New York City become possible. And then that replaced the iron in over 20 years time and just reaching saturation become a sort of like social infrastructure railway and big bridge and big structure like 30 storey and 40 storey become possible by steel and electricity and heavy engineering. And from UK all three initiated by UK, but spread out to US and Europe and everywhere.

And fourth is right now (See #14). We have been living in 20th century. This is the new paradigm which is initiated by discovery of oil which has become very cheap fuel and combustion engine which allowed automobile and T Ford by Ford 1908 allows much cheaper automobile which many people now can afford. Not everybody but at least \$500 at that time for automobile so that many people buy. Highways, motorways and completely like social structure become different. So you can commute railway and automobile and highway and this would become a mass production and that was age from 1908 through 1974. And 1974 face of information and telecommunication that age from 1971 that we live right now. So, we are mixing these two and these are

Technological Revolution and Techno-Economic Paradigm	
C Freeman and C Perez	
• First: Industrial Revolution;	UK, 1769-1830
• Second: Age of Iron and Railway;	UK, 1829-1873
• Third: Age of Steel, Electricity, and Heavy Engineering;	UK and US to Euro, 1875-1918
• Fourth: Age of Oil, Automobiles and Mass Production;	US to Euro, 1908-1974
• Fifth: Age of Information and Telecommunication;	US to Euro and Asia, 1971-2077

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Fourth: Age of Oil, Automobiles and Mass Production:	
1908-1974	
• Mass production, mass markets, consumerism	
• Economies of scales (product and market volume)/horizontal integration	
• Standardization of products	
• Energy intensity (mostly oil-based)	
• Synthetic materials	
• Functional specialization/hierarchical pyramids	
• Centralization/ metropolitan centers-suburbanization	
• National powers, INF agreements and confrontation	
-Linear innovation, Supply-side dictates	
-National, Bi-lateral, International	
-Human resource development	

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the social infrastructure we face with railroad and ship and all other infrastructure and we are at transition at the moment.

So the age of oil, automobiles, and mass production we are very familiar with it developing countries try to catch up on this model. But this is a mass production, mass market, and consumerism which resulted in climate change and pollution and everywhere and Japan really suffered from Minamata disease and itai itai disease and you suffer. And in fact, this was noted already in 1962. You remember Rachel Carson's book 'Silent Spring'. She gave a clear warning we cannot go this way anymore too much human suffering and environmental impact and that was not really caught a lot of attention to the greater public. So that means it is not politically relevant issue. And in fact, this year is the 100 year from the birth of Rachel Carson. Then in 1972, you remember Rome Club published a report, Limits to Growth, about acid rain and pollution. We knew them but no political action. It was – that was a paradigm which really drove this economic growth.

And 1987, you remember United Nations' report so-called Brundtland Report called 'Sustainable Development'. So, we really have to save our natural resources for the future generation to enjoy what we enjoyed in this century but no political action. 1987 still the height of Cold War, alright. So that is mass production, mass markets, consumerism, economy of scales, products and market volume, horizontal integration, standardization of product, so all the products to be interchangeable otherwise you cannot export to Thai different standard and Vietnam different standard, Japan different standard. That is inconvenient, so you can not capture the market standardization, energy intensity is mostly oil based, cheap synthetic material first time in the history a lot of synthetic material, dye and medicine and a lot of plastic all the things which makes our life much easier and functional specialization – specialist hierarchical pyramid, centralization, metropolitan center, suburbanization this is the way of life we enjoy national powers, so that is the foundation of national power. So that national powers international agreement and international confrontation that was the paradigm we really enjoyed and we took it – took them for granted. This innovation was more like a linear from research development to the marketplace done by one corporation like Toyota and Honda and everything, so that is linear.

So each part of this a sort of linear integration linear innovation linear integration you can do just in time, sell and that kind of more efficiency this is incremental innovation, supply side dictates



(See #15). Many of you use electric oven, right? Let's see when you have electric oven how many buttons you have, how many buttons you have ever used. Maybe one or two. Ask your wife even she does not use 10, alright. Why do they make just 10, I am still surprised, we need more choices that is crazy see engineer and technologists want to have a better technology, so what, I mean that is not irrelevant to the consumer. So you rather have only two buttons but half the price, no? So supply side dictates and national, bilateral, international and human resource development. Because structure of corporate society are reasonably fixed, so you like to have a human resource development is the key but not anymore. That is very important part human resource but next thing this ended in 1974, why? In 1973, there was forced Middle East War so-called Yom Kippur War and then oil prices went up and then oil can not be abundant source of energy.

So all of a sudden Middle East becomes very wealthy. And at that time I was in Los Angeles, I remember vividly this Yom Kippur War and the consequence because many estates in Beverly Hills are bought by Islam guys and they changed all the painting all the things. That was fantastic but was strange. But that is what it is.

So that is the end of this and also we are not sustainable climate change, smog all the things. So the Muskie Act was implemented in Los Angeles. In 1971, I moved into Los Angeles from Philadelphia and there was tremendous smog, it is everywhere. So Muskie Act was implemented which within 10 years you have to reduce emission by 90%. All the Detroit motorcycle – Detroit Company oppose this new regulation but nonetheless they approved this law in action, but 3 years time Honda was the first to clear this CVCC engine and everybody is surprised. And at that time Japanese car become reasonable credible entity because in 1971 in California highway, Japanese car came into United States but they were laughing like this. If you drive this in California highway they might just all of a sudden into collapse and just pass only and just say they are laughing at it. But once this Muskie Act came in and Honda cleared fuel efficiency, so Japanese car became recognizable entity.

Now you have to wait 6 to 12 months to buy Prius in United States. That is the end of this mass production, climate change and everything. And age of information technology started in 1971 in Silicon Valley primarily this 1971 is the foundation of Intel.

Innovator – innovation for this new world who they connected world and computers. As I told you in the morning, internet was

Innovators and Innovations

- Computers- connected
- Internet: www (92); Netscape, Yahoo, Amazon (all 94); Windows95; Linux, Google (97)
----Wireless, mobile, modular
- emails
- Mobile phone
- iPod to iPhone; what was Apple in 97?
- PS3 vs Wii
- Entrepreneurship
- Demand-drive innovation

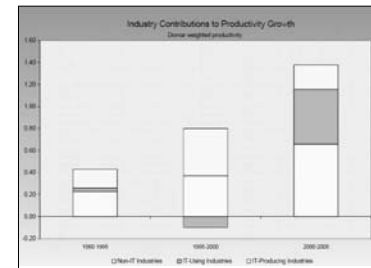
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there from 1980s in the United States and the academics, we work in university in the United States had access to internet but we do not know how to do it. Because you know we had the tabletop computer which is affordable in 1977 produced by Apple, Apple II, but we use only excel and word processors. And then Japanese manufacturing making a lot of tabletop computers even laptop by Toshiba and make it smaller and faster. But then Berners-Lee thought about it is computer it is good but we are – they are working in this – physicists are working in Geneva and each – everybody are using this thing and storing data but no access to it.

So they thought this is so inconvenient so that they invented a program called Hypertext Transfer Protocol, HTTP, and which evolved into World Wide Web in 1992. Many people have a computer at that time already, but when it is connected, what happened. Japanese are still making computers in five or six companies but they never thought about different things different, completely different paradigm this is connected Netscape, Yahoo, Amazon, now become major but they are all founded in 1994. They thought about how to use this infrastructure. That is where the creativity comes, out-of-box comes, not manufacturing. Use your brain is the key. And Microsoft just jumped into this in 1995 and Google in 1997. But they left university and started their company in 1998, they had a hard time but finally in 1998 first investor came.

So within 10 years they have a \$200 billion company in just 10 years. They want to organize all the data, information and give it to anybody in the world and free of charge. That is their vision. Even Google has so big but still their creators, these two guys, Sergey Brin and Larry Page are like in mid 30s but still the company working for this has to be judgment of the business decision is this good for everybody or not. That is the major decision. Now they expanded so much invited many corporate executives to work for their company and corporate executives are so surprised. They thought this is a joke. But in fact in every little decision, their value judgment is this good for everybody or not. They are so surprised for business person still they are just chasing dream. Because if you capture the world sort of information you can do many things but they do not want to do that. This has to be good for the people or not is their judgment in every step of business. That is amazing, and that is good.

By technological revolution, there are wireless, mobile and modular, so how to use it is a new business (See #17). And Linux came in with Linus Torvalds with all the open access and IBM



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jump in, so now major software become open source. Now e-mail; you were not using e-mail 10 years ago, but now everybody use that. Everybody use mobile phone, but not 10 years ago like car phone or something but not really mobile phone. Apple in 1997 has only five weeks of cash flow to sustain, so they were going to go into the verge of bankruptcy and many companies maybe want to buy. But now it is the most successful brand and most innovative company with iPod and iTunes and iPhone. All the things are the work of innovator Steve Jobs.

I will get back to you on what Steve Jobs did. So just 10 years just bankrupt almost five weeks to go but they have just survived. So don't give up even you have only five weeks to go, no problem.

Japanese tend to be really technology intensive. Sony's PlayStation 3 visual image is just fantastic, no question. But this is a technologist Wii. Do you know Wii? But when Nintendo came with Wii everybody bought Wii and this is fantastic. For Sony's PlayStation, its target customer is young male only. But you know Wii now grandfather can play with granddaughter and good for metabolic syndrome obviously. So family joined together. That is a great invention.

Now Nintendo become the third most valuable company in Japan, just for DS and Wii. So if you are engineer you have to think not only left side of your brain. It is not enough your decision has to be at right side of your brain. What kind of customer you want to catch? So this is entrepreneurship demand innovation not only supply side chain like 10 button for electric oven. Just two button say something and they just cook something for your chicken. That is what innovation is.

Therefore, if you see this is all the time this Freeman thing there is a new frenzy of new technology like 1960s to 1995. This was industry contribution to productivity growth. This yellow is IT producing industries they contributed significantly to the economic growth until year 2000. I think you have all the printed material of my every slide you can see that. This is one of the major driving force or pulling force for economic growth until year 2000 there is so-called IT bubble burst or NASDAQ Fall in 2000 after that IT become one of the social infrastructure. So IT producing industry is not contributing that much anymore to the economic growth, but rather IT will be utilizing building a new business model to meet the demand driven economy. So you capture like Wii and other economic business model, IT utilizing industry becomes one of the pulling force for the new business.

Japan is still producing IT producing factor is not good. So age of information and telecommunication, information intensity microelectric based ICT, decentralized and the integration network structure become more important and more relevant and knowledge as a capital intangible value added to the corporate as I said because everybody sees that. So the corporate value is not only to the shareholders but stakeholders really judge your corporate value. So heterogeneity, diversity, adaptability adapt to the change and different crazy people just meet together and get the crazy idea and get finance. That is what it is. We will change the world within a few days, few years.

Segmentation of market, proliferation of niche everywhere, your culture, your value maybe quite relevant to somebody in Africa, somewhere North Europe and somewhere in South America. So you can capture this niche it is not like old paradigm, but this is proliferation niche is how to find out these niches and connect to them. So if you have a diversity and heterogeneity in your frenzy that certainly become advantage and branding is very important. Perhaps as you know like Japanese up to a few years ago there was a study by McKinsey. Do you know Louis Vuitton? Many ladies want to buy Louis Vuitton, and you are forced to buy something. Because they are your girlfriend or your wife, but 40% of gross sales of Louis Vuitton was by Japanese. Crazy, isn't it? And 60% of profit of Louis Vuitton was by Japanese, not necessarily in Tokyo but in Paris and everywhere. Japanese men say crazy but Louis Vuitton was very successful in branding their image, their product captures the heart of women. And women themselves are not buying it. They force their father and husband to pay for them. That is good.

The branding is very, very important element to catch certain segment of your customer. So you specifically identify your customer what you want to sell that is very important not to serve Sogo Denki Maker. Economy of scope and specialization combined with scale specialization target what is your target demand driven globalization interaction between the global and the local. So cluster has a unique tradition and culture like wine you want to get wine, very expensive wine to target. That is very important and instant contact and action. So the instant global communication you have to just think but act and keep running and while you are running you change the course. Competition becomes so fierce and many Asians and so many entrepreneurial Asian from Vietnam and Thai, China, India. That is great competition. It is fun. So that is the paradigm we are facing right now. We still have to develop infrastructure of society based on the old paradigm of railway and all the things, but this is a new



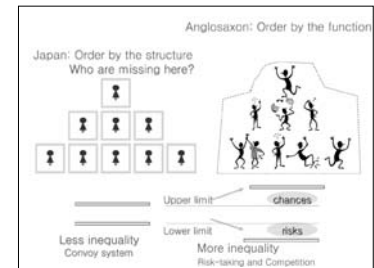
opportunity of growth of new economy.

Japan has been very successful from 1950 to 1990, but It was due to Japanese social structure which is hierarchical and seniority (See #18). If you instructed “go this way” and they are very strong but if something change they cannot change. So that is the struggle right now of Japan. So this is also in this hierarchical society in Japan you never move laterally from Mitsubishi to Mitsubishi, it is not allowed and this is very consistent and also comfortable for Japanese which came with Samurai Warriors mindset, over 400 years. So who are missing here in this hierarchical Japanese economy?

Women are not a part of it and foreigner are not part of it. So they cannot change this course even their company is going fall apart, until Carlos Ghosn came as a top in Nissan. And even Sony’s Chairman is a foreigner. Until such time they cannot change it because there is no foreigner or women in every layer of this hierarchical society. So everybody just obey. I say this is a typical of so called Tagosaku society. Tagosaku is very much afraid of woman and foreigner. So that is a weakness of Japanese. But it is not age-related hierarchy, it is your ability to do certain specific aims. If this is work, then it is like baseball player like team you cannot be everybody ace pitcher, you need a shortstop, everybody has a different roles, then as a team you become – it is not age, your ability to excel in certain things.

Innovation in globalized world, investing in human capital and human resource is important (See #19), because somebody may have a crazy idea like Google. How they changed the entire world. Just two guys who were born in the family of mathematics and they were interested in somehow connecting this world and that what it is. Human capital can change the world.

Bill Gates, who went to Harvard but after 2 years he left because he wanted to have this software. So he quit Harvard, but he came back to Harvard last year to give a commencement speech. If you read this he addressed to a new graduate from Harvard, you are very selected few elite. So you have to realize inequity in the world, every sector of the world so you have to really avoid of this inequity that is your responsibility, that is a very powerful message of Bill Gates and he said at the opening when he was admitted to Harvard, his parents expected him to graduate Harvard and have a great life, but he quit. He was sorry, but he will get back with honorary PhD.



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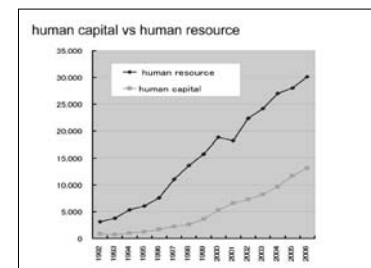


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Nurture entrepreneurship, out of book, not only you talk, but you act for the higher course for common growth and this is the just, this is the right thing, this is beautiful you do it. To do that, heterogeneity and diversity adaptability is very important for this changing world and global world. You are just communicating not only certain establishment but you want to associate with somebody else. Focus was the strength and core competence of you or your culture or your civilization, your family value or your own country's strength, there must be some core strength, you have to focus on that. And forget about weakness because comparison is so fierce and speedy and so I think trying to correct this weaknesses is a waste of time, it is better to collaborate who has a core competence in that particular ability of your weakness.

In Japan, I think, production and manufacturing is very good because they are somehow flat, all the things they are very good and they want to be perfect but they are very weak in management and very weak in finance. And always Japanese go to the government and that kills. Don't rely on government because they are not responsible. You know government is government, but you do your own business. Strengths and core but you recognize that, speed is the essence of game so much competition. Local values, but always act globally.

In fact human capital, this is sort of English, English written like economists and Financial Times how often human resource has emerged and human capital that is from 1990s human resources is very important and human capital like 2 to 1. So they are really important of this education and so to nurture your own strength, human capital could change the world.



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Climate change and sustainability. So 'Green to Gold' by Daniel Esty, who is a Professor at Yale but he used to be an EPA, wrote a book 'Green to Gold.' This is the paradigm of business, not gold rush, green become a value. And Helios projects by Lawrence Berkeley National Laboratory headed by Steven Chu. Steven Chu is a good friend of mine. He is a Professor at Stanford, but now Nobel Laureate in Physics in 1997, but he left Stanford, become a Director of Lawrence Berkeley National Laboratory. So I called him why you become a Director of National Laboratory rather than Stanford which is much sort of vibrant academic community. But he said he had to start working on something for the Clean Energy for next century like 22nd Century. So he is a really brilliant guy, but I think now he is starting this Helios projects just as a many, many good project and even that many companies like oil company just investing his project like \$500 million or \$50 million. That is great.

- Green to Gold, by Daniel Esty
-Prof at Yale, formerly at EPA
- Helios project at LBNL by Steven Chu
-Nobel laureate in physics, 1997,
-formerly professor at Stanford U
- Gold rush to Carbon rush

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And Gold rush to Carbon rush, it is going to happen. Carbon becomes not commodity but valuable asset. How to do this carbon rush business?

Silicon Valley is a crazy place (See #22). All the out-of-box guys are there, management and finance and ideas and the initial engineer and in fact capital investments Silicon Valley, because capital is more like financial capital. So majority are venture capital and Green and Clean Energy tech. The amount of investment to the Silicon Valley last years of \$4 billion, year before was only \$1 billion, year before only \$0.5 billion. So there is a lot of expectation in Silicon Valley because these guys are going to make something crazy, but relevant to this global world and that is very interesting.

In fact, last time Silicon Valley gets one entity of \$4 billion and ICT was 1995. So it is going to happen. Do you know like Tesla Motors in Silicon Valley? Tesla Motors is a Silicon Valley automobile maker, which now has a very nice fantastic electric car with a functional Porsche, so it takes only 4 seconds from like 0 starts to like 100 kilometer plus per hour. You can see that on YouTube, that is great. I want to buy one. And it is not expensive, it is amazing, this cost only \$100,000. This is cheaper than Porsche. So that is great stuff. Lot of investment, those who invested on the thing makes a lot of money, so that is good. Not the government money, if you want the government money not going to work, that is a moral hazard. So Venture Capital with financial capital managing that is essence of the game.

As I told you, globalization 1.0, ODA and poverty, national, ODA was not globalization that has been there, but with many people seeing the suffering of human suffering, many woman and man want to contribute (See #23). Civil society movement, NGO, bottom-up, right like then many new business model emerges from here like Grameen Bank and Mr. Yunus. They really want not only contribution and donation because donation and charity is not going to help them because charity is not really encourage them to self esteem even they are poor, but they have a pride of their own. So charity is not going to help them, but rather help them to become self sustainable. So Grameen Bank and they are not losing money. And now there is a Grameen solution. The new CEO is a guy, also Bangladesh guy who was educated in the US and worked for Ford in the US, now spent two years in Hiroshima. He speaks pretty much good Japanese. He knows Japanese but and he is Grameen Solutions, CEO. I met him a month ago. A great and young man.

And then globalization 2.0 philanthropy is always there, but

Capital investment in Silicon Valley:
Green and Clean Energy Tech

500 million USD	2005
1,000	2006
4,000	2007

Ref: 4,000 million USD on ICT in 1995

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Globalization 1.0
NGOs – civil society movements
Globalization 2.0
Philanthropy and foundations
Globalization 3.0
Private sector
Globalization 4.0
Universities

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now philanthropy is towered with human suffering and disparity and Green Tech all those things and there are many people are working for this solving global issues.

Gates Foundation is more like suffering and HIV AIDs, malaria and tuberculosis. And now Google has a Google.org who is a Google Foundation who head by. I met this guy last summer, but he is a medical doctor, he is American, but he spent like 20 years in India. He knows every parts of India. He said he went to every states of India for the last 10 years. He knows everything. Google Foundation is now doing a lot of philanthropy for this, addressing this issue and also they are very much interested in investing on Clean Technology and Clean Energy Technology.

Globalization 3.0. Private sectors go into this, because they want to expand not only their market but just by doing this they are helping building up infrastructure. And globalization, universities invest on human capital and human resource. So there are many leading university in the world, opening up and try to attract brightest of the brightest from the world. But Japanese Universities are very much late behind them. And they are not sending a lot of strong message. Have you ever heard strong message from any leading university in Japan. No. Why that? For example, you know Cambridge University as a good university. You want to go, right. You know who is the top of the Cambridge? Alison Richard, woman, Anthropologist. She was a provost at Yale, but she was recruited to head Cambridge University about 5 years ago. She was a graduate of Cambridge, but she spent 35 years in the United States. So her husband is an American, but he does not want to go but I think he went nonetheless.

Do you know MIT? You want to go, right. Do you know who is a head of MIT? Susan Hockfield, another woman. She is the first biology neuroscientist to head MIT. But she is a great woman too. But when she was recruited, by MIT was a provost at Yale. So that means Susan Hockfield was Yale provost when she was recruited her successor was Susan Hockfield and she was recruited to head MIT within 1 year. She is a great lady too. I like her. I like both of them.

But do you know there are 8 Ivy League universities, and 4 out of 8 presidents are woman, Princeton, Penn, Brown and Harvard. There are 82 or 83 national universities in Japan. There is only one woman president or Chairman with the woman college. That is a disaster. So I tell Komiyama-san, provost of the University of Tokyo, has to have his successor woman at the top of the



University of Tokyo. But he says that will be difficult. I know that. So I told him don't worry, don't need to think about Japanese, just only Japanese woman, you can think of somebody like from somebody from Malaysia, who went through for the Cambridge that part of British commonwealth, that was a major impact to the world community. If the University of Tokyo is open, that will be great, many male establishments will resist.

You can listen to and see this Steve Jobs, Founder of Apple who was invited to give a commencements speech at Stanford in 2005. He gave a very powerful moving speech. He went to college only six months, but he quit because his parents are very poor, they adopted him, very poor, so I think their entire savings went to his college even one year. He quit because he did not see any value of what they are teaching. When he left college, he started playing with his friend, one of friend. He is the first one to make Table Top computer. But he is type set every design all of a sudden came back to him, so all the design typeset is designed by him and his team because he learned this Calligraphy.

That is beautiful and he said in his commencement speech, in fact Microsoft when they came, they took his model so that every personal computer you use is by his design in essence. So that means you cannot connect the dot looking forward. So you do not know what is coming in front of you and you can only connect dots looking backwards, oh that course really helped me 10 years later. So you do not know what is going to be good for you. So that you have to trust that dot will somehow connect you in the future. So whatever your encounter today may have something to you 10 years later, who knows. But so you have to trust something what you learn. That is the message. You have to stick what you learn but you do not know what you like, but when you see that, all of the sudden it comes to you right away. That is what he says. Like you meet new girlfriend or somebody, just you hit intuition. That is what you really wanted to have, that what it is. That he said.

Next one you have got to find what you love. When he founded Apple successfully, he had \$2 billion annual sales and 4,000 employees, but I think he was kicked out. The reason was because a business plan he was thinking was different from that of CEO's they hire and Board of Directors sided with this CEO. So he was kicked out. It is strange he founded this company but he was kicked out. So he was on the top of this industry and he felt so miserable. He always thought about leaving Silicon Valley because he just got a baton from his predecessors.

■ you can't connect the dots looking forward; you can only connect them looking backwards. So you have to trust that the dots will somehow connect in your future. You have to trust in something —

■ You've got to find what you love. Don't settle.

■ Death is Life's change agent.
=> Stay hungry, stay foolish!

A quote of Stewart Brand by
Steve Jobs, CEO Apple & Pixar Animation
At Stanford University, Commencement in 2005

But he went to talk about this guy, to sorry about this and they said, no, no don't worry about it. But then all of the sudden he begin to feel, he was really back again to where he was originally, that means being there in a top of big corporate, he felt completely different pressure, but he began to find what he really backed to what he liked to do. So he made a NeXT company, Nexus and Pixar under which he made many animation movies and all of a sudden later Apple bought his company. So he is back in Apple again and so he delivers about whatever this Apple iMac. In 1997, his business was almost running out, but he came back again. So you try to find out what you learn. Don't settle. That was his message to the Stanford students.

And he said also at that time, when he was giving this lecture in 2005 he was found to have a pancreas tumor, cancer. Because I am a physician I know that you have only maybe three to six months to go. He was told by his physician, his would be dying in at least mostly in six months.

So he started thinking about but I think that his doctor decide to biopsy his tumor and it so happened, this is a very rare benign tumor, which you can remove by surgery. So he is back and here he was. But he was really thinking about his death at that time, but I think he in reality he said this is life change agent. It is very good because everybody has to die, which is good because that is your turning over to next generation. So he said that is you to new. So that is their message was, death is life changing agent. This is a great thing but don't settle and looking, keep looking for what you really love. So you can watch his speech and also you can watch his sort of transcript but I think I recommend you to see his on website.

So he says stay hungry and foolish. All the time stay foolish and stay hungry. That what he means and that is a quote of Stewart Brunt I think he talks about this Stewart Brunt history, a story in late 1960s to early 1970s. He is a great guru of San Francisco area and quote of Steve Jobs. I really suggest you to read it particularly young people who have a great career and a great future.

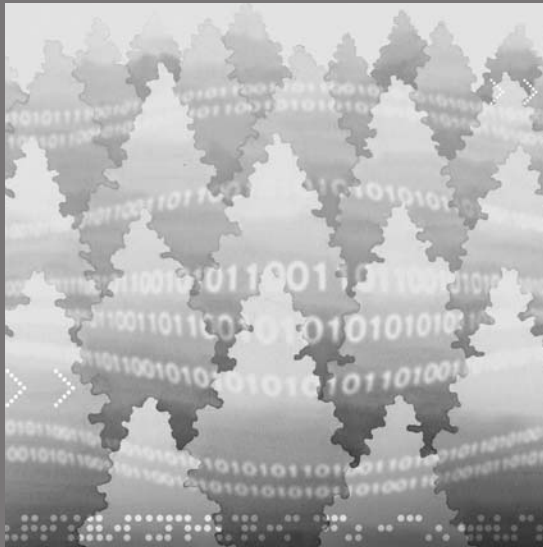
Thank you very much.



Session 3:

New and Clean Energy

– Case Studies –



Session Chair

Hirohisa Uchida

Vice Chancellor, Tokai University

HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Session Chair:

Hirohisa Uchida

Vice Chancellor, Tokai University

In this session, we treat new and clean energy and especially case studies. We discussed much yesterday and actually today we show you typical – practical cases. And first, I want to briefly explain this session. What can we do actually to solve global environmental issues? Maybe we receive several information from Thai side and Japan side. And how can we incorporate innovative technologies based on ecotechnology into our society. These are very big two themes.

Please look at this picture. This is surface of our Earth and you can see here thin layer. The thin layer is our atmosphere, we can now breathe in. The thickness is around 10 or 20 or 30 kilometer anyway. This is very thin. And what is happened now around 250 tons of carbon is increasing in this atmosphere. And even one does not know exactly but maybe 600 tons oxygen maybe decreased. How thin? You can imagine it. Assuming that 1.3 metaball and the surface atmosphere is just like one millimeter or 2 millimeter, so thin, very fragile, right? Actually yesterday several reports showed out here. Now we have very nice remote sensing technology. We can observe what is happening, what is going on the surface of the earth. And this is very important and of course international collaboration is going on in this field. Therefore, we know exactly what is going on the earth. For example, the movement of typhoon or the state of desertification or temperature distribution or you can see a geographical seabed or on the other hand you can simulate the level of sea and so on or chlorophyll distribution. So, nowadays we can get so many vital information from satellite and this is very actual information.

You can see here, this white part is cloud. This is the Japan Island, this is China and North Korea. Japan is suffering every March or April, through yellow sand. Yellow dust from west and this yellow dust come from west side. And just above China and North Korea they get oxidants, each particle carrying such oxidant together SO_x, NO_x to Japan and rains in Japan is acid rain, pH value is 4.725 independent of place in Japan. Just we are getting really acid rain everywhere in Japan. Thus, this pollution – this issue is not a local problem but this is really an international or global problem.



Siriluck Nivitchanyong

National Science and Technology Development Agency (NSTDA),
Thailand

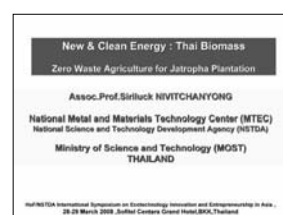
The theme of this conference is about the ecotechnology. So I am pleased to present about the zero waste agriculture for Jatropha plantation. The R&D conducted at NSTDA and our partners (See #2).

The outline of my presentation is about the zero waste philosophy and then we will give the example of the MTEC initiative projects on utilization of Jatropha biomass. The first step is about the plantation in acidic soil in the North Bangkok and then about design engineering of the equipment, which had oil extraction and the biodiesel production and use of the waste from the biodiesel is the glycerol. And then to the project about the utilization of the waste from the Jatropha cake, which is the gasification system and other project about the value-added of Jatropha tree.

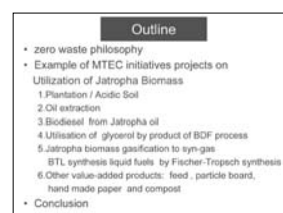
There are many projects in this presentation. So we have many partners who together work in this under the Jatropha project, which are the university (See #3). Kasetsart University and Prince Songkla University, King Mongkut University of Technology North Bangkok and Thonburi, and Chulalongkorn University. And from the industry is the Thai Machinery Association and research institute is the TISTR or Thailand Institute of Scientific Technological Research that is our partners.

For the zero waste philosophy, we try to combine many projects to put in this philosophy (See #4 to 8). Zero waste is the philosophy that aims to guide people in the redesign of using the resource, which aim to reducing waste to zero or near zero. So it starts from the recycling and then is reused as the way it is in the nature for this Jatropha project. The plantation starts from the site area, which is the acidic soil area. It is in the Rangsit Canal number 13, which is the northeast of Bangkok. The pH of the water there is around 3. So, we start the plantation – improve the acidic soil by putting the alkali chemicals and then plantation of the Jatropha.

From the Jatropha tree we can get many kinds of biomass like stem, leaves, flower, fruit and seed and shells, and Jatropha oil. Jatropha oil is non-edible oil so is out of the conflict of the food and fuel of it. This is the picture from the plantation. The biomass from one Jatropha tree in one year, we can get the seed that can give us the Jatropha oil, 1 kilogram of



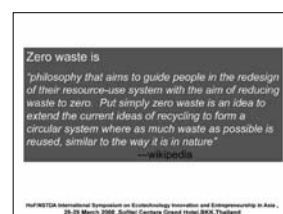
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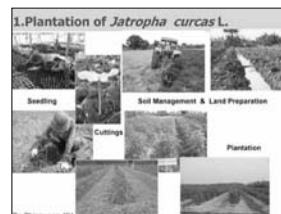
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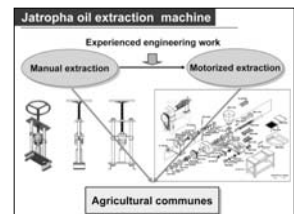
the seed and 3 kilogram of shell, 10 kilograms of leaves and 20 kilograms of stem. 1 kilogram of seed we can have the oil, 250 milliliter and we have the seed cake and we have the dry shell and we have the dry leaves and stem that can be used as the solid waste as a biomass. So the Jatropha oil can go to the biodiesel production or can be used as for the agricultural machine. And the biomass – the solid can be used as a solid fuel for the gasification system, for the power or electricity generation. And other kinds of biomass like stem or leaves can be used for value-added products.

When we have the Jatropha tree and many biomass, we start with design engineering about the machinery for oil extraction and palletizing (See #9 to 20). From the Jatropha fruit, we need the shelling machine to crack the husk and seed. From the seed, we need the extraction machine to have the oil. From the Jatropha husk together with Jatropha cake we need a palletizing machine to be used as a solid fuel of the gasification system. So this is the shelling machine that is designed, construction by the MTEC researchers and Thai Machinery Association. So our idea starts from the manual extraction and go to the motorized extractor that is for the agricultural communes. So they start learn step-by-step from the manual and then toward the motorized. From the manual, we design as it can be constructed in the commune in the local area. And for the motorized extractor we design two types of these machines. One is for around 15 kilogram of seed per hour and they are the one is bigger is around 70 kilograms seeds per hour. And then this is the training of the people in the commune to use these machines.

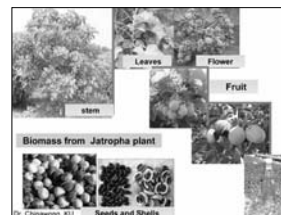
After extraction, we get the Jatropha oil and the cake. The cake together with other biomass like leaves or stems from the cutting from the propagation, we put them in the pelletizing machine to have the Jatropha pellet or solid fuel which can be used in the gasification to give other kinds of energy like electricity or some synthetic fuel. From Jatropha oil, we use it. We can use it directly in the agricultural machine and the other way is to send it to the biodiesel production unit



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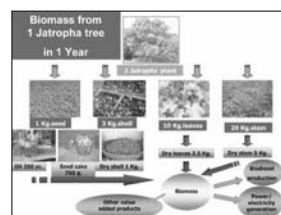
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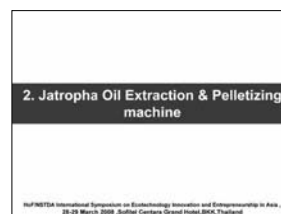
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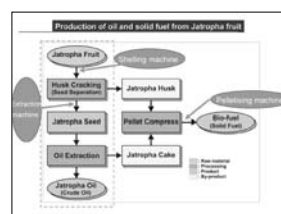
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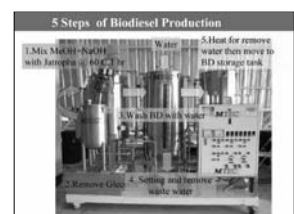
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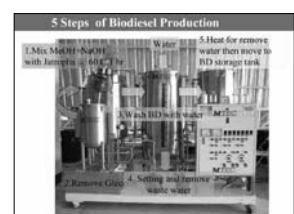
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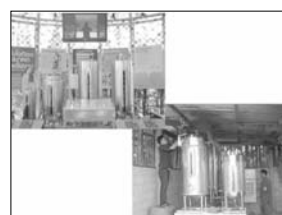


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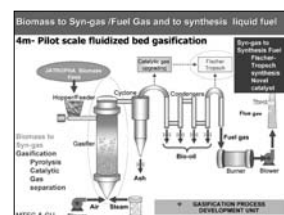
which is the chemical conversion of the Jatropha oil to methyl esters. The conversion starts from let the Jatropha oil with methanol by the catalyst that we use as sodium hydroxide or potassium hydroxide. This set can be batch type that is about 200 litter per batch. So there are many steps that we do it as simply as the people in the commune can do it by themselves. And this is the picture that many types of the unit. When the Jatropha oil is converted to a biodiesel so then the glycerol is a byproduct from the chemical reaction. Glycerol is the waste from the biodiesel production. We use the Glycerol for the research work on converted Glycerol to Propanediol. So the project of synthesis of the 1,3 Propanediol from Glycerol is just an aerobic digestion conversion. So the work starts from the isolate and identify bacteria strains and select the best strain for the highest production of the 1,3 Propanediol. This work is ongoing.

Another waste from the extraction machine is the cake. We decide to use that cake to be the fuel for biomass gasification (See #21 to 29). There are two gasification systems in this project. One is for the power biomass gasification and the second is, we call it, BTL or Biomass to Liquid. The data from the gross specific energy from the biomass from Jatropha that a seed cake – you can see seed cake gives very high energy when compared to the shell and leaves and stem or compared to the other kinds of biomass like rice husk, palm shell and coal or heavy oil. This biomass gasification is designed for power generation. 50 kilowatt is the downdraft gasifier and a screening system and electricity generation. This gas, the fuel gas, can be repressed the diesel – in the diesel engine for 70%.

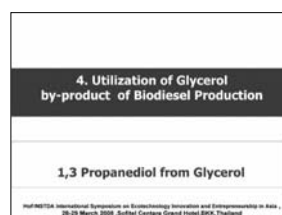
The second project of the gasification is a biomass to liquid. So the gasifier is designed to give the synthetic gas and the Syn-gas goes to the Fischer-Tropsch reactor, which the reaction of the carbon monoxide and hydrogen with the help of the Fischer-Tropsch catalyst can produce the synthetic fuel like a synthetic diesel. This is the picture of our work at Thailand Science Park and in the university.



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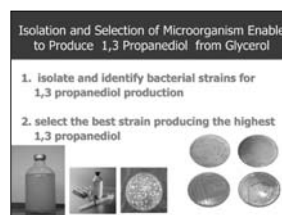
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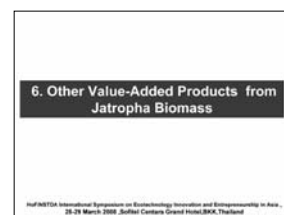
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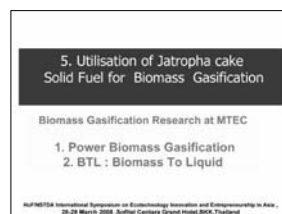
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Gross specific energy in each Jatropha Biomass VS others biomass & fuel (ASTM D585-02a)

Biomass	Gross specific energy Kcal/kg
Seed cake	4,008
Shell	1,422
Leaves	1,424
Stem	1,312
Rice Husk	1,280
Palm Shell	4,200
coal	8,100
Heavy Oil	9,300

Dr. Chinnawong, KU

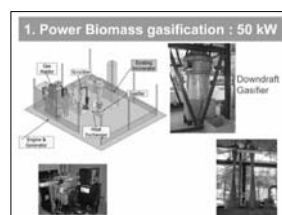
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Macronutrient in each Jatropha parts

Parts	Nitrogen (%)	Phosphorous (%)	Potassium (%)
Stem and branch	0.50	0.25	1.74
Leaves	1.77	0.83	2.43
Shell	0.86	0.14	7.10
Cake	2.04	0.77	1.93

Dr. Chinnawong, KU

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The last project is about the value-added products from the Jatropha biomass as a waste. The waste is a stem from cutting propagation and other waste. So we use it as a solid fuel in gasification and also to make a paper or particle board. And when consider the macronutrient in each Jatropha parts, you can see the nitrogen phosphorous and potassium amount in each types of the biomass. It can be used to the fertilizer and animal feed. But we have to do it – for using as the animal feed we have to do – detoxificate it.

In conclusion, the Jatropha plantation can be applied the zero waste philosophy (See #30). We plan to deploy a biomass to bioenergy concept as the bio refinery to complete-cycle biodiesel pilot plant. And in the acidic soil area of Rangsit, we plan to extend a concept to the palm plantation. And I think this zero waste philosophy can be applied very good with the palm plantation. For the promotion of the Jatropha, I would like to propose some issue and concern.

Since the Jatropha cost – very high cost in harvesting so we should have the R&D in harvesting method to reduce the harvesting costs. And also the R&D in new variety of non-toxic and machinability of the Jatropha for the harvesting. And also the toxic chemicals in Jatropha can be converted from a pharmaceutical or cosmetic products. So then it can be add more value in Jatropha plantation. So I think it is nearly used – we demonstrate nearly zero waste of the Jatropha plantation.

Conclusions

- Zero waste philosophy for Jatropha plantation is demonstrated
- Plan to deploy biomass-to-bioenergy concept, or Bio-refinery to Complete-Cycle Biodiesel Pilot Plant
- Plan to extend the concept to palm plantation in Rangsit acidic soil area
- Issues & Concern of Promotion Jatropha
 - R&D in harvesting method to reduce harvesting cost
 - R&D in new variety of non-toxic and machinability harvesting
 - R&D in conversion toxic chemicals to pharmaceutical / cosmetic products

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Morihiro Kurushima

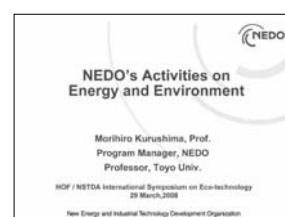
Professor, Toyo University
Program Manager, New Energy and Industrial Technology
Development Organization (NEDO), Japan

To this opportunity what I would like to make some presentation on behalf of NEDO. There are three filled: Background and overview, NEDO, and R&D for energy and the environment and the international activities.

NEDO is a government organization with METI, Ministry of Economy, Trade and Industries (See #3 to 6). Of course, and there is Prime Minister's Office, Council of Science and Technology policy with the other ministries including Ministry of Environment and the Ministry of Education and Science. So NEDO has some fractions to bangle with universities, academia and industries and the national laboratories. Some kind of bonding machines. So well I would like to just introduce two slides from the presentation of Dr. Chanabon. He is the President and Professor of Thailand University. He made some presentation in Japan with me. So this is composition of primary energy consumption in year of 2000. It is a very, very – that is some of the similarity with Japan.

So, the top is the Thailand. The orange part is oil and the green part is natural gases and the yellow part is coal and the nuclear and hydro. So Thailand and Japan, we look at some similarities depending on the fossil fuels still be. Japan is now depending on fossil fuels around 80% and some parts of the nuclears especially source of the electricity. But the other countries which have already overcome the energy diversifications. But Japan and Thailand have some similarities. So in addition to that there are very high price of the – oil prices we are struggling with including you, the Thailand. So this is some examination for the GDP minus impact. According to the oil price that is 10 barrels, per barrels to attack our economies.

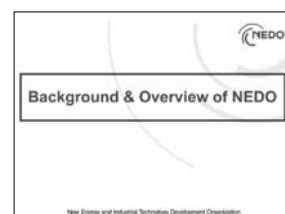
Thailand made very – there is a severe attack by the high prices of oil even that is 10 barrels, per barrel rise may attack the Thailand's GDP minus 1.8%. Of course, Japan now not so severe, but we may receive the minus 0.4% with the other European countries and United States. We should like to make some – that is a bit huge interest and effort towards energy saving and the renewables. Would you please recapture three background snap shot by me. This is the snap shot at the Conference of the Parties at the UNFCC COP-7 in Marrakech. There are very limited



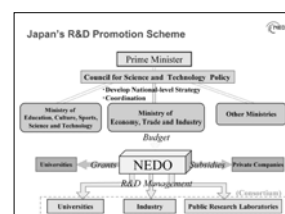
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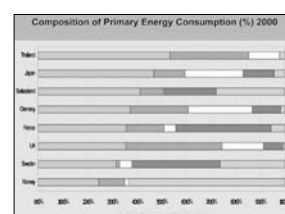
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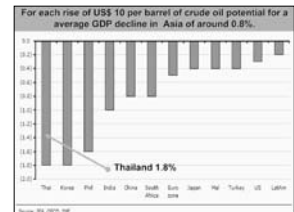
participants from all over the world, only the governmental officials.

This means, just look at this table. Here is Prince of Morocco (See #7). He made us some welcome remarks for us and after that some coffee break. In that time I just take a photo towards him, but the important is around the table, please look at the table. Beyond any kind of the races or nationalities or genders or ages, all most of the people have a very keen interests towards only one topics, climate change, global warming. It means when you look at here, brown, black, maybe the naked or the weak. Anyway, so any kind of people should concentrate only one matter.

So second matter, we are very strong economies. We have Thailand or Japan and the United States or Europe but there are very — still be the dark world, lack of electricity. Only half of the population, human beings can access electricity freely, the rest of the world cannot access. So we should develop the energy more and more. Of course, cutting such carbon dioxide emissions is a key and important issue for us, not for the Japanese but for the all of developed countries. It means common but differentiated responsibilities (See #8). And third, peak oil is real (See #9). Peak oil is real. I specialize in mining engineering including all development but peak oil is real or not? It is very difficult. But at least some parts of the world including the Middle East and the North Sea are the peak of oils already. I have lived in London, so I have a lot of friends with DTI, Department of Trade and Industries of UK Government. Their report – last report described up to the white line, this is already that is done by the production. That orange zone is oil and the yellow zone is the natural gas from the North Sea in the British territories. But very soon – I was very surprised that figures, up to the 2010 North Sea oil shoot down and so this is my red chart. This line by me, this is British consumption. This is the production. So rest of this British was and maybe is the exporter towards the Europe so far as oil and gas matters. But they should importer – they should be importer very soon. And so Japan has strong position regarding the energy consumptions.

Just skip the only one that is red chart with the METI, source of the analysis (See #10). This is oil crises 1973. In 100% Japan's industries, that is energy consumption per GDPs. But manufacturing steel, chemicals, ceramic and stones and the paper pulp, metals should reduce very rapidly until minus 45%. It is made great effort according to the Japanese industries. So, and we have a very good positioning. For example, Japan based 1. United States 2.7, Thailand 6.3, and China and India 9 and Russia is more. Well, Ukraine is the worst in the world, 28. So the GDP energy consumption per GDPs.

We would like to some effort towards – all over the Asian countries with ecotechnology. One of this is the good example with the top runner



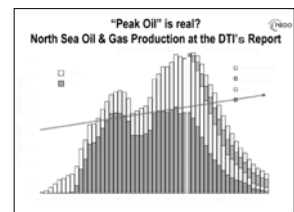
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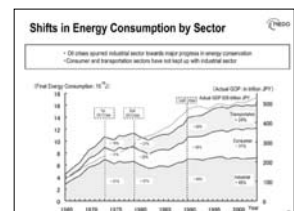
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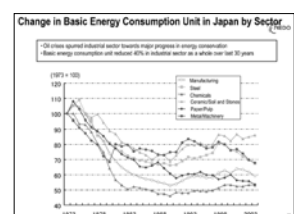
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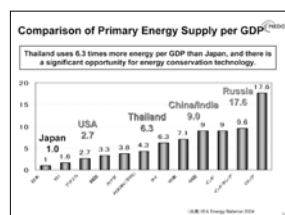
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methods. Some kind of the methods by the Ministry of Economic and Trade Industries, the top runner is very peculiar systems. Because some automobiles companies for example, FORD, is good enough. So as a maker they should improve such energy efficiency levels during the four and five years. It means quite, really that is peculiar but very excellent way to achieve top runner methods. I make some presentation in the Cambridge University where almost of the participant said to me like communist, socialist but any way this is one of the way to energy savings.

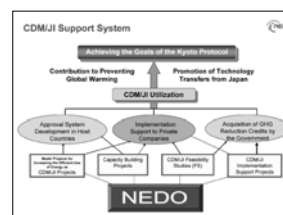
And I would like to make few slides on the renewables. Renewal energy is a very useful for our common future. But we are struggling with the high cost of the prices, high cost of energy, electricity prices with renewables. Of course the conventional energy is a very – that is at low level for per kilowatt hours Japanese Yens, nuclear 5.9 or coal of 6.5, etcetera. But PV is still 45 or 50 levels and the wind is a little bit cheap but not so good. Biomass is very wide range of. We are now developing the market and the technology development to push the snow ball to drive the market mechanisms. So, according to NEDO such kind of the effort, two efforts, one is the technology development, the other is market development. Now cost of such facility it is very – that is rapid down and the market is expanding very rapidly. Well, previous time, it is very expensive but now only around the 40 Yen per kilowatt per hour, so for as electricity production levels. So this is one example with local government peoples.

This is Ota town in Gunma city (See #23). This is a very good for the win-win-win approach. Win-win means some that is winning people did appreciate that. We are living in the eco towns. All these houses, 110 houses, equipped with solar panels and the developer did appreciate. The very quick and good selling such kind of houses and of course electric company did appreciate frequent – constant energy supplies.

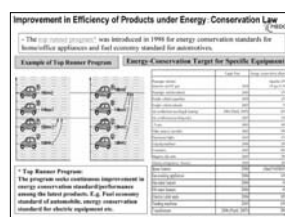
Finally, in the renewable fuel we would like to



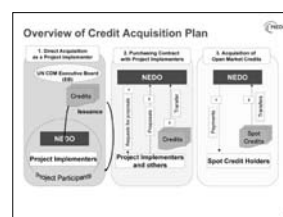
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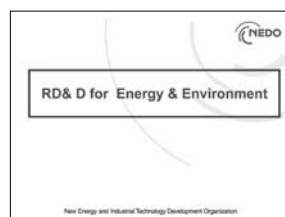
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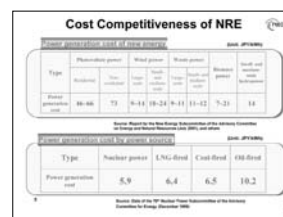
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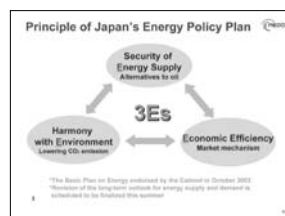
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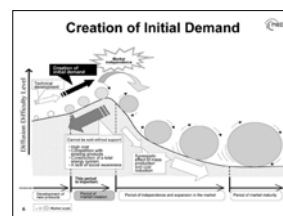
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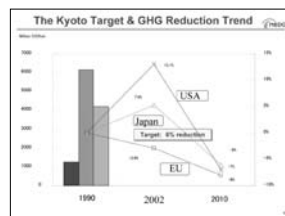
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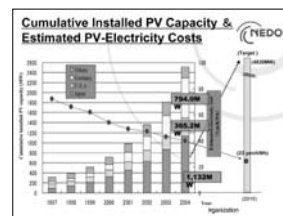
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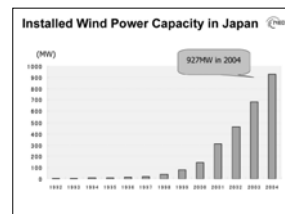
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introduce to that – local governmental effort to introduce, it means for you Kuzumaki Town in Iwate prefecture and Tahara city in Aichi prefecture with wind and biogas, and wind and solar (See #26). For example, Kuzumaki town, catch phrase is, “milk, wine and the renewables,” my town. And some efforts towards energy management system with IT. And so, this is our new project with Japanese government and with light carbon dioxide capture and storage underground. We have three projects in the aquifer and sea but we may abandon such kind of methods.

This is a very small project with some universities and companies. It means biomass project with accumulating the carbon dioxide and the heat towards a compact type multi storage, the bio beds. It is a very efficient way to observe the carbon dioxide and local areas development.

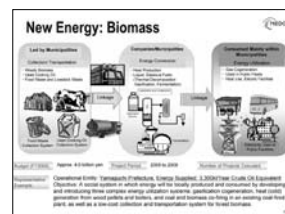
International activity (See #30): NEDO's project with industries because there are some project with – profit projects with Mitsubishi Heavy Industries and Japan AMAs including in Bangkok, the traffic improvement project at the Banlung junction in Bangkok. This may be good enough for us. Because this photo is a energy saving type trolley buses in Mexico city (See #31). This means there are some kinds of win-win-win approaches. Because the Mitsubishi Electric Corporation could have the business chance and the Mexican government will receive the high technologies. It means the energy saving trolley buses, etcetera. So this is some NEDO project on photovoltaic power generation. There is very limited energy supply in the town of the Noyon villages in Mongolia (See #32). So NEDO with SHARP corporation did supply such kind of the very big solar systems and they can enjoy the electricity 16 hours per day. So very freely. The other is JI project in Kazakhstan (See #33). This is a very simple means, very common co-generation systems in Japan but in Kazakhstan there are very old-fashioned boilers and the power steam generation system. So, we could supply the gas turbine with Hitachi Corporation. We could get emission right



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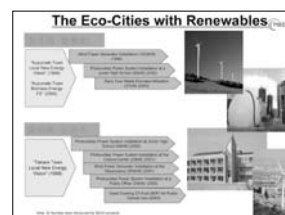
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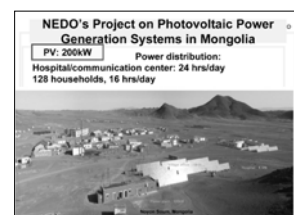
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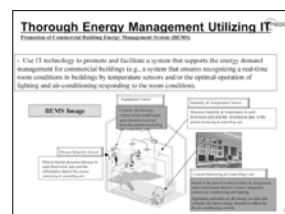
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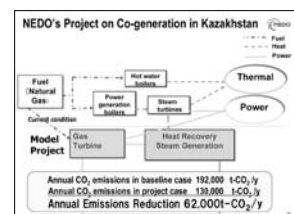
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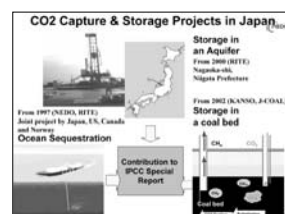
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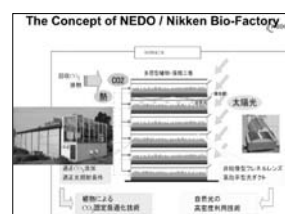
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from the Kazakhstan government about 62,000 tons per year.

This is project on steel making facilities with Nippon steel on CDQ, Coke Dry Quenching in China and India (See #34). The NEDO supports – this is only support not by our project but private sectors activities for CDM, biomass power generation project at Suratthani province in Thailand (See #35).

So, well this is some point of the words because yesterday Dr. Kurokawa mentioned and introduced that doing should be the most important. So because I was afraid – I was a bit astonished at the Ching Hua University (See #36). Of course NEDO has a very wide range of partnership with Churalongkong University or Bandung institute technology or Tsinghua University or the Beijing University.



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Pakorn Supanich

Assistant President,
National Science and Technology Development Agency (NSTDA),
Thailand, SolarTech

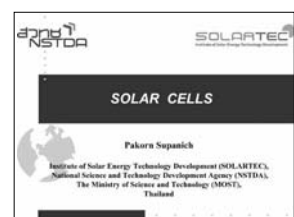
Today I will be saying about the solar cells. First of all, I will introduce you to know about the PV network in Thailand (See #2). It composes of private sector and the government agency. This one is the government agency, Ministry of Science and Technology. And Ministry of Interior focuses on the solar home system. Ministry of Industry does the privileges and factory rooftops. And the last one is the Ministry of Energy. It composes of DEDE, EPPO and EGAT. This mean Department of Alternative Energy Development and Efficiency, EPPO is Energy Policy and Planning Office, and EGAT is the Electricity Generation Authority of Thailand.

The other is the company, the private sector in Thailand who are involved in the PV market (See #3 to 4). There are five companies name in Thailand. Mecasolar Company, Ecrat Solar, SHARP, Solartron and Solar Power Technology, and there are other companies involving in the BOS or Balance of System. And other is the University, Chemical Institute of Energy, Chulalongkorn Chemical Institute of Energy, Thonburi Campus on the system and solar map is studied in Chulalongkorn University. This is the showcase of the trend of Ecosolar is the manufacturing maker in Thailand.

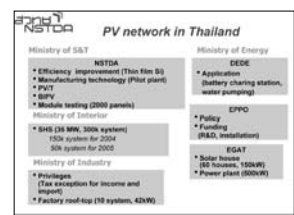
This one is the trend of PV installation in Thailand (See #5). You can see the installation increasing each year and in the last two years. The trend is increasing very high because on the solar home system is about 24 megawatt around the country.

This one is the target of PV installation in Thailand made by DEDE, the Ministry of Energy (See #6). The target is about 250 megawatt in the year of 2011. This one is one sample of the PV installation in Thailand. Tesco Lotus is the company in Thailand. The capacity is about 460 kilowatt (See #7). And this one also the capacity is 500 kilowatt installing in the Maehongsong province (See #8 to 9). And this one is the solar home system installing in the rural area of Thailand.

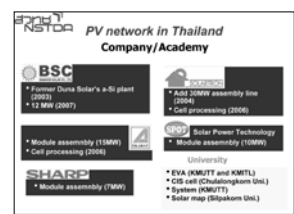
This one is the largest PV site in the world installing in Germany (See #10). You can see the site comparing with the maybe airbus or football



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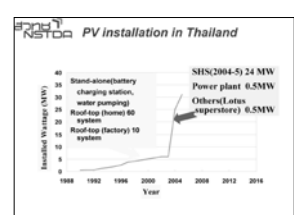
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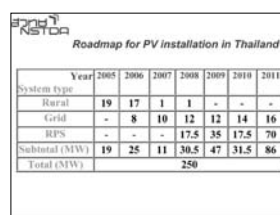
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field, pretty large. The capacity is of 14 megawatt. This one also is the solar home system, including of BOS inverter and charger controller in the rural area in Thailand (See #11). Each house has the power of 121 used for the electricity of one light bulb and one television just about five hours a day.

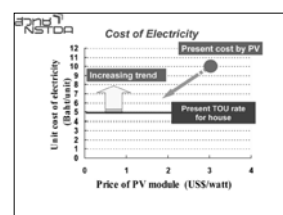
This one showed cost of electricity in Thailand and the cost of the PV system (See #12). Someone in the future, it should be made together. This show about the price of solar cell, although the price of PV or solar cell is high, but is lower than the price of electricity in the peak time (See #13). In the peak time, the price is about 16 but the price of solar cell in this day is about 8, half. So, solar cell is suitable for cut peak in the day time. This is the target of the solar cell installation 3% and 10% cut peak in the year of 2020 (See #14).

This one shows the comparison of the electricity usage in Thailand and Japan (See #15). Thailand used electricity in the amount of 10% of Japan's. And Japan can produce electricity from PV system about 10%. So, on the electricity producing from PV in Japan can use for on demand in Thailand.

This one is our activity in NSTDA (See #16 to 19). We do the research of the light, start with the upstream, we do the material and EVA is the polymer for protecting solar cell. We research, we doing the matching for producing solar cell and the midstream we are researching for the improving or the increased efficiency of solar cell. Now we hit 14% at a small piece of solar cell. We can hit the 7% in the commercial size of 8 square meters. The other task is doing research on the other type of solar cell is the organic diode – so the diode solar cell is newly PV in Thailand. Now we can hit 12%, more than 10% at the small piece. And in the downstream process, we are doing in the system. We do the PVT, it means photobiotic and thermal. Now we installed the system like this to six sites in Thailand. It can lower cost and higher breakeven point.



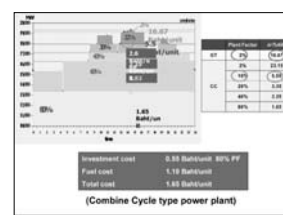
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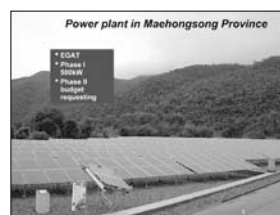
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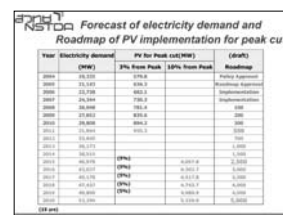
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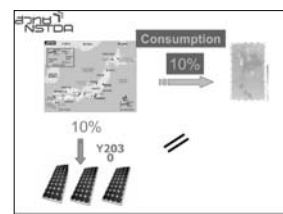
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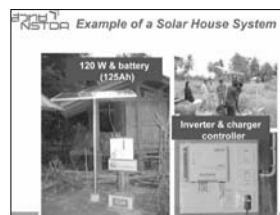
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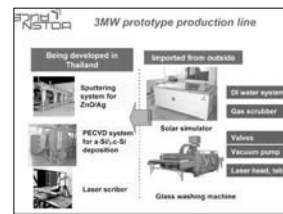
Other project is the VIPV newly indicated on the rooftop or the facade class of the building. This one is the machine in our laboratory (See #20). It is the first model in Thailand. This one is to produce the electricity for the robot, under the sea and is the installation site in Chiang Mai. This one is the production line, 3 megawatt production (See #21). This was installed at my facility. This one is the picture taken from my facilities. And this is the chart of the PVT system (See #22). It can produce both electricity. This site can produce 3 kilowatt and can produce the hot water. This site is installed at hospital. So the hot water is used to wash septic clothes in the hospital.

And this one is the biggest site that we used to install in the Queen Sirikit Hospital, Chonburi province (See #23). It can produce electricity of 9.7 kilowatt and produce hot water for 10,000 liter per day and the hot water is used for hydrotherapy. This one is installed at Science Park, NSTDA and this one installed at the Police Military Division in Bangkok (See #24). This one is the new application to use PV to do the air condition for the absorption chiller (See #25). This is the one installed in the Ministry of Science and Technology in Bangkok.

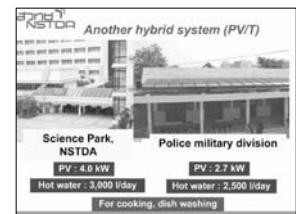
After NSTDA can research and hit the result, we will transfer this technology abroad and private sector will help to do the machine to support this project (See #26).

The last activity of SolarTech is PV in Thailand because now no standard for PV that suitable for Thailand or hot climate tropical area (See #27). We did research with Japanese side to set the standard for tropical area. Now this project is ongoing.

This one is the scheme to show in the past all of solar cell directly sent to the consumer (See #28 to 33). But present Thai Industrial Standardization Institute can solve some of this PV but only some parts still directly go to the consumer. The standard of the international is not quite suitable



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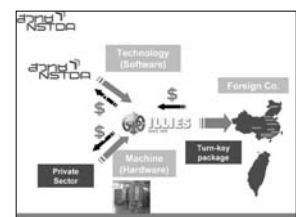
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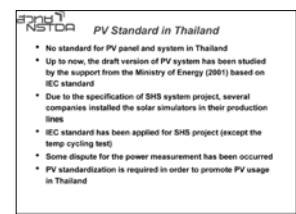
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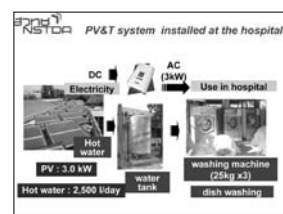
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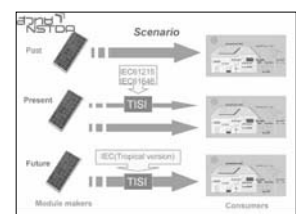
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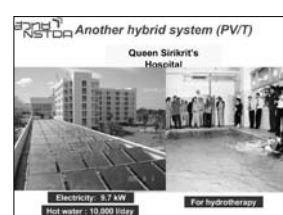
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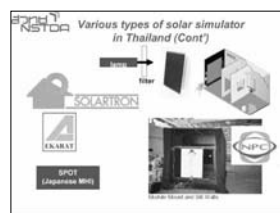


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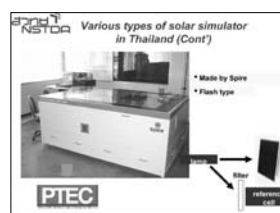
for tropical area. But in the future we will adopt these standards to be the version that suitable for tropical area, for the hot climate and high humidity like Thailand or other countries in tropical area. All of the PV models should be passed this standard from TC before sending to the consumer.



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Question from floor

PV is good enough for our generation. But I am afraid that of course usually electricity is a very useful for the night time. So the battery maybe a good way to solve such a kind of matters. Of course you already challenged PV on applying the hot water treatment, but do you have any some kinds of the effort towards the battery improvement or systems?

Pakorn Supanich

Yes, battery is one of the BOS or Balance of System that very important for this PV system. Unfortunately SolarTech is not evolved on this area for this subject. But I think MTEC do this? Not yet, not yet. Yes, battery – not only battery, the inventor, the charge controller and other is very important for the system because only PV models cannot work by itself. So, this kind of BOS is very important. Some pressures, the system of PV is down but the reason is for BOS battery not worked, inventor has malfunctioned or maybe the installer has no skill to install. Because right now, the PV maker has improved their sale to produce the PV in better version. So the BOS is very big problem for the system. I said unfortunately our facility not involved in the BOS system.





Yuji Kawaguchi

Operating Officer/General Manager,
Honda R & D

I am from Honda R&D and responsible for fuel cell research and future energy. Today I would like to talk about future transportation mainly on the sustainability and technology. It is clear for transportation sector we have very difficult issues on greenhouse gas emission and energy security. Due to a rapid growing energy demand especially in Asian and the developed countries, CO₂ emission is increasing tremendously.

This chart shows basically from IEA announcement and calculated by our Honda, shows energy demand toward 2050 (See #4). It is clear for our rapidly growing energy demand reached to about 2.2 times of year 2000. It is total energy usage and if we look back for automobile (See #5). This is history of United States, of number of automobiles since early 1990s and recently exceeding 80% of ownership and this is including baby or people who do not drive. So, it is a huge rate and other country like Japan nearly 60% and OECD countries is increasing at the same rate depends on economic growth. So, China is almost 2% recently but should increase.

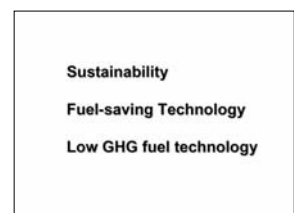
This is energy consumption in transport sector and also this is calculation based on IEA and reached to same 2.2 times toward 2050 (See #6). It is a basic case. And yesterday at the session one, introduced some data and future forecasting about our CO₂ issues and toward a global carbon emissions, need some deduction of a total CO₂ if we calculate to our future target of percentage of CO₂ in 450 ppm.

Also supply of oil we come to remitting the futures and of course it is – depend on economic growth and if we calculate on 3% average before 2020, there are some issues for demand and supply. Of course, there are some new activities to seek new method of oil supply not of existing oil. So I want to summarize for my explanation in that two approach on the transportation. One is fuel saving technology in existing IC vehicles and the second low CO₂ fuel technologies.

First, I would like to talk about our fuel saving technology. This is additional chart of WBCSD and simulation for CO₂ values and how to reduce toward even to year 2000 toward 2050 (See #7). Only in case of using biofuel or fuel cells from mainly renewable can reduce and adjust to same CO₂ emissions. And let me shift to a fuel saving technology, mainly



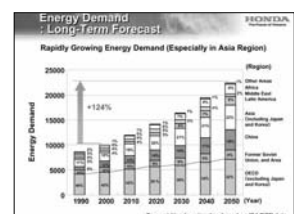
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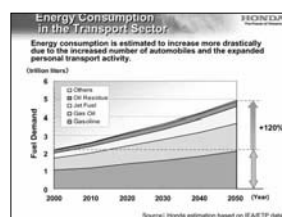
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from a Honda technology. This chart is our evolution of CO₂ or fuel efficiency of Honda. And annually Honda improved fuel efficiency by IC engine mainly V-Tech technologies. We think IC engine including diesel is technology for improvement around 15% to 20% and hybrid technology is defined as 30% or 40% technology and automated technology for CO₂ deduction is fuel cell.

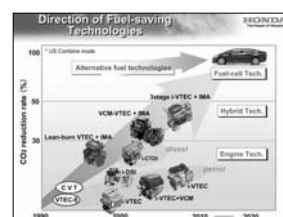
First, we introduced V-Tech engine in 1989 as a type of a high performance car and modified to fuel-efficient technology (See #12 to 14). And this is the formation of such pulp timing technologies. And we call hybrid technology of IMA, Integrated Motor Assist systems. It is a very simple system. It has thin motor direct to engines and assisted by electric power and using a brake power, two batteries and we announced for some expansion of our IMA systems and the hybrid production toward 2010. 200,000 vehicles annually.

Next, I want to talk about low GHG fuel technologies (See #16). There is a similar combination for pass of fuel on the energy. As a primer energy, there is a candidate of so-called renewables, biomass solar wind and in the sense of non-CO₂ emitter we can say nuclear power. If we make use of those energy for secondary energy, candidate is such ethanol, hydrogen and electricity (See #17). Let's think about some combinations. This chart is changing of primer energy of power sector on electricity. In Japan after oil shock, a combination of energy, primer energy is rapidly changed, and more nuclear and natural gas and renewable energies. If we compare with US case, in the United States using much of coal and emitted a big value of CO₂.

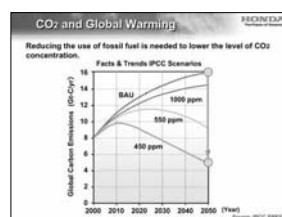
It is an example of a case study for using electricity and hydrogen (See #18). This chart is a comparison with using a carbon neutron energies in Japan. Russia is 42%. Right side is the fossil energy, 58%. We can calculate for total or average of CO₂ emissions. And the result is – it is Japanese case, FCD marked 36%, EB 29%, IC Engine, 15%. Of course according with changing of our



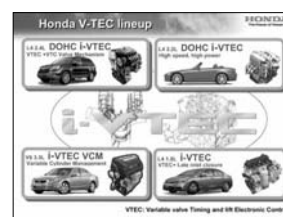
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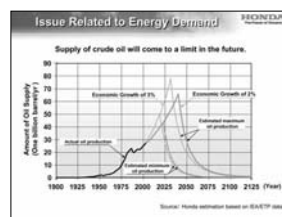
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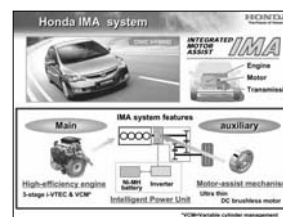
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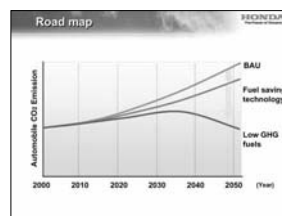
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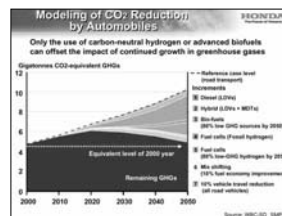
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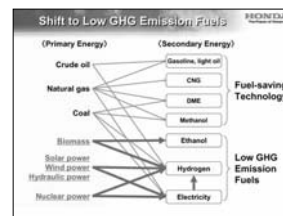
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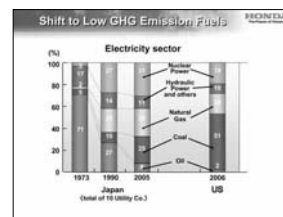
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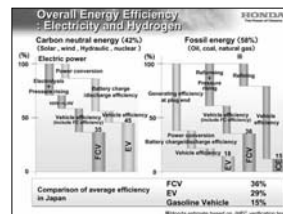
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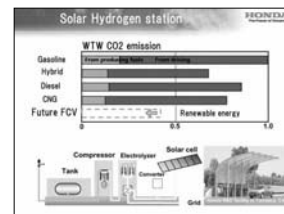
primer energies, fuel efficiency is changing. Renewable energy will assist for electric vehicle or electric powers.

Finally I want to talk about direction of such fuel especially on fuel cell (See #19). Honda marked for future target or such energy and technology as fuel cell vehicle and the fuel cell technologies. We announced last year delivery of real fuel cell vehicles called FCX Clarity (See #20). It is however, limited production in Japan and United States. But they are certified and limited productions to public. The unique point of this vehicle is installed fuel cell vehicle on the center section and the floor outside of our bodies (See #21). And hydrogen tank is installed to the rear side and using lithium ion batteries. It is a first case for Honda. And important point for – their usage on their market is safety in the event of a crash, made a dedicated design to these vehicles. And fuel cell is marking a high efficiency and if we compare our existent vehicle, three times of IC engine and double of hybrid vehicles and by such a high efficiencies range performance is reaching 440 kilometer on real conditions. It is certification data. There are so many opinions about EB or FCB. We are using both battery and FCB. If we compare with a performance, it is a chart of a power density, kilowatt per kilogram versus energy densities.

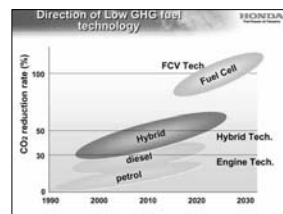
There are so many type of lithium ion battery but for application of electric vehicles, fuel cell is about three or four times of performance on energies. So and lithium ion is useful to use high power usage like accelerations. So we thought using both characteristic or good point for lithium ion and fuel cell vehicles. By evolution of those technologies, we can change for combination of those energies. And also we are looking and doing fundamental research using renewable energy to vehicles. It is a case of Los Angeles Research Centers using solar cell and electrolyzer makes hydrogen and vehicles. Also this is a combination of so-called coordination power and to home energy and vehicles.



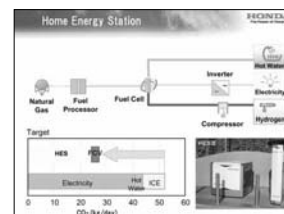
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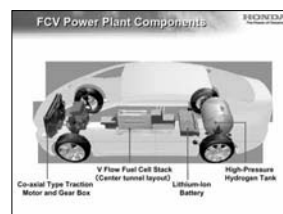
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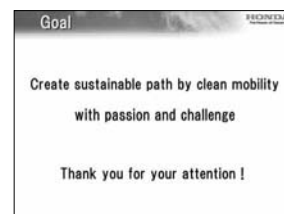
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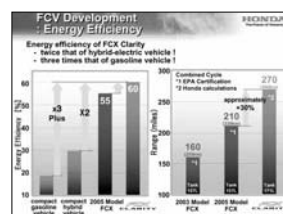
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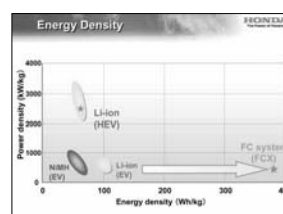
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Going over this concept in the US case total energy in home is almost a four times of a Japanese case and people using two vehicles per families. So much more effect is expected I think or I believe. So, we Honda has a policy just doing like racing heritage. Challenge to dream is our concept. So, our goal is create sustainable plus by clean mobility with passion and challenge.



Question from Hirohisa Uchida (Session Chair)

Have you ever made one calculation actually FCV or Fuel Cell Technology itself is very, very expensive still, of course. But if you consider environmental impact of fossil oil and fuels, we have to just take care against our damage by fuel fossil and means and materials oil and so. If you compare, so we have to pay cost for damage by oil and the fossil fuels and the cost of fuel cell systems. Have you ever made some calculation or comparison for that?



Yuji Kawaguchi

We do not have a clear assimilation in that case of our introduction. But we are discussing about some of our study of how much money is required to introduction of fuel cell vehicles, especially for infrastructures, investment and also calculation of impact of fossil fuel. But there is no clear result. Only conclusion is we have to make real vehicles and an energy sector person told us if you make good vehicles for public, we can follow. So, our assignment is to make a good vehicle for public persons.

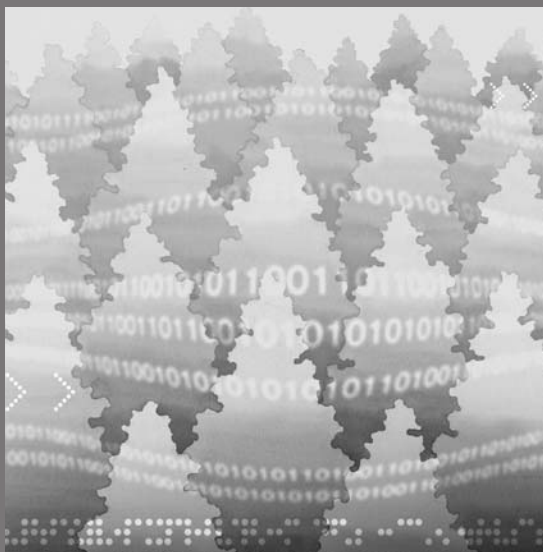


Comment from Hirohisa Uchida (Session Chair)

I made this question therefore because I was involved in the R&D of hydrogen technology in 1975 or 1976. Daimler Benz at the time made very clear argument. They are selling so many cars in the world and in future they will be claimed. So your car gives big damage around the world. You have to pay or any way all motor companies should pay. So they calculated this amount of money and they decided, they invest money to R&D of hydrogen energy. I heard that around 30 or 40 years ago, yeah since that this question is unsolved therefore I asked you.

Wrap-up Session

What as Citizen of the Earth We Could Do
together with the Spirit of Ecotechnology



Session Chair

Atsushi Sunami

Associate Professor and Director of
Science & Technology Policy Program,
National Graduate Institute for Policy
Studies (GRIPS), Japan

HONDA/NSTDA

International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Patarapong Intarakumnerd

Project Leader,
National Science and Technology Development Agency (NSTDA),
Thailand

I just want to kick off this session by trying to put the ecotechnology into the wider context; that is the context of sustainable development. In this session, we are asking what as a citizen of the earth we could do together with the spirit of ecotechnology. I think it is quite important to look at the ecotechnology in a wider context. So ecotechnology should be perceived as a mean to achieve sustainable development (See #2). And I think one of the main reason that why ecotechnology is now very popular because of the proliferation of sustainable development concept.

What is the core meaning of sustainable development? (See #3) One is that the environment must be protected to preserve essential ecosystem functions and provide the wellbeing for the future generation. This is quite an obvious reason. And another one is that not only environment must be protected, but we have to concern about the issue of equity as well. That is the goal is to – is the improvement in overall quality of life; it is not just income growth that poverty should be ended and resources more equitably distributed. And another important issue, when we talk about sustainable development, is that we need participation that is all the section of the society should be involved in the decision-making. And environment, economic and social policy must be integrated. So this is the whole issue that we should consider as a background of ecotechnology.

And when we talk about sustainable developments, at least we have two models (See #4). One we call is an overlapping system model that is the economy, society and ecology they are – all of them – all of the three pillars they are overlapping, but someone says that economy is more important. So you can see it has a bigger size I mean, in the left-hand side model. But many people believe that economy actually is the smallest part. It is located in the wider societal context. And society actually is one integral part of ecology. So ecology is the one that we should look at the widest. I mean the widest framework that we should look

What as a Citizen of the Earth We Could Do Together with the Spirit of Ecotechnology

Patarapong Intarakumnerd, Ph.D.
NSTDA

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Ecotechnology should be
perceived as a means to
achieve sustainable
development

- The proliferation of sustainable development concept led to the development of ecotechnology

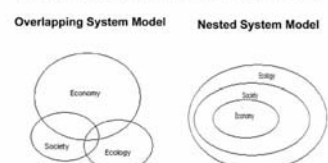
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Core meanings of SD

- The **environment must be protected**, to preserve essential ecosystem functions and provide for the well-being of future generations
- **Equity**: that the goal is improvement in overall quality of life, not just income growth. That poverty must be ended, and resources more equitably distributed
- **Participation**: that all sections of society should be involved in decision making
- That environmental, economic and social **policy** must be **integrated**

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Two models of sustainable development



Source: (Australian State of the Environment Advisory Council) (1996: C3/10 p12)

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at. So this is a sort of the argument on the sustainable development. Because many people when they talk about sustainable development they still think that economy is the most important. When there is ecotechnology, they put all the emphasis on the things that can promote the economic benefit. But many people think that we have to look at ecology as the most important thing. And economy is only the subset of ecology. This is one of the debates because people can say the same thing, but mean different things.

And what we should do together is to push for the development of ecotechnology that lead to innovations that benefit people at large (See #5). When they talk about innovation, I mean something new and that new thing has the economic and/or social benefits. So participation from all key stakeholders is necessary to make sure that this kind of innovation generated by ecotechnology can benefit people at large.

I can use one of the examples, innovation example that comes up with the ecotechnology base (See #6). This kind of innovation is a result of interaction, compromise between all the actors. I mean, people have different agenda when it comes to the end the innovative solution is what we call negotiation. Innovative solution is passed through the negotiation process whether it is formal or informal. For example, NGO when it comes to the wind energy what the NGOs people want is a very small scale community control local use, but what the mainstream corporate people want is different thing. They want to pay more attention to concentrated output, centralized control. So eventually, negotiated innovative solution can end up, for example, in the form of wind farms, moving offshore, renewed community interest. So, we have to integrate I mean these two agenda. These two have to be negotiated somehow.

Or even in organic food, the NGO what they want is a mix farms. They want no artificial inputs at all. They want people to be totally self-reliant, and they focus on the things that really bring up the local livelihoods. They want to have what they call whole food nutrition and no process at all, but this is different from the mainstream corporate agenda. The corporate agenda, they focus more on the price. Price is one of the important issues for them. They focus more on mass production, this organic food, should be able to be sold all year round and they should be somehow graded and package well as well.

So eventually, we end up with more compromise solution like

What we should do together is push for development of ecotechnology that lead to innovations that benefit people at large

- Participation from all key stake holders is needed

5

Ecotechnology-based Innovations: Results of interactions& Compromise		
NGOs Agenda	Mainstream Corporate Agenda	Negotiated Innovative Solutions
<i>Wind energy</i>		
Small-scale, community control, local use	Concentrated output (MW), centralized control	wind farms, moving offshore, & renewed community interest
<i>Organic food</i>		
Mixed farms, no artificial inputs, self-reliant, local livelihoods, whole-food nutrition, seasonality	Price, graded and packaged, mass production, all year, one product / customer amongst many	supermarkets import organics as non-GMO, healthy ranges, box schemes farmers markets, slow food.
<i>Eco-housing</i>		
Natural materials, low energy, site specific, self-build, radical designs, bespoke customers.	Standard, volume designs, cost, buildability, conservative customers, regulation driven.	better insulated, low energy, water recycling eco-houses.

6



we have supermarkets so we import organic as non-GM. We have a healthy range of food. We have box schemes and we have what we call slow food that is in contrast with fast food, so this pass through the negotiation process.

And also in eco-housing, NGO want to have natural materials, low energy and something that is size specific, self built. I mean, people in the village can build the whole eco-housing. They want to have a radical change in designs, for example. But the mainstream corporate agenda, they want to have standard and have the volume designs that – you want something that is cost effective. You want something that is easier to build. But eventually, what we end up is we end up at the negotiated innovative solution as we have a better insulated house that use very low energy and water recycling eco-house. So eventually, innovation from ecotechnology happens because of the participation from all sectors. It come as an innovative solution through compromisation, through interaction negotiation and that should be the way to go. Because NGO agenda or even corporate agenda, they look at only one side of the coin and only look at one perspective. But maybe no one is right and wrong here. But what we need to do is to have good participation, we have to have what sociologists call, we have to have enough public space for interaction. And we should not only listen to corporate agenda or NGO's agenda or even scientist agenda because those agenda represents only a piecemeal. It does not represent the whole situation. And what we as a citizen should do here is to make sure that all the agendas can be discussed openly with high respect of each other and then we can achieve negotiated innovative solutions together.



Session Chair:

Atsushi Sunami

GRIPS

I think it is very interesting to hear that my colleague in economics will talk about the importance of ecology more than economics and putting in the Nested Model context. And we can come back to that model later. And you have also mentioned the importance of participation by all the sectors that are involved in this section, in this concept of ecotechnology.

Now, I think it is appropriate to invite Mr. Bhattarai, who is from the general headquarter of Asian Productivity Organization to come and give his remarks. In fact, for last two days, we heard a lot from the distinguished scientists and engineers and some government official – government – board of government also on the importance of bringing this ecotechnology to Asia. But I think Asian Productivity Organization is a unique organization. I guess it is the only regional international organization. It is active in this Asian region and also you have been extensively working closely with the industrial sector of these 20 Asian countries?



M. D. Bhattarai

Director, Research & Planning Department,
Asian Productivity Organization (APO)

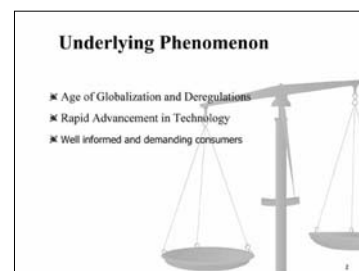
These two days actually has been a very learning experience for us. In fact, we have been learning and a lot of information we have already picked up which could be very helpful for us to go ahead. So, we are very much thankful to all the distinguished speakers, particularly Dr. Kurokawa and Professor Uchida for setting the tones. Thank you very much once again.

Before going to the activities of my organization, let me touch upon a few of the underlying phenomena that are shaping our activities in the region (See #2). Actually, I have picked up three very important aspects from our side. We all discussed about the globalization and deregulation. In fact, we are in the era of the WTO, World Trade Organization. And at the same time, there are other bilateral and multilateral free trade agreements are happening. We are talking about the AFTA ASEAN Free Trade Agreements. We are talking about SAFTA, South Asian Free Trade Agreement and there are lots of other free trade agreements. All these things are making the market very, very competitive. Even for a small organization, like a papa-mama organization, they have to face the competition with the multinational organization. They have to face the competition with Wal-Mart, Cisco or you name it. Even the small organization, papa-mama organization has to face the 7/11 chain. So market is becoming very, very, very competitive. In order to survive and the governments all over the world now because all these agreements are facing very difficulty to protect directly or indirect barriers to protect this very small even the small scale industries. So in order to survive in this market, the company has to be competitive and in order to be competitive they have to be productive and in order to be productive, they have to be innovative. So innovation is becoming a keyword for the survival.

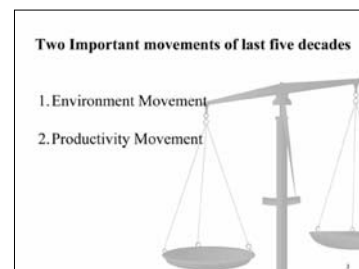
The second important thing is of course, rapid advancement of technology. We have been discussing how internet is affecting the whole world. We are talking about nanotechnology, biotechnology and these things are coming and the company has to catch up with all these technologies in order to survive in the



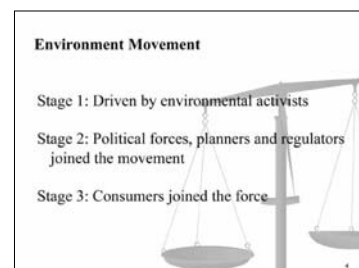
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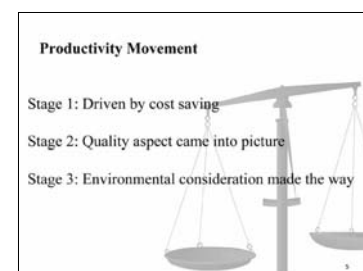
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market. And so we are looking into this technology from that perspective.

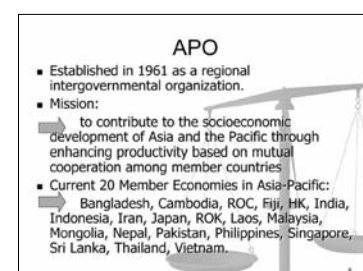
And finally, consumers. Consumers are becoming very well informed, very sophisticated and particularly very demanding. You know before going to a medical doctor, a patient already nowadays check the website and find out what could be the diagnosis. Lot of pressure to the doctor because sometimes some patients know much advance knowledge than even the medical doctor, so consumers are becoming very competitive. Before buying a car, everyone goes to all the competitors and they can get the prices and everything, all the technology. So how to please these customers is another problem for companies and then gone are the day – those days when you supply now consumer are demanding very difficult process. So these three processes are affecting not only the productivity, but actually even the researcher in science and technology to come up with the solution.

Let me touch upon the two very important movements of the last five decades (See #3). One is the environment movements and second of course productivity movement (See #4). For the simplicity, I have broken down the environment into three stages. First stage 60s-70s was driven by the environmental activities. Dr. Kurokawa mentioned yesterday about Sirent Spring, limit to growth and we have seen Greenpeace – emergence of the Greenpeace so many factors coming in. And then we moved to the second stage when political parties, regulators everything started to come in. Routeline Commission, our common future actually part of the second stage and we have seen the RIO Summit. And now we are in the third stage when consumers are coming in. Consumers are alarmed by all these environmental disaster starting from the very early stage of Minamata, itai itai or Bhopal MIC, methyl isocyanate, and now we are talking about the global warming. And the consumers are saying, 'Hey, now you have to give us eco-products and services.' And look to another movement is productivity movement, same time 60-70. At that time, we were focusing on the cost, cost cutting down of the productivity equation was very much important at that time and then we moved to the second stage when quality comes into the picture. So, we are trying to offer the quality. And now, we are talking about the environmental consideration. So basically, these two movements are converging to the environment – quality of the environment because this quality of the environment everybody – all the consumers are realizing it will save the quality of life.

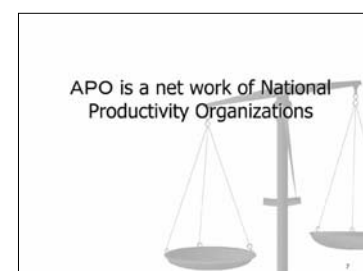
So basically, I think these convergence actually are forcing everyone scientist, technologists, policymakers, planner, everyone



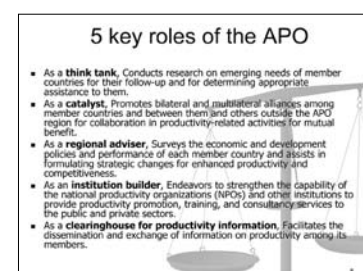
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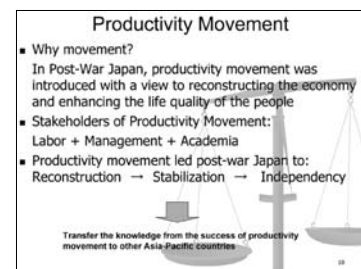
through the consumers that we have to come with the ecotechnology that could help the innovation and bring out the green entrepreneurship. So the theme of the symposium is basically, is basically the demand of the day.

Let me go to our organization. It is a unique organization (See #6). We have established back in 1961. It is a regional intergovernmental organization. The main mission of the organization is to contribute to the socio-economic of the member country based on the mutual – the most important part is based on the mutual cooperation among the member countries. We have 20 countries in the Asia and Pacific. Actually, this organization is a network of National Productivity Organization. One of the prerequisite to be the member of the APO is to – a government has to setup a National Productivity Organization in each of this country. That organization is going to spearhead the movement – productivity movement in each of the respective countries.

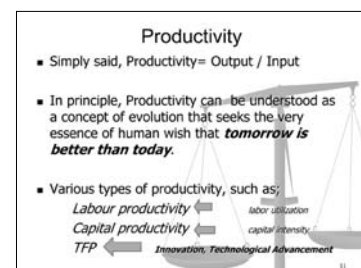
In the case of Thailand, we have FTPI. Dr. Phanit is heading that National Productivity Organization, and he is spearheading the movement. So he will let you know about the activities in the Thailand through the NPOs' perspective. And my colleague, Ms. Asano will talk more about the networking of this NPO, National Productivity Organization.

We have the five key roles of what we do (See #8). We act as a think tank. We act as catalyst to enhance the productivity movement in member countries. We do as a regional advisor and then institutional building – capacity building of the National Productivity Organization as well as the other stakeholders, and of course the information – clearinghouse of the information. There are number of activities that we do and some of the activity that is related to the environment I will touch upon a bit late. But we do lot of researches, study meeting forums, conferences, observation seminar that sort of things. Basically, we do not provide any fund as such, but what we do we bring people together, either physically or virtually because now the world so we are also doing virtual. So our job is to bring people together and let it go the discussion, or solution.

So basically, actually if you go back to 1950s when Japan – after post war Japan had started to reconstruct the company economy and enhance the quality of life, the leaders of that period actually they thought that their efforts to come to the development in quality of life should be shared with other member country. Actually, that was the basis – that was the reason for the



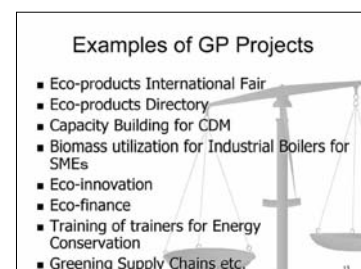
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establishment of the APO. And then in 1959–61 an APO was established.

Basically, productivity as you know output by input (See #10 to 11). We can look into it from the different aspect. It says, 'Tomorrow is better than today.' Like Honda Foundation, Honda is saying dreams challenges of the future dreams, so we are saying that tomorrow is better than today. So it brings us together, in fact from that perspective.

As I mentioned that when we realized that environment movement and productivity movement are converging, then we have come up with the concept of the green productivity (See #12). In fact, productivity itself is a green concept. But through the concept of green productivity, we are trying to highlight the green aspect of the productivity. Green productivity or we call GP is a strategy to integrate productivity and environmental concern together. We have been doing a lot of activities related to the green productivity. For example, like yesterday Dr. Sombat, the Thai Federation – Federation of Thai Industry mentioned about the Eco-Product International Fair (See #13). Since 2004, we have been organizing on annual basis EPIF, Eco-Product International Fair. In 2005, we have organized here in Thailand with the collaboration of Thai –our National Productivity Organization FTPI and then FTI. Honda is all the time cooperating very much giving us support in organizing this FTPI. In fact, when we organized this Eco-Product International Fair in Thailand one of the attractions was Honda robot, ASIMO. In fact, through this Eco-Product International Fair, we bring the achievement of the ecotechnology, Eco-Products to the consumers so that consumer would know that what is happening so that they know their choices because that is what they are demanding.

And during – in last – actually this month, we have organized EPIF in Vietnam which was attended by close to hundred thousand people. Lot of children also came. I mean, the schools have brought even the children to the Eco-Product International Fair.

Another important aspect we are doing the Eco-Products Directory (See #14). Ecotechnology is producing production services and then we are combining them into Eco-Products Directory. Last year, when Former Vice President Al Gore of USA visited Japan, this book was presented to him also. In fact, Sweden was very much impressed by the Eco-Products Directory. So last December, they sent one mission to the APO to explore the possibility of coming of the APO-EU Eco-Products Directory. We are working on it. You can go to our website and

Dominance of Service Sector and the need for a proper use of Innovation and Technology

As an economy further matures, it undergoes a process of deindustrialization and service industries become the dominant sector accounting for 70 per cent or more of the economy.

↓

To Grow service sector productivity, technological innovation is indispensable as well.

15

Interconnectedness of economies, productivity and human happiness

- Economies are **interrelated** through supply chains, trade, capital flows, and migration in the era of **globalization**.
- Diffusion of embodied **technology, knowledge, and skills** occur across countries with the flow of goods and services and factor inputs

↓

Facilitating economic growth and productivity

↓

HOW TO TRANSFER the benefits of these to real actors in Asia?

16

TFP

- labor productivity is only a one-factor productivity measure and does not provide a full perspective of production efficiency.
- In populous Asian economies, which are relatively abundant in low-skilled labor, production lines may be deliberately organized in such a way that could utilize this abundant, and hence relatively cheap, resource. It follows that the chosen production method is most likely to be (low-skilled) labor intensive with little capital, manifested in low labor productivity.
- In today's world where production lines are increasingly globalized, we observed that production lines and supply chains are being redesigned and reorganized to enable offshoring of low-skilled parts to the emerging economies and further specialization in the more mature economies at the high-skilled end. This is why economists analyze total factor productivity (TFP), which is GDP per unit of combined inputs, to get a more complete picture of countries' production performances.

17

Asia is a diverse regional economy

- Different countries in the region have embarked on their own journey of economic development at different times and at different pace.
- The challenges that lie ahead for the fast growing economies in Asia are how best to manage their resources to sustain growth, and how best to share out the benefits of economic growth and technological advancement more broadly, without derailing their economic development effort.

18

Productivity Challenges in Asia (example)

Our productivity data research suggests that:

Service sector labor productivity growth in Asia has been largely driven by potential IT-using industries.

e.g., Particularly prominent in India, service sector accounting just under 80 per cent of labor productivity growth for the whole economy in the recent decade. Its service sector labor productivity was growing at 5.6 per cent on average per annum in 2000–2005, of which 86 per cent was accounted for by potential IT-using industries.

↓

KEY is to how to maximize the impact of technology and science in the growing sector, as well as how to outreach their impact to real actors of economic activities, including those SMEs in Asian economy

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you can see the Eco-Products Directory. This is our first step towards helping the ecotechnology or Eco-Products and services to the public.

And we are also working on the different aspects, like CDM. We have been organizing capacity building of CDM. Because in order to realize the development mechanism or what other market mechanism, we found that you have to build the capacity of the country also. You have to have the CDM consultants, CDM auditor and so on and so forth. So, we are organizing a lot of programs in relation with the CDM, energy efficiency and that sort of things.

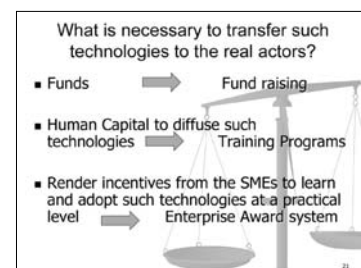
This morning we talk about the biomass utilization. In fact, with the help of the ASEAN Foundation, we have last year we conducted a series of programs in the Mecon River, Vietnam, Myanmar, Thailand, Lao, Cambodia. The utilization of biomass in the industrial boiler for SME, so ecotechnology– once ecotechnology is there, we would like to build the capacity of the SMEs and other so that they can utilize it effectively. And what we did, we trained the people; we trained these SMEs. Since most of the SMEs are not converse with the English, so we translated into their each language and put in the website, so anybody can go and see there. So, we have a manual – training manual of the industrial utilization in Cambodian language, in Lao language, in Vietnamese language in our website.

We are coming also like eco-innovation. This is new concept actually. So last year, we organized a program on eco-innovation in Sweden and actually my colleague Ms. Asano handled the project in Sweden. And this year we are going to organize a program in eco-finance because market is demanding – market has to face the demand of the eco-friendly good and services. But how these marketable instruments are now shaping? The banks are coming with the new scheme, new way of evaluating the funding and loan. So, we are organizing a program on the eco-finance. Of course, as I said, our main job is to build the capacity human capital, so we always see the training of trainers for energy conservation. We are also looking to greening the supply chain etcetera. So lot of activities – but most of the times we try to see that we develop the capacity to absorb the ecotechnology and produce the eco-friendly goods and services for the quality of life.

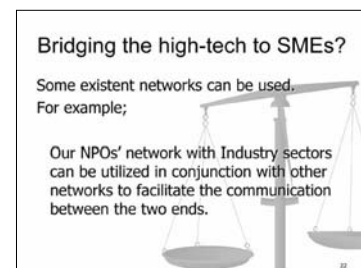
As I mentioned earlier, we do a lot of researches as well. Last year we conducted actually our research and productivity data. We try to find out what the status are of the productivity – level of



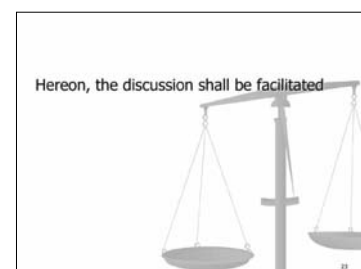
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the productivity in our member country and we have come up with the report this month. My colleague Ms. Asano again is in-charge of that study.

One of the finding of the study is basically that now Asia-Pacific is moving from agriculture sector to the service sector. So although in many of the countries manufacturing is contributing up to the 40% of GDP. But now it is moving towards the service sector. But service sector is very complex – very, very, very difficult sector in terms of the productivity enhancement. Compared to the agriculture and manufacturing, enhancing productivity in the service sector is very difficult (See #15). Reason is the consumer, because consumer has become the part of the process. So level of the consumers in terms of quality, in terms of understanding of the technology, in terms of getting the service, in terms of even, like Professor Uchida was mentioning about, the mood of the consumer while we are using the robot. Each individual is unique, so service sector has to be customized. So, we are moving from the era of the mass production to the mass customization. And then, here we see that the innovation – eco-innovation will have to play a greater role to satisfy the need of each individual customer in terms of the service sector.

So actually, when you transfer the technology or capital or trade technology embedded technology knowledge and skill also across then that will facilitate the economic growth and productivity (See #21). And how to transfer the benefit of these achievement of the science and technology to the real actor is, in fact is a very daunting task but it is a task that we have to address. There are so many – during our 45 — almost close to 50 years of experience, there are lot of challenges ahead. One of the challenge that Asia itself is a very diverse economy, we have country like Japan and Korea which are almost like the OEC, I mean they are developed country, but at the same time we are having Lao, Nepal, Bangladesh which are in the lower end. So how to service them is a big challenge to us. How to give the right technology or right management techniques to the SMEs of these countries is a big challenge to us.

I would just like to mention that this R&D activity how to disjuncture between the R&D activities and the real user this is the question of the day. So one of the most important things is that we have to try to see the SMEs so that they can pass all these achievement of the R&D, so that we can produce the environmental-friendly goods and services to the consumer through these very important vehicles.

Finally, as I mentioned, APO is a network of National Productivity Organization, so we work together. We assess the outcome of the R&D, assess the outcome of the innovative – innovation strategy and then try to pass to the consumer or to SME through this network of the National Productivity Organization.



Yasuko Asano

Program Officer, Research & Planning Department,
Asian Productivity Organization (APO)

I would like to review what we need to do here to effectively implement ecotechnology in our region and what as an APO perhaps can contribute to that effort.

First I would like to revisit some of the keys in implementing the concept of ecotechnology (See #2). Technological innovation should be connected to the real human life and the needs on the ground. And innovation as not to be taught by somebody, it is for entrepreneurs to search what is needed and what can create new social value as per the customers' or societies' demand. And we need also, in order to do it, we need innovative leaders who can find and create new social value that is compatible with the context of the actual time and the situation and for common good. So that is what we have discussed yesterday that we have kindly –kind of agreed.

In the middle of the globalization, Asia is a diverse, regional economy which entails diversity in which countries are at different development stages and development paces (See #3). As Mr. Bhattarai has briefly touched upon in his presentation, the general trend of Asian economy nowadays suggest we are mobilizing out of agriculture-based economy towards manufacturing and ultimately to the service businesses. And the service sector nowadays account for an ever larger percentage of economic growth in our region.

So the challenge lies ahead for the fast growing Asia (See #4). What do we have to do? The challenge is how to best manage the resources to ensure growth and sustainable development and how to best share the benefits of the economic growth more equally and more broadly. And then we have talked about sustainable growth and then development by implementing ecotechnology is now a key for us in our region. And who is the main actor in this implementation of ecotechnology?

Well, everybody is participating in this endeavor, but I would

What we need to do and what APO can contribute to the effort of effective implementation of ecotechnology:

1

Revisiting the keys in implementing the concept of ecotechnology

- Technological innovation should be connected to real human life and needs
- Innovation is not to be taught, but it is for entrepreneurs to search what is needed and what can create new social value as per customers' or society's demand (→ demand-driven innovation)
- We need innovative leaders; those who can find and create new social values, compatible with the context of the actual time and situation
- For common good

2

Asian Economies amid Globalization

- Asia is a diverse regional economy which entails diversity and in which countries are at different development stages and paces.
- General trend - Mobilizing out of agriculture to manufacturing and ultimately to services businesses
- Service sector account for an ever larger % of economic growth in the region

3

The challenges lie ahead for the fast growing Asia

- How to best manage the resources to ensure growth and sustainable development, and how to best share the benefits of economic growth more equally and broadly:

↓
Sustainable growth and development by implementing ecotechnology

↓
Who is main actor in implementation?

→ Real business actors including SMEs

4

say the strong actors are real business actors including SMEs in our region.

So taking consideration of this trend, we APO, we have been trying to support economic growth in Asia through productivity enhancement by promoting production efficiency through capacity building in production management and so forth (See #5). But now we have realized that the paradigm of economic development in the era of globalization has changed as we have discussed since yesterday. The global issues, such as three F, water problem, climate change etcetera these things must be taken into consideration in the new paradigm of sustainable development, not only aiming at economic growth solely.

What I would like to kind of suggest is that what APO can contribute to this endeavor in our region (See #6). As we said, we have 20 member countries in Asia-Pacific region and in each member countries we have national productivity organizations we call it NPO and then those NPOs in each country have extensive local business networks. So in that way APO is a unique, non-political, regional, intergovernmental organization. So perhaps, APO can mobilize the business and the academic communities and the policy makers as well from diverse Asian economies under one common roof and we can serve as a catalyst to initiate ecotechnology movements in Asia in line with our green productivity movements. This is a suggestion.

And lastly, I would like to briefly mention about the importance of evidence-based planning and implementation (See #7). Policymakers, they need evidence to plan their policies to support the ecotechnology. And business actors, they also need to identify the socio-economic needs based on the evidence. Data is a key source of making decision.

As Mr. Bhattarai briefly mentioned, APO has been trying to produce productivity data book annually. And one of my projects actually started last year, we produced APO productivity data book. This is the new edition. This is 2008 version. This will be annual issue. There will be continuous annual issuance of this data book, and we are hoping that this data book will be improving so that it can provide some sort of evidence-based planning source for the policymakers and the business leaders in our region to promote ecotechnology implementation in our region. And plus, we have not yet embarked on it, but we need to think about conducting more research to major innovation. This is a great challenge, but we are working on it.

Taking into consideration of the change of paradigm

- APO aims to support economic growth in Asia through productivity enhancement by promoting production efficiency through capacity building in production management.
- But, we have realized that the paradigm of economic development in the era of globalization has changed.
- Global issues such as 3 F, water, climate change etc must be taken into consideration in a new paradigm of sustainable development, besides aiming at economic growth.

5

What APO can contribute?

- 20 member economies
- Each member country has National Productivity Organization (NPO)
- NPO s have extensive local business networks
- APO is a unique non-political regional organization

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APO can mobilize the business and academics communities and policy makers from diverse Asian economies under one common roof and;
Serve as a catalyst to initiate ecotechnology movement in Asia in line with green productivity

6

Evidence-based planning and implementation

- Evidence-based policy making
- Identification of socio-economic needs based on Evidence



Data is key source for making decisions:
- APO Productivity Databook (2008)
- Further endeavor to conduct research to measure innovation

7



So this is kind of my contribution to the session that I would – I wanted to brief what we do on to what APO can contribute in the endeavor of implementing ecotechnology in our region. And now if I may, I would like to hand over the floor to Dr. Phanit. He is Executive Director of FTPI, one of our NPO in Thailand. He can talk about what FTPI is doing in terms of implementing innovation and technology project in Thailand.



Phanit Laosirirat

Executive Director,
Thailand Productivity Institute (FTPI)

As we call it NPO, National Productivity Institute, which is a network of more than 20 countries, exactly 20 countries in the Asian regions. Actually, Thailand has been a part of the APO about 48. More than 40 years ago. And we are local partner of APO here in Thailand. We have been implementing green productivity here in Thailand, I think, more than 6-7 years ago. And right now, this project is still going on and mostly in the manufacturing sector. And as the – we call the local partner here in – of APO here in Thailand, we also have done several study on the policy implementation about innovation and technology capabilities.

This is actually the most recent survey that we have done. We surveyed more than – close to 2000 firms, and this study is very statistical or significant. According to the IMD or World Economic Forum that innovation index here in four local firms here in Thailand ranked pretty low and we try to find the reason why that is the case here in Thailand. This is what we came out. We have done this study. We have just finished it six months ago. This is one of the question that we asked Thai firms that what competency that they need to keep up with the emerging technology in the future. This is what they ranked and what they have been telling us here. They say that they want special technical and professional skill. And what they put here, I can also tell you that this is the areas that they are – we have problem in this area IT skills, creativity or innovation skill and then English language proficiencies. And we did a further study and asked them deeply into the questions; what is the most important reason that you are not engaged? You are not engaging in more innovation activities. 30% – 3.4 – most of them said that high cost of financing innovation activities. And also what they – even almost equal number is that lack of knowledgeable and trained personnel who can contribute to the innovation activities.

This is what we have concluded. 70% never worked with and this is what we found out is that 70% of them have never worked with any research and technology support institution in the past three years. And most important reason now why this is such the case, they say that because university or research institute – they say that those kind of services are not relevant to their firm's need and they do not know anyone



there to make a first point of contact. And this is very easy to correct. Haven't heard of them and lack of technology – technical capability in-house to interact with the institutions.

And we did a further study. We tried to find a technological capability index of Thai's firms. We measured technology capability index into three areas which are investment capability in technology, production capability in the technology and also the linkages within the economy. For the investment, what we asked them is that are you planning to invest substantial investment in order to increase capability, improve productivity or quality. And we also asked them that what percentage of your next investment will be in IT related or in technology related, training workforce to implement technology transfer from parent establishment. For example, if I am OEM, so do I prepare my workforce to accept the technology from the parent company. And so run a formal in-house training program for employees to accept new technology. And we also asked them for the production side of the technological index is that do you want to – do you plan to upgrade your machines or equipments in the near future or you want to also upgrade your production line in the near future and also, has your firm received any ISO or any ISO standards recently.

We group this into production capability. This is the most important that comes out every time when we do the survey. This is the survey that asked the linkages within the economy that if they do not invest in, either their employee training or their production, so if the company finds any help the increase technology – their technology capability. So, we asked them that, are you a supplier to the multinational corporation or not? Or you use email in interactions with the clients or suppliers and also technology innovation develop in cooperation with other firm or not or technology innovation that you are developing is in cooperation with university or any research outside your firm. So, we conduct all these survey, and this is what we came out.

And the horizontal line is what we call the technology capability index and on the vertical line that is density that indicates how many firm that – that is the density of firm that has that particular or any particular technology capability index. This diagram is telling us that for SME you see that the top of the graph here that means that most SME has less technological capability index than the large firm. Naturally, this is the case. And this is technology capability index in regions in Thailand here. Now, we can say that in the southern part firms those are in the southern part of Thailand have less capability index than those firms that are operating in the east and the central areas of Thailand. And this is technology capability index in terms of the type of industry. We can see that those who have high technology capability index are those in the area of electronics, auto parts, machinery equipment. But also, we can see that this is what we call the niche area. But in terms of value-add production to Thai economy, these are the sector – this is on the left-hand side furniture, rubber, textile,

clothing these companies are companies that employed most people in Thailand, but have less technology capability index. And this is what we found out.

And furthermore, by looking at the production technology capability index, those questions that involve asking the companies that are you going to invest in your new production line, new machineries, or do you – are you going to implement ISO 9000 or 14000 and these are index. We can see that for the index that the technology – technology capability index in productions and we can also see the case that the majority of Thai industry that is local owned are less production technology capability index. And in terms of linkage, technology capability index that measure how Thai firms interact with outside research firm. And we can see that this index – it does not matter that in any sector we have less interaction with outside helps in terms of improving the technology capability index.

So this is what is going on here. This workshop and also the area that we are working with APO is trying to address these kind of shortfalls here what is going on here in Thailand. And I would like to conclude that, promotion of ecotechnology or any technology in Thailand here even though it is science and technology driven, I think like my previous presenter that it is alright that it is science and technology driven but it must be focusing on consumer as it is demand driven rather than technology driven alone. Environmental friendly must be a part of the quality and productivity improvement. Because right now, I think, the environmental friendly a concept here is not part of the firm practice or the product that they sold or they produce does not make any difference even though that they are environmental friendly, but producing these environmental-friendly product or services requires lots of investment. So naturally, it is going to be sold at more expensive price. So – but if we make these kind of quality and productivity improvement in the long run, the firm and consumer or people or public will be the beneficial.

Strong cooperation and interaction between government and private sector. For example, public awareness that we have been talking about the public at large must value these products that – those are environmentally friendly. Tax incentives also for those firm because these – for producing these environmental-friendly service and products require lots of investment, so the government has to step in producing this kind of incentives to the manufacturers.



Comment from Atsushi Sunami (Session Chair)

Dr. Phanit has presented us with a very interesting statistics on the activities of Thai firms. But It is quite surprising that there seems to be a tremendous gap between the Thai firms and the kinds of things that we have been talking about past two days on ecotechnology with the cooperation with NSTDA that 70% and more of the Thai firms had no contact or cooperation with the research-based institutes for last two years.



Phanit Laosirirat

Because in most of our subjects for our research, majority of them are SME.



Atsushi Sunami (Session Chair)

Right. I think the majority of the SMEs are quite appropriate for other Asian countries, but they are the time drivers according to our colleagues from APO. And maybe this is important to see the way to bridge the gap between this kind of ecotechnology and actually users of ecotechnology in the Asian regions to really come up with a solution that we have been talking about. And I think this morning, Professor Kurushima was talking about making business sense of climate change is a kind of very important issue. We maybe come back to that at the conclusion of the session. But before that, I would like to turn to my colleague Patarapong that what is going on in Thailand?



Comment from Patarapong Intarakumnerd

I share the same opinion with Dr. Phanit on many things. We have conducted innovation surveys as well. We have done it three times since the year 2000. And it also show that most Thai firms do not interact with university or research institutes because of so many reasons and that he mentioned that many of the government universities or research institutes are not quite well known among firms and it is very difficult to approach them and people from both side have a very different mindsets. I mean, especially university people or researchers they want – they focus more on scientific achievement. But people from the corporate side, they want something ready very soon because they are the one that have to compete in the market. So, this kind of the time horizons problem between the two always exists, but exists more in the case of Thailand. Because in comparison with Korea, we have done the comparative study with Korea, you can see there is a big difference between the level of interaction – university and industry interaction in Thailand is much lower than in Korea. And one of the explanation is that because Koreans company, they have higher technological capability. They have more learning ability. So they can interact better with the university and research institutes because they are readily available and that is one of the things. And maybe another explanation is that the university and research institutes in Korea are much more industrial relevant than the one in

Thailand. For example, KAIST itself is the Korean Institute of Advanced Technology is setup because of the reason to stimulate innovation and technology capabilities or Korean firms. So they have very focus purpose why university or research organization in Thailand, many of them they do not have this kind of focus that they want to promote industrial technology development in the firms as its main goals. So, this kind of difference explains why university industry interaction is different in the two countries.

And I want to – also want to make a comment on SMEs as well. Many people talk about SMEs. The SMEs of course, is a key organization that we have to look at because SMEs are many of them and they are majority of the firms in most country. But SMEs in developing countries Thailand, for example, they have to struggle to survive on daily basis. So they have to concern more about cost reduction. And when you talk about whether SMEs they should adopt ecotechnology that might seem to be very far fetched because it is not something that they have to think about at the moment. They have to think about the survival in the short term before this kind of ecotechnology – implementing ecotechnology. And many of the SMEs in Thailand, you do not have to talk about innovation in term of product or process. Even in term of production capability to produce goods and service efficiently, they still have some problem. So before helping the SMEs to be more innovative, to come up with innovation or to use ecotechnology maybe the first step is to help them to survive on a daily basis, to help them to strengthen basic production capability. And I think the role of the Asian Productivity Organization, the role of the Thai Productivity Organization, they are very much important, because we need to strengthen the capability at the basic level first. As our friend from APO said that the environment has come into the picture in the later stage, but many people – many SMEs in developing countries still struggle at the first stage. So, we have to think very hard how to help them, I mean to surpass this first stage first.

And then another issue that I want to mention is the issue of the service industry. Because people talk a lot about manufacturing and I mean many presentation is focusing on manufacturing. But in service industry it is very, very important because 70% of our economy now is relying on service, 60 something percent. And in other developing country as well the service sector is very, very important. So, we have to focus on how can we increase productivity in service. I mean, in the country – not only developing country a country in Asia like in Japan, when we talk about productivity in service, it is much lower than manufacturing in any survey or any calculation. But how to improve the productivity in service and make the service greener is one of the important issues. And I think many of the measures to increase productivity in service and to make the service greener and greener is different from the measures for promoting the same thing in manufacturing. So, we have to think about different paradigm when it is concerned with the service sector and make sure that as I have said before in my presentation that we have all the sectors engaged in these kinds of activities. So far, we talk a lot about business agenda and also scientist agenda as well, but the agenda of the civic movement should be considered very seriously as well. These days we have a sort of the wall between us, between NGOs, between business sector, between the people at the



grassroots, between scientists we have to break this wall and we have to make sure that people very much come on board and talk about these kind of things together. And that is the way that innovation will be a long-lasting one and will benefit all of us. This is my idea.



Comment from Atsushi Sunami (Session Chair)

I think the board of university is also important even in the case of Thailand. Professor Uchida's speech yesterday reminds me of the story of Soichiro Honda, where he has no higher education. But in fact, he has often visited the local Shizuoka University whenever he has a technological problem, where he can turn into. And clearly, there was a kind of interaction even though for the small SME size. And I think this is again very important issue that we have to keep in mind. Also you mentioned about bringing in not just the business sector and university or scientist agenda, but also civil movement. I think that we will have Mr. Arimoto will come up I guess in the wrap-up session to talk about the more general concept of GIES which really talks about bringing all these stakeholders into one system.

I think we are ready to wrap up. The two days conference. So I would – first, I would like to ask each session chairperson to make a few remarks on wrapping up that particular session for us and also some remarks on entire symposium – reflecting on the entire symposium as well.



Paritud Bhandhubanyong

Specialist, ADO Advisor to President,
NSTDA

Let me summarize what we talked. Yesterday, I had a session on the climate change. I put my view and also I include all of the thing that the climate change we are talking about how can we, as a citizen of this world, do together to help alleviate the problem climate change.

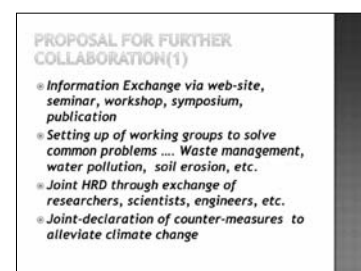
This would be the proposal for further collaboration together we could establish information exchange. We had a website, seminar, workshop, symposium, or publication. We can set up working group to solve the common problem of waste management, water pollution, or soil erosions like that. Then we can join human resource development through the exchange of researchers, scientists and engineers together then joint declaration of the countermeasures to alleviate the climate change problem.

The last slide is the promotion of the green products and green procurement through bilateral, multilateral trade agreement; promotion of sustainable economic development initiated by his Majesty King Bhumibol. Also the joint effort to educate politician, which is very important and policy makers on global warming and long-term policymaking.

Last but not least, action is very important. Action, action, and action with the AFTA spirit or action first talk after.



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Hirohisa Uchida

Vice Chancellor, Tokai University

I have to point out two facts. So all R&D is going by collaboration among academic, industry, and governmental sectors. I think this is very important fact.

The second one is all R&Ds are going also in connection with some business sense and this is very, very important. I have to tell you something – facts for Japan. Over 90% or 95% of energy and resources we Japan are importing from foreign countries. And even in food, over 70% we are importing from foreign nations. What we have? We have only brains, people.

So we import resources, materials, and energy and we are producing value-added products and we are selling and we receive money and then we can buy food. So energy or food, they are our security model. This is very important. So we call this time bicycle-driving system. As long as you are driving bicycle its okay, but if you stop moving your bicycle we fall down. Japan is like this. And this is a very important point for us. And so you can see how instable and fragile structure we have in Japan in supply energy or food.

And for energy – anyway new energy or anything we have to connect these activities with business sense or actual business. This is true. Therefore, for example, Honda is very active in R&D of fuel cell automobile.

I tell you one example in a project of RISTEX, Japan Science and Technology Agency where Mr. Arimoto is working as a director. We have worked so much on realization of sustainable society or sustainable systems and from these activities we have some new words and activity. For example, econavigation system uses ubiquitous IC technology. I think this is very important. If you go to market or supermarket, you will find something where everything is stated where they are coming and when was produced and so on. So, you can see or you can notice everything. Using such ubiquitous technology, we can introduce econavigation system. This is also one example of ecoinnovation. And from that, we are realizing ecolife, ecobusiness, ecofund, or ecofinance and so on. So there are so many different types of ecoactivities are just more in Japan. And Japanese consumers are very, very concerned about such new activities, especially ecoactivities I should say. In this sense I suppose in Japan I have a feeling that the consumers feeling is really just moving to ecosense.



Morakot Tanticharoen

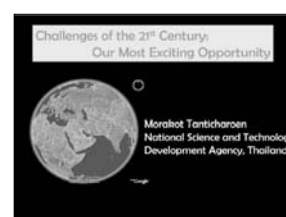
Director, BIOTEC, NSTDA

We start with the title is already wrap up, because the first part of my title “Challenge of the 21st Century” is from Dr. Kurokawa and then I think many speakers talked about the technology and they were so excited you know to make the world safe. So this comes from my title (See #2).

And usually, what are the challenges of 21st century. I think before 21st century, we talk about the competitions for power, for market, and for resources, but now with 21st century this is all the challenges. I do not want to read this because I think it is similar to Dr. Kurokawa. Probably, it is not the same version, but very similar to that.

So, it is the potential to seeking global solution, and is very exciting. But how? (See #3) So we have to change our mindset. This is like Dr. Kurokawa said, change the mindset and its not nation. And Dr. Kurokawa said, it is not international as well, but is globalization and not us but them. And also, you have to make the right choice. But how to make the right choice? You have to have understanding. You have to know the changing trends in environment, economy, technology, and society. Why I said that? I give you an example of the genetic engineering. You know, the technology itself is quite I think is quite powerful, but with the public perception so you cannot transfer technology quite effectively. The politician does not want to make decision. And this is the perception of Thai journalists. See they said this is a GMO, but in Thai, this is politics, Thai politics about GMO. So this is the perception of Thai journalists. And this is from western journalist. So you know we view it as a remarkable feat of genetic engineering when you have GM plants with its leaf as a dollar. So this is pro and cons, you know good and bad things.

So, what is the action? So you see in wrap-up, this is Dr. Kurokawa’s idea – functional structure. So we have to develop new sustainable technology and we have to make sure that they reach outdoors who need them. And what is the success? To get success in this, you have to have like combination of clear objectives, you



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have to have effective technology, have a clear implementation strategy, and also source of funding. So, can you make it. Yes. This is in our hand.

So let me give you an example how NSTDA work for the society because usually you mentioned a lot about work with industry or even small and medium enterprise. I give you a little bit case study about the NSTDA work for society, in particular farmers and local communities (See #8). So as NSTDA has four national centers, so you know that we are dealing with the technology and in order to reach the user, we have the technology management center.

So, what is the ecotechnology? I am not sure this is the ecotechnology or not (See #9). So the husband drives past the gasoline station and he saw out and he said, 'Don't worry. We have a hybrid vehicle.' I do not know this is ecotechnology or not. So we work for NSTDA, we are dealing with technology. We have to make sure that we can catch up with the new technology, the emerging one. Like for biotechnology, we have molecular breeding like genetic engineering or marker-assisted selection. We also work with the bioinformatics. Because yesterday, some one talked about this is IT work or is it biotech? It is a combination of biology and IT.

Once we have this platform technology, we have to make sure that we can use this platform technology to answer the countries need or the need of the user (See #10). As you can see – like we use this platform technology with agriculture, biomass energy, or even like environmental technology. So like something with the rice breeding to do the trim farming. We do not want to destroy the mangrove anymore.

So, this gives you an example the way that we work for the public, like for the farmers (See #11 to 14). Usually this is the aromatic rice, the Jasmine rice. We have a problem with fresh flooding due to the deforestation. For the last two years, we have problem like this. And with this Jasmine rice, if they live you know underwater for just only couple of days, they die. So we developed the Jasmine rice which is submergence tolerance. If you have fresh flooding and its there for like for three weeks, not longer than three weeks, they can stand and then this is the recover. So we do a few trials, and now it is ready to give to the farmer. So the way that we give to the farmer because we are not under Ministry of Agriculture, but we work with them. So we give to the Her Royal Highness Princess during our annual meeting last year. We gave her about three tons and she gave to the farmer in the province that have flooding like two years ago. So she gave to the farmers and we teach them how to grow it. And this year, they cut a lot – they cut



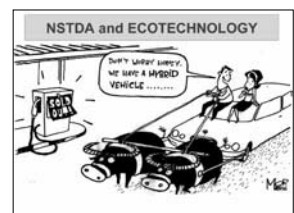
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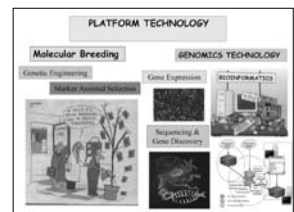
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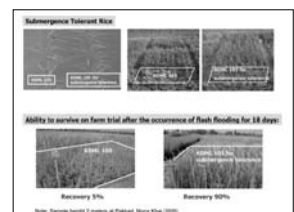
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about seven tons. And the good thing is that, with the seven tons they put – these farmers they put two tons back to what they call the seed bank to distribute to other farmers. So in this way you can distribute to more farmers.

And also, this is like upland rice (See #15). So usually, the one that you saw before – this is like for lowland that you have enough water, but upland rice usually in the north and north east region when the hill tribe people you know live in the high mountains. So you have a problem with the erosion. And then after three years, they usually keep moving. So there is the problem of deforestation. The reason I show you this one because sometime we do not have to use the high technology, just simple technology. So usually we tell them how to select the good seed, like the one with good germination so they can get good productivity. We tell them to use the organic fertilizer and how to put the organic fertilizer. So first year, the production – the yield increased like from 150 kilos to about 350 kilos and so next year we tend to do like variety improvement.

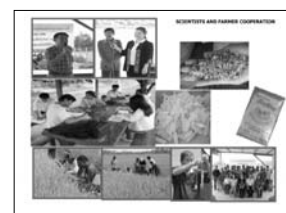
This is another one using like phytoremediation on salinity land (See #16 to 18). In North East of Thailand, most of the land is salinity. This used to be forest before, but now that in the past they do the salt mining. This is underground. So usually they put back the water, get the saline water and then they have to evaporate. So they cut the tree – and then to evaporate it. It is now just like – that is an area. So this is before plantings and then we do the phytoremediation using plants. So this is after four years. You can see like you know plants growing and the salts decreased because it just go back – the salt go back to underground. With this technology, now we work with the company. This is like CSR of this company to do the remediation of the salinity lands. But this time, it is not only plants but we grow you know like salt tolerant rice developed by our scientists. So the company is working with the farmer. Now the farmer can use the land to grow rice.

With that success, the company got environmental award. So now another company, The Siam Cement Group they see the example so now they support our researcher and work with farmer in another area. And this time it is not only rice, but it is going to be fast growing tree because The Siam Cement Group has a pulp and paper mill. So with the fast growing tree, the farmer can sell back to The Siam Cement Group for their livings.

Another example on the environment is about the diversity in the forest (See #19 to 22). This forest is a tropical rainforest just near the Malaysian border. It is very fertile forest. So, usually this is the two provinces. And usually, they have a forest here and forest here used



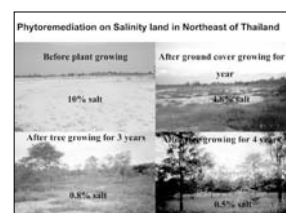
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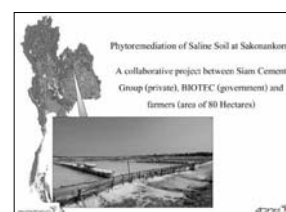
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to be the same piece, but with a wrong decision the government moved people and settled around here, now it is separate. Anyway, but you cannot kick the people out, but how the people can live in harmony with the forest.

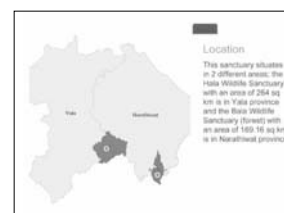
So what we do? Also, we study the diversity using the GIS system and trained officials they can monitor the diversity and how you are going to utilize this diversity. So we do not want the village, you know, the villagers just to go and take more biomass, plants from the forest even that you know they can bring it and sell it. So we have the tissue culture. We are setting up the tissue culture lab in the forest, produce the plants and distribute it to the villagers so they can grow that in rubber plantation and we find a market for them. This one is one of the companies send it to Japan. So we help them with marketing and as well as to improve the variety.

And we also, using the forest as a size camp, as a outdoor room (See #23). So we have a size camp for the kids who live around there. Probably they learn more. It is a kind of inspiration so to be scientist or even they love their land and they want to protect it.

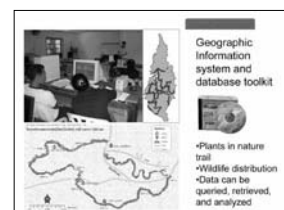
So, they learn about the mushroom (See #24). And then this is like for arts, they do it from clay or from bread and then we can sell to visitor, but it is a little bit sad because it has some kind of security problem in the south. There are not many visitors around here. So this is probably a few messages. So we have to think beyond market and not to expensive to solve because you have to think about the environmental impact. You have to have cooperation among nations and you have to begin with public awareness and encashment and also dynamisms and creativities (See #25). We talked a lot about leaders yesterday, you do not want all leader. You said you want the young generation who can follow, the professor, and as well as politicians. And one thing that we did not touch much, but usually like they talk a lot, they talk just a bit about ethical, legal, and social implication (See #26). Dr. Patarapong talked about the equity sharing, have or have not that Dr. Kurokawa said about that that is about resource distribution and that is between urban and rural area and technology transfer.

So just examples like between bio resource rich country and technology rich, how you are going to share things together (See #27). You see this is about the AOC. You know you have something like two face of coin (See #28). And something with the IT, it is a virus and with the genetic engineering you worry about the bioweapons (See #29).

And I think it is the most important thing because Dr. Kurokawa



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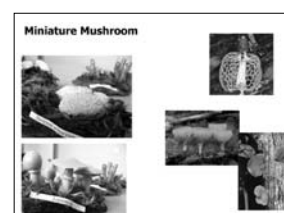
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said about its human ecology, so you have to understand the cultural diversity (See #30). And these are the pictures that I love very much. I cut from the advertisement of the Hong Kong Shanghai Bank. They said they can do good business because they understand the local people. And this is like cricket. The same cricket, in USA they say it is pest. They want to get rid. In China, it is pets. The kids play with it. But in Northern Thailand, we are much better. This is the appetizer for us. So you can think differently. This is doctor this is local – as a people but does not matter you think differently, but if you act the same. And that is Dr. Kurokawa said, ‘Think locally, Act Globally.’



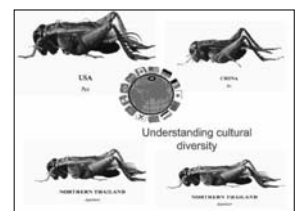
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Tateo Arimoto

Director General, RISTEX, JST

One and a half years ago, former Prime Minister Abe asked Dr. Kurokawa to be the first officially designated Science Advisor to the Prime Minister in Japan after the almost 40 or 50 years. And Mr. Abe asked him to Chair Innovation 25 initiative. I think this initiative and this recommendation is the first broad-based approach to tackle the social system in the field of Japan Science Technology policymaking.

I can not show you in detail. So this time about the main point these initiatives is yesterday, Dr. Kurokawa frequently insist innovation is not invention, integration and promotions, three types of innovation he stressed this initiative and recommendation. Innovation in science and technology. Not only in science and technology, but innovation in social systems and innovation in human resources. This is very important message to the Japanese general public and the governmental sectors.

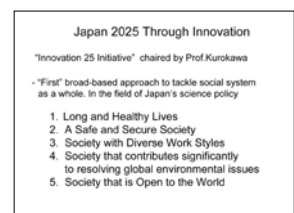
Coming back to the current discussions, I show you yesterday the outline of the Global Innovation Ecosystem International Conference. We held this big conference three times since the 2006 Kyoto, and we plan to hold the next meeting somewhere in Asia. This conference growing supported by not only the Japan's distinguished peoples, but also the abroad distinguished people. For instance, yes, right hand side here she is the President of the US Council on Competitiveness which published the public sector report. Almost 20 – more than 20 years ago, they published the Young report.

Anyways, do you know these gentlemen? This conference just open big conference as well as lot of parallel workshop so the – I could show you yesterday, we established now those concept national innovation ecosystem, Asian and European innovation ecosystem, and the global innovation ecosystem. And Professor Kurokawa stressed 'Think locally, act globally' and 'Think globally, act locally.'

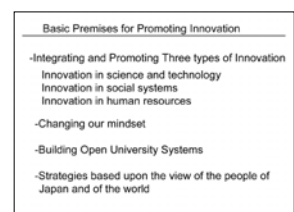
So the innovation is not invention. So innovation is consisting a lot



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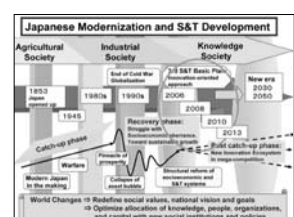
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of the components science and technology, talent, human capital and resources, and finance capital, and final market and society, and needs-driven policy.

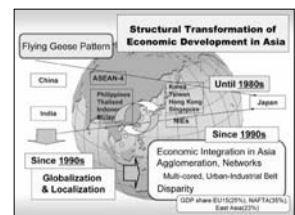
And yesterday, focusing upon the international how to organize and establish international collaboration framework. This is very important point. So since yesterday, you have a lot of the information on the policies, ecotechnologies, resources, and global environment, water, food. Today it is more in the new and clean energy, but frequently stressed from the discussion to – from the lecturing [ph] to real action. This is very, very important. And also rapidly the rule of the game is changing rapidly. But we are facing lot of the gaps for achieving the innovation goals. One gap is the global and the national levels and regional levels. And another one is the private and the public in between gaps and open innovation and closed innovation.

Ecotechnology will give us good models I personally think, because in order to achieve the sustainable development and in order to get resolution of global problems. Especially, I point out, Dr. Kurokawa yesterday, last evening stressed global innovation 1.0, where this one energy. 2.0, probably philosophy and the 3.0, global innovation 3.0. Private sectors, private sector now they are changing their characters from not only getting the profit, but also the social responsibility, expanding that horizon. And global innovation, 4.0, university. Also the university, their horizon is expanding.

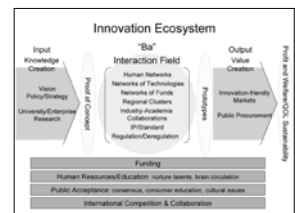
So finally, my sector, public sector. Global innovation, 10.0 anyway. But how we realize our discussions. This is very important sector, how to organize these frameworks. I have ideas about how to plan and realize ecomodel city in Asian countries and international networks.

Another point, Asian Research Foundation. Here is another point – the important point is Dr. Kurokawa stressed innovation outcome is not profit. Innovation is for creating social needs – social bodies okay. I change, socio economic bodies. I would have talked and this – anyway because innovation's outcome should be sustainable and economically rational. This is my personal view.

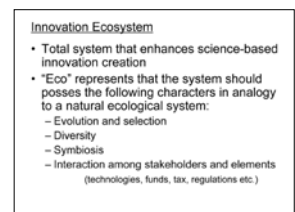
And Ms. Asano stressed last session, this is very important point from the public sector and the policy making sectors, evidence-based policy making systems. My proposal is this one, innovation research network should be established in Asian countries. This is very important point. Integration of disciplines in the field of the science and technology. My institute is the granting agency focusing



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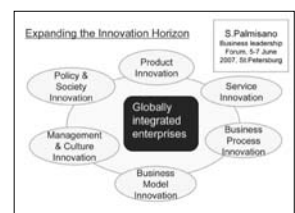
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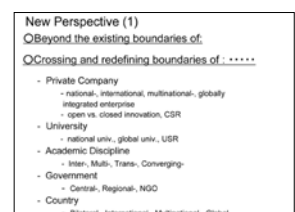
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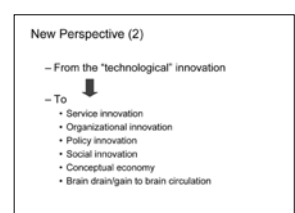
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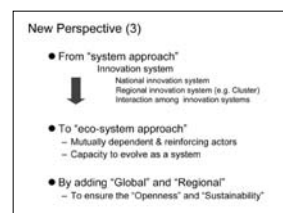
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upon the not final goal is the economic barriers, but the final goal is the social and the public barriers. For instance, to get the security and safety in communities. And another point is, bridging the science developing brain science and education practice.

Integration of disciplines is not only the science related discipline but also Dr. Sunami says political sciences and humanities in order to get final goals of sustainable development.

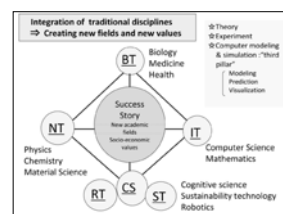
I am still wondering these changing days and world nation states system based government policy, how this as a governmental official how to play our role as a nation state government to achieve the final sustainable development world in the future. This is my last question to Dr. Sunami. Dr. Sunami says it is the political science.



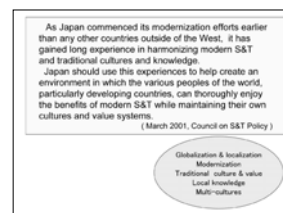
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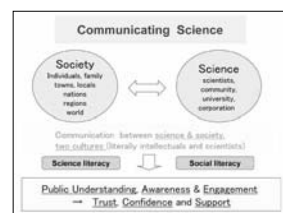
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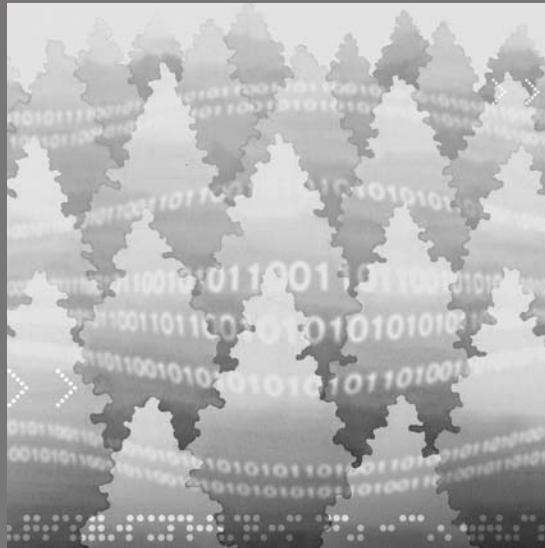


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Closing Remarks



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International Symposium on Ecotechnology 2008
Innovation and Entrepreneurship in Asia



Closing Remarks



Sakarindr Bhumiratana

President, National Science and Technology
Development Agency (NSTDA), Thailand

I would like to thank you all of you here, like to thank you Honda foundation for this very important, I feel very important activities. I think we have said quite enough, but yet not enough because we talk about 'action first, talk later.' We talk about, 'think globally, act locally,' which is certainly very important if we can get everybody to think globally and act locally I think we will be doing a great job. And I guess this is where I think I look forward to working with anybody, especially Honda foundation in creating the sense of urgencies to every one of us. I think that is what we need. We need to create sense of urgency so that actions can be carried out by everyone. Because once you feel the sense of urgencies, I feel humans act.

The problem is, I am not quite sure how we do that. I think it is, how do we stop pointing fingers. It is not the politicians; it is not the technologies; it is not the farmers; it is not the industrialist; it is all of us that need to carry out action.

I said this because if you think back in history, the first greenhouse effect was mentioned by Fourier. And if you are mathematicians and you are electrical engineers or electronics person, you know Fourier was in the 1800s, 1820 something like that. He mentioned the first greenhouse effect. In 1860, Tino was talking about effect of composition to climate. In almost 1900, we talk about calculation of CO₂ as effect temperatures.

In nearly 1960, we measured CO₂ so the observation started from 1820 up to about 1960, those are observations. And then warnings began. Warnings began in 1960, another calculation of CO₂ and then there were consensus of scientists in around 1985 very recently that we are in difficulties; scientists start warning. So warning period I guess we can say begins about 1960. The problem is with all these warnings, when are we going to get the sense of urgency.

This year Nobel Prize Laureate as mentioned by Dr. Kurokawa that IPCC was warning us and warning us and warning and then goal come out with some success of creating sense of urgencies. But I suppose what we are talking about today we have not created enough sense of urgency for people to act. So the question is when are we going to really start on acting with enough adequacy for us to really getting us back to – getting us to make sure we are going to have as we were saying green cool.

So with that I feel I think these are important actions. We need a lot more these type of actions and we need to do everything we can to create the sense of urgencies to everyone. I am not sure whether the current economic system be it market-driven, be it capitalistic. I think we all need the type of innovation you mentioned to turn all this so that we all act because we knew it needs all our action together to get us to have sustainable development. So with that, I would like to again thank you everyone and like to close this session.

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