The Winners of the Blue Planet Prize

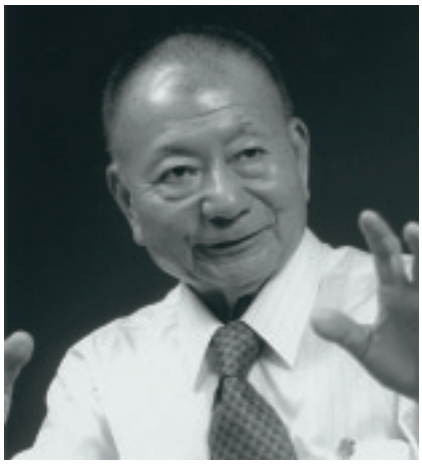
2006

2006

Blue Planet Prize

Dr. Akira Miyawaki (Japan)

Director, Japanese Center for International Studies in Ecology (JISE)
Emeritus Professor, Yokohama National University



Dr. Emil Salim (Indonesia)

Professor, Faculty of Economics and Post Graduate Course, University of Indonesia
Former Minister of Population and Environment, Republic of Indonesia.

Eternity:
Some time in our past, we humans stopped listening to what the forest tells us and no longer paid heed to the wisdom of nature. We forgot that life is limited, and that the might of each individual is also limited. The 2006 opening film told the stories of the wisdom of nature and the forests which were the cradle of living creatures in their pursuit of eternity.

His Imperial Highness Prince Akishino congratulates the laureates

Their Imperial Highnesses Prince and Princess Akishino at the Awards Ceremony

The prizewinners receive their trophies from Chairman Seya

Dr. Akira Miyawaki

Dr. Emil Salim

Hiromichi Seya, chairman of the Foundation delivers the opening address

The prizewinners Dr. Akira Miyawaki (right) and Dr. Emil Salim (left) at the Congratulatory Party

Dr. Saburo Nagakura, President of the Japan Academy and Jusuf Anwar, Ambassador of the Republic of Indonesia, to Japan, congratulate the laureates

The prizewinners meet the press

Profile

Dr. Akira Miyawaki

Director, Japanese Center for International Studies in Ecology (JISE)
Emeritus Professor, Yokohama National University

Education and Academic and Professional Activities

1928	Born on January 29, in Okayama, Japan
1952	Graduated from the Department of Biology, Hiroshima University
1958-1960	Visiting Researcher, Federal Institute for Vegetation Mapping, West Germany
1961	Doctor of Science, Hiroshima University
1961-1962	Lecturer, Yokohama National University
1962-1973	Associate Professor, Yokohama National University
1970	Mainichi Publication Cultural Prize for "Plants and Human"
1973-1993	Professor, Institute of Environmental Science and Technology, Yokohama National University
1985-1993	Director, Institute of Environmental Science and Technology, Yokohama National University
1990	Asahi Shimbun Prize
1990	Goldene Blume von Rheydt Prize, Germany
1992	Purple Ribbon Medal, Japanese Government
1993-present	Professor Emeritus, Yokohama National University
1993-present	Director, Japanese Center for International Studies in Ecology
1995	Reinhold Tüxen Prize, Germany
1996	Nikkei Global Environmental Technology Awards
2000	Order of the Sacred Treasure, Gold and Silver Star, Japanese Government
2002	Japan Culture Life Award
2003	Distinguished Service Award, Ecological Society of Japan

Dr. Miyawaki specialized in weed ecology for his graduation thesis at Hiroshima University. After graduating, he conducted field research in locations throughout Japan and wrote several paperes on weed ecology. His paper drew the attention of Professor Reinhold Tüxen (1899 - 1980), then-director of the Federal Institute for Vegetation Mapping in Germany. At Professor Tüxen' s request, Dr. Miyawaki studied in Germany under his tutelage from 1958.

Dr. Miyawaki studied the concept of potential natural vegetation which is the natural vegetation supported by the existing conditions of the location in the absence of any human intervention under Professor Tüxen and returned to Japan in the fall of 1960. He then conducted research into the natural vegetation remaining in the forests indigenous to the region

around shrines and temples called "Chinju-no-mori," as well as the vegetation of more than 10,000 locations throughout Japan affected by various types of human activity, including mountains, riverfronts, agricultural and mountain villages, and metropolitan areas, from which he created maps of existing and potential natural vegetation.

Further, beginning in 1980, Dr. Miyawaki spent more than 10 years to research vegetation throughout Japan and author, edit, and publish the 10 volumes comprising "Vegetation of Japan," with the cooperation of plant ecology laboratories at universities across the country. Through his research, Dr. Miyawaki demonstrated that the primary indigenous species in the evergreen broadleaf forest region of Japan are indeed the evergreen broadleaved plants, like the chinquapin, Machilus tunbergii, and oak, like those found in the forests around shrines and temples. Plants like the Japanese cedar, cypress, larch, and pine, found in limited locales in extreme environments like ridges and steep slopes were not native to the habitat, but were planted for the purpose of producing lumber.

The more research he conducted, he learned that the plants he used to believe were native to the area were far from the unadorned face of the forest – the potential natural vegetation indigenous to the location – and felt increasingly astonished at his findings. This astonishment served as a turning point. Dr. Miyawaki saw forests as much more than merely providing an appearance of greenery. Instead, he began to believe in generating forests faithful to the natural habitat, as our ancestors had created and left behind, and as symbolized by the traditional "Chinju-no-mori." Believing these forests should be recreated based on field investigations into vegetation ecology, Dr. Miyawaki presented a plan to recreate native, indigenous forests, the equivalent of environmental protection, disaster prevention, and water source protection forests in modern terms.

In the early 1970s, forest creation began at the Oita Steelworks of Nippon Steel Corporation. A research was conducted at the nearby forests at Usa Shrine and the Yusuhara Shrine to identify potential natural vegetation. After determining which species of trees should be planted and undergoing trials and errors, it was decided potted plants should be created and utilized. They were planted mixed and densely in accordance with the system of an indigenous forest. Large forests have been created at the steelworks in the 18 years since the trees were first planted, thus making possible the formation of a native forest using native trees. In the years following, Dr. Miyawaki succeeded in restoring communities of disaster prevention and environmental prevention forests in 1,300 locations. The success can be attributed to the support of corporations, as well as municipal organizations, and government ministries, with the Ministry of Land Infrastructure and Transport at the forefront, those organizations with foresight and action.

Beginning in 1978, Dr. Miyawaki conducted vegetation surveys in Thailand, Indonesia, and Malaysia. He proposed that it was possible to restore tropical rainforests by conducting forestation using an ecological method based on surveys of the local vegetation, while conventional thinking assumed that once a tropical rainforest was destroyed from felling and intentional burns, restoring the vegetation was nearly impossible. From 1990, Dr. Miyawaki dedicated himself to the restoration of tropical rainforests in Bintulu, Sarawak, in Malaysia. By 2005, the seedlings planted in 1991 had grown to more than 20 meters tall, and a diverse trop-

ical rainforest, mimicking the natural version as closely as possible, has been restored in the region.

According to a theory known to as the classical succession theory, it would take more than 150 to 200 years for an indigenous forest to restore itself on barren land in Japan, and between 300 and 500 years for a tropical rainforest. However, Dr. Miyawaki proved that it was ecologically possible to restore disaster prevention and environmental protection forests that closely resemble indigenous forests in 20 to 30 years by densely mix planting various trees based on potential natural vegetation.

Dr. Miyawaki has presented multi-faceted research results numerous times in various international symposiums. His work has been internationally acclaimed for approaching forests not through the conventional method of commercial forestation, but with the end of restoring forest ecosystems indigenous to the habitat based on potential natural vegetation and for having achieved demonstrative results which proved his concept.

More than 30 years ago, Dr. Miyawaki felt threatened by various environmental problems including the destruction of the environment on a global scale and biodiversity. He recognized the importance of indigenous forests as a basis for human survival, and developed what is known as the "Miyawaki Method" to restore and reconstruct forests indigenous to the habitat based on rigorous field investigations of the local vegetation and ecological theories. Based on his method, Dr. Miyawaki has achieved demonstrable results in experiments and in the field, inside Japan and abroad.

Essay

A Call to Plant Trees

Dr. Akira Miyawaki

The Rise and Fall of the Forest and Human Civilization

Today, we live in an era marked by the greatest scientific and technological advances ever seen in the 6,000-year history of human civilization. Differences remain between the North and the South. Nonetheless, every industry has progressed, and we enjoy more material wealth than our ancestors could have ever imagined. To satisfy mounting desires, however, we fell forests and mountains, overwhelm oceans and rivers with landfill, create new industrial sites, and scramble to build more cities.

Before long, more and more greenery began disappearing from our environment. In particular, the "native forests by native trees," the indigenous forests with 30 times the greenery in surface area of single-layered lawns, are disappearing without a trace. Living greenery is the only producer in the ecosystem, and is fundamental to the existence of all life forms on Earth including humankind. With the destruction of nature and the spread of environmental contamination, however, people—from scientists, corporations, and politicians to housewives and children—have finally begun to contemplate the gravity of environmental problems.

Environmental problems are occurring not only within large-scale natural development and the realm of physics and chemistry, but also within new industries that contend with life forms, such as agroforestry. They also accompany urbanization and the development of transportation infrastructure.

Environmental problems encompass an extremely wide range of issues. Some, like typhoons, earthquakes, fires, floods, and tsunami, seem like nature's retribution, triggered by her fury. Other problems include the environmental destruction wrought by natural development, water and atmospheric pollution caused by factory emissions of chemical substances, and global warming caused by increased carbon dioxide emissions. Various measures are being put into place to contend with each of the problems, incorporating the latest science and technology; nevertheless, these solutions are implemented on a case-by-case basis. Although conferences do take place to deal with such issues, as environmental problems range so widely, the essence of environmental concerns gets lost in political and other agendas.

To protect the environment is to protect life. Human beings today behave as though they own the universe. The fact is they only appeared in the last interlude of the history of life on earth spanning some three billion years. Human beings have barely achieved a life span of less than 100 years. Primitive forms of life were created on Earth three billion years ago. Since then, our DNA, the thin thread of our genes, has somehow continued until the present in an unbroken chain, bringing us to our existence today.

What is it that those of us who live today can leave for the future? It cannot merely be material luxuries or money. What we can pass down is the thin but irreplaceable thread of our

genes, the genes that have been passed down from three billion years ago until the present day. These are the genes that belong to you, your loved ones, and your neighbors, which is the one thing we can carry into the future. We live today as milestones for the future.

The most fundamental factor in protecting those genes is living greenery. In particular, the "native forest by native trees," the concentration of three-dimensional native greenery, is the basis that guarantees the passage of our life, intelligence, sensibility, and, most importantly, our genes into the future. In reality, however, much of the three largest rain forests, long regarded as natural forests, have also been felled and devastated. Forests in most areas where people have built civilizations, beginning in ancient times, from the Mediterranean to India to China, have been completely destroyed from practices such as the overgrazing of livestock. Environmental destruction has also advanced in North and South America, as well as in Australia, known as the new world. Indigenous forests are without a doubt vanishing on a global scale.

Global Warming and the Forest

There have been voluminous research and assessment across the world into global warming caused by increased carbon dioxide emissions, with projections made into the future.

Fossil fuels, like petroleum, coal, and natural gas, contain carbon, the principal culprit for global warming. Fossil fuels were produced as a result of the underground carbonization of organisms, largely plants, from approximately 300 million years ago. Life forms were in the midst of evolution. There were no broad-leaved plants like there are today; plants had only evolved to ferns. In a climate likely to have been favorable with high temperatures and humidity, however, tree ferns grew dense, forming large forests. Through photosynthesis, these forests absorbed the carbon in the atmosphere and solidified. Subsequently, shifts in the climate and in the Earth's crust buried them underground. Underwater mechanisms have yet to be fully elucidated, but conventional thinking states that until recently the balance of material circulation on Earth had been maintained in the space between the atmosphere, the geosphere, including the hydrosphere, and the biosphere, the thin layer on Earth where all life forms exist.

With the onset of the Industrial Revolution at the end of the 18th century, the development of new industries like heavy manufacturing, fossil fuels that had been buried and locked underground were drawn above ground and burned. Burning fossil fuels creates a chemical reaction whereby the carbon combines with the oxygen in the atmosphere, producing carbon dioxide. The amount of atmospheric carbon dioxide became unquestionably greater the more fossil fuels people burned, which advanced global warming.

Energy conservation has been advocated as a countermeasure to global warming. People around the world are raising their voices to advocate specific measures like curbing manufacturing or excess consumption, decreasing electricity consumption, and driving as little as possible. Such vital measures have been put into place throughout the world; unfortunately, however, no matter how much they conserve, people of today will be unable to completely stop using electricity or eliminate the use of machines, cars, and air conditioners. Even if countries fully exert their efforts to curb carbon dioxide emissions as determined at the Kyoto Conference, as long as they continue to maintain their current economies, industries,

and urban lifestyles, energy conservation measures will remain insufficient. Further, there is an end to the availability of fossil fuels, which can be said is the current basis for modern civilization. Estimates project fossil fuel reserves to run out in several decades; no matter how much people conserve, the reserves will not last another 100 years. In addition to hydraulic and nuclear power, and the use of natural sources of power such as solar energy, research in nuclear fission, has been advanced and its results are highly anticipated. However, these sources of power are still insufficient for immediate use. So what options are available?

The alternative I will describe may seem unspectacular and rather unrefined at first, and some may think it will not have an immediate effect. Having said that, I believe that creating indigenous and real forests, and covering as much of the land as possible with forests, is the most certain and effective measure to reduce carbon dioxide. Real forests form multilayered communities, of tall trees, semi-tall trees, short trees, and bottom weeds. Thus, they have 30 times the surface area of greenery for photosynthesis compared to such single-layered communities as moors and lawns. As such, real forests should also have 30 times the ability to preserve the local environment and to mitigate impact, in terms of noise insulation, dust filtration, air purification, and maintaining water quality. Moreover, the primary trees of real forests have deep and axial roots, making them more resistant to falling, and contributing towards disaster prevention.

Plants absorb the carbon in the atmosphere through photosynthesis, turning into hydrocarbon and lignin and forming trunks, branches, and leaves. By following such methods to create a forest—in which small potted seedlings of the primary trees of the area's potential natural vegetation are planted—increasing amounts of carbon are absorbed and solidified as the seedling grows into a mature tree. For example, if a seedling with a dry weight of 300–500 grams grows into a tree, 10–20 meters in height or even taller, with a dry weight of one ton, then 50 percent, or at least 40 percent of its weight is carbon. This suggests that the tree absorbed and solidified that much carbon from the air. Further, the semi-tall trees, short trees and the bottom weeds would also grow as the forest develops, increasing the amount of carbon that is absorbed.

Theorists ridicule such efforts. They say that for a small number of people to plant trees for carbon dioxide reduction represents only a drop in the bucket. But in 30 years, we have created forests alongside residential communities in more than 1,300 locations in Japan, with the number rising to 1,500 when we include overseas locations like Borneo, the Amazon, China, and Inner Mongolia—planting more than 30 million seedlings. Environmentalist Wangari Maathai of Kenya, winner of the 2004 Nobel Peace Prize, has also planted 30 million trees.

When I first met Ms. Maathai, I promised her I would cooperate with her in creating real, indigenous forests in Kenya. After conducting two rounds of field surveys of the local vegetation, we had our first tree-planting ceremony in November 2006 and planted seedlings of indigenous primary trees, with the support of organizations like Mitsubishi Corporation. At the time, Ms. Maathai spoke about her proposal to the United Nations to plant one billion trees around the world in 2007. It may not have an enormous impact for one or two people to plant trees, but what would happen if people around the world planted 10 trees wherever they could? What would happen if they planted another 30 trees?

People often ask if we would run out of places to live if we continued to plant so many trees. But that concern is unwarranted. For example, 98% of the 120 million people in Japan live in the evergreen broadleaf region of the country, which stays green throughout the winter. That landmass is the equivalent to the area from the shoreline to 800 meters above sea level west of the Kanto region. Many say that Japan has an abundance of greenery. Our recent research, however, shows that only 0.06% of indigenous forests with multilayered communities remains compared to the original potential of the evergreen broadleaf forest region. Even if the amount was increased a hundred-fold, it would only comprise 6%.

It may be the case that certain situations require the isolated planting of coniferous trees for economic purposes, or to plant fast-growing trees to accelerate the greening of an area. But the fundamental principle behind creating forests with high disaster prevention and environmental preservation capacities is to conduct mixed and dense planting of as many different types of trees, in accordance with the potential natural vegetation of the area. The planting should center on the primary trees of the location, and following the laws of the natural forest.

Fast-growing trees like the poplar and eucalyptus grow extremely rapidly in the early stages, leading many to think that they have a high capability for absorbing and solidifying carbon. But the effect is not lasting. Seedlings of potential natural vegetation indigenous to the area, with well-developed roots, planted densely and with different species mixed together, will not require maintenance after three years. They may bloom slightly later, but they will unfailingly grow through a process of competition, and will continue to live for hundreds of years. If plants cost money to maintain after five years, it is because they are secondary vegetation or substitute tree species; in other words, they are counterfeit.

Real forests consisting of potential natural vegetation are formed from tall trees, which are the primary trees, and beneath them, semi-tall trees, short trees, and bottom weeds, with the entire forest functioning as a whole system. They are resistant to natural disasters like typhoons, earthquakes, and fires, and do not collapse easily. They also serve as levees against tsunami, and can be a shelter or an escape route in case of an emergency. In addition to such local functions, globally, they absorb carbon and can be expected to curb global warming by solidifying the carbon and maintaining it within the forest for countless years.

Naturally, live trees die after several hundred years. But the semi-tall trees and short trees underneath them have successor trees in waiting. When one tree dies, these successor trees quickly dominate the space it left behind. As a result, forest systems sustain themselves semi permanently.

Plant Trees—From under Your Feet to the World

Creating indigenous forests is possible around the world. On continents with vast amounts of land, forests should be created on the largest possible scale. Places where even if desertification has progressed, plant trees. Approximately two-thirds of the deserts and semi-deserts on Earth today are man-made. In other words, these are regions where forests have been devastated, annihilated, and turned into semi-deserts as a result of human activity over the long term. It follows that pursuing an ecological response—although challenging—will enable forests to recover, and that is what must be done. In addition, in places like Japan where land-

mass is limited and the population is concentrated, forests should be created not only in mountain areas but also in the metropolitan areas as urban forests. They should also be planted in residential areas.

In the Japanese written language, the pictograph for "forest" is symbolized by three trees, while the pictograph for "dense forest" is represented by five trees. As this implies, the first step is to plant a tree. If a problem arises, then a solution should be considered. Debates and conferences are also necessary, but actions should first be implemented. Even if it is a small number, plant indigenous forests—those that absorb and solidify carbon; have the capabilities to prevent disasters and preserve the environment; enhance the knowledge and awareness of all citizens; and function as reservoirs of potential energy for new activity. It is essential to implement measures to counter the source of environmental contamination on the one hand, and, at the same time, aggressively plant trees to create a green environment brimming with life.

Recently, there has been a trend toward planting trees as a societal contribution, perhaps as a result of society gaining some breathing room. They say it is to bring back the insects and the wild birds, and to restore our natural habitat. There is no question that this is important. But regardless of the scientific and technological advancements that we achieve, I would like for people to recognize the cold, harsh reality that we only sustain our lives by being parasites to green plants. Restoring and regenerating real forests, the native forests by native trees with the greatest concentration of greenery—our hosts—is of utmost importance. Recreating forests is not merely for wild birds, or for other people. It is for you yourself to survive into the future in good health, and to ensure the future of the blue planet that is rich in biodiversity, where all types of life forms can coexist.

Real forests created based on the research of potential natural vegetation should, as a forest system, last more than 10,000 years even if individual trees replace one another. They should continue to exist provided there are no catastrophic circumstances or human-inflicted destruction. The next ice age is predicted to arrive in 10,000 years. Let each one of us take an active step to plant trees to create this forest of life, starting with the ground we stand on—for ourselves, for our loved ones, for our many neighbors, and to protect this beautiful blue planet.

In the last 60 years, I have conducted field surveys in 38 countries around the world, and planted 30 million trees in the last 30 or so years. The main participants of forest creation are citizens. It is the local citizens of all ages who plant trees, with sweat on their brow and hands in the earth. The trees are planted densely with different species mixed together. The citizens' efforts are overseen by governments, corporations, and all types of organizations, and are based on the results of local field surveys of vegetation science, in accordance with the laws of the natural forest. It is not necessary to plant large trees but to plant potted seedlings with well-developed roots of many different species of trees. Focus the planting on primary trees indigenous to the location; they will have the strength to grow into large trees. Anybody who is serious about this endeavor can start anywhere, at any time.

I am only 78 years old. From a biological standpoint, humankind should live for around 110 years. My dream, as the first Japanese recipient of the Blue Planet Prize, an award acclaimed highly both domestically and abroad, is to continue planting trees for another 30

years. I would like nothing more than to create the forest of life, the foundation for the survival for all of Earth's life forms and the key to human development, with the citizens of Japan, the rest of Asia, and the entire world. I would like to make this dream come true. Let us plant trees together—from under our feet, and into the world.

Lecture

Aiming for the Restoration of a Green Global Environment

Restoration of the Green Environment on the Basis of Field Studies and Research into the Ecology of Vegetation

Dr. Akira Miyawaki

Introduction

I am deeply honored to receive the Asahi Glass Foundation's 15th international global environmental award, the Blue Planet Prize. In accepting this honor, I would like to express both my debt and my heartfelt thanks to all the people who have given their support, cooperation, guidance, and assistance, both in and away from the spotlight, for the humble research and environmental restoration activities with which I have had the good fortune to be involved.

Protecting the Environment Means Protecting Life

Science and technology have made astonishing advances, and we are now enjoying lifestyles somewhat rich in material in the midst of an artificial environment that our ancestors could never have imagined. The necessities for life and our other desires can mostly be fulfilled in an instant, and in the virtual world of information technology in particular we can gain access to information around the world with just a finger. Yet why is it that while we are blessed with such an environment, there exists a great many people who feel a vague unease about the future? Perhaps it may come from some basic, animal instinct within us human beings who have been made to dwell in an unliving, uniform urban environment from which the greenery and the indigenous forests that once covered the land have almost all been lost.

If we are to live in good health into the future, we must protect the environment, which is the very basis of living and health. Environmental problems are the most pressing issues facing us, which everyone from elementary schoolchildren to politicians in the world must address. However, the area covered by the environment is extremely wide, comprising both hands-on and more intangible aspects. Hands-on measures taken in such areas as energy conservation, waste disposal, or pollution source control are all important, but it is not sufficient just to take partial measures that only focus on one side of the issue; the fact is that at best such measures merely prevent the environment from deteriorating further than it already has. Rather than just thinking in terms of returning the environment that has been lost to its original state, for the sake of the future we need to proactively regenerate and create a rich environment for survival. Protecting the environment means protecting life from an ecological standpoint. Our DNA and our genes stretch back for over three billion years in an unbroken chain; biologically speaking, whole purpose of our short lifespan in this modern day, which measures less than one hundred years, is to continue this chain of genes into the future.

The Role of Forests in Protecting Life

There are many types of greenery. Whether it be man-made, monoculture forests of conifers

grown for lumber, undeveloped woodland surrounding rural settlements, or the purely cosmetic greenery grown to make our cities more pleasant, all greenery is important. Living greenery is the only producer in the ecosystem. We human beings are consumers within the social order of living things, and we only live by being merely parasites on green plants. Green plants are thus our hosts. Among the different types of greenery, real forests made up of trees native to the area are three-dimensional, multi-layered communities with 30 times the surface area of greenery of single-layered lawns, and have more than 30 times the ability to protect against natural disasters and to conserve the environment. These forests are completely unyielding to natural disasters such as fires, earthquakes, typhoons, or tsunamis. So the greenery that is most important to us now is the greenery of native forests made up of trees native to the area, as symbolized by the groves of village shrines. Native forests protect life and protect the environment.

I have been working on creating forests of indigenous trees in their native habitat for over 30 years, together with people of foresight from the government, private companies and the general public. Rather than simply restoring forests that were there before, this work involves creating genuine native forests through rigorous field surveys and research into the ecology of the vegetation in order to ensure a future without the mistakes that have been made so far. Forests that have been regenerated on the basis of potential natural vegetation cost nothing to maintain, are long lasting, and carry out a diverse range of functions. Native forests protect the lives of all the people born and raised in the area, and the people who go to school or work there. They sharpen the senses for the creation of culture; they give rise to intellect for new developments. I became wholly engrossed in regenerating this three-dimensional green environment almost without realizing it. The conviction and the activities with which I devote myself to creating forests for life are not something that came about overnight; I hope you will look at them as the way I have lived for 78 years.

Specialty in the Ecology of Weeds

I was born the fourth son of a farming family in a mountainous area some 400 meters above sea level in Kibi Kogen, Okayama Prefecture. I grew up watching the people around me carry out the hard task of clearing weeds and undergrowth by hand, and in my young mind I wondered if there could be a way to make life a bit easier for farmers by keeping the weeds at bay without resorting to herbicides. I left elementary school at the end of the 1930s, in the midst of a disastrous war. My brothers went off to war, and my father decided that I, the youngest of the four, should take over the family's farm. However, perhaps because he thought I wouldn't be up to straightforward agricultural work as I was a rather weak and lazy fellow, he sent me to Niimi High School of Agriculture and Forestry, one of three agriculture high schools in Okayama Prefecture at the time.

Academic study became more interesting for me when I entered agricultural high school, and as I felt I wanted to continue my studies a little further, I took the examination to enter Tokyo College of Agriculture and Forestry, which is now Tokyo University of Agriculture and Technology, in Fuchu City. The examination was in February 1945, the final year of the war. I couldn't make it to the examination hall because of the fierce air raids on

Tokyo, but I was given another chance to sit the examination a month later. The Tokaido Line had sustained damage in the bombing and was out of use, so I had to make my way along the coastline of the Japan Sea. It took me three days and three nights to reach my brother's house in Saitama. My brother had avoided being conscripted due to his weak constitution and was aiming to become a writer of stories for children. The night I arrived, the sky to the south was bright red. It was March 9, the night of the firebombing of Tokyo. The following day I walked to Fuchu, and after all I had been through I was finally able to sit the examination. I entered Tokyo College of Agriculture and Forestry on the biology course, which had been specially set up because there were not enough biology teachers in the junior high schools, girls' high schools and normal schools at the time.

At that time I didn't have any special liking for green plants; in fact, I was rather indifferent to them. Right by my parents' house there were plantations of cedar and cypress trees, as well as groves of undeveloped woodland—called satoyama in Japanese—with deciduous trees such as sawtooth oak, konara oak and Japanese snowbell. There were also meadows of cut grass, rice paddies and crop fields. All around was a mass of greenery, yet I longed for the big cities standing shrouded in black smoke that I had seen in my text books in elementary and junior school. As a youth, my dream was to live somewhere where I could hear the deafening roar of airplanes every day.

When I actually moved to Tokyo, the year the war ended, there was a grave shortage of food and I felt the pangs of hunger in my belly. Nonetheless, I threw myself into my studies with Ichiro Oga and my fellow students. Going out to Mt. Takao to carry out surveys and looking at the grass and trees of the fields, I was amazed by the variety of plant species which I had never even noticed before. When I went back home to Okayama for the summer vacation, I was surprised again to discover that the wild plants growing in the fields were more or less the same as I had seen in Tokyo.

After graduating I worked for a year as a teacher of biology and English at Niimi Agricultural High School in Okayama, but I very much wanted to study some more. However, I did not want to return to the hunger of Tokyo, and instead I went to Hiroshima University of Literature and Science (now Hiroshima University), which was then the nearest national university to Okayama. It was normal for students from agricultural school to go into the biology department, and I opted to specialize in plants, as I couldn't stand the sight of blood. It was four years since the atom bomb had devastated Hiroshima; the ceiling of the science department building, which had escaped being burned down, was pitch black and the electric lines still hung down. There were just nine other students beside me, and we studied as hard as we could, at night cooking rice in a camping pot together. I enjoyed it immensely.

I was fortunate to be taught by Dr. Yoshio Horikawa, who took a fieldwork-oriented approach and had walked throughout Japan studying plant distribution. When I was asked what I wanted to study for my graduation thesis, I replied straight away that I wanted to study weed ecology. I had grown up watching farmers struggle with weeds, and so one way or another I wanted to become an expert on them. Dr. Horikawa looked me steadily in the eye. "Weeds are on the border of science and agriculture—there is almost no one working in that area," he said. "If you study weeds, Miyawaki, your work will probably never see the light of

day and no one will have anything to do with you. But if you are determined to risk everything on this, then you should certainly go ahead and do it." I am an extremely earthy individual, and I have spent nearly 60 years since then single-mindedly tramping the field.

Weeds grow quickly, and so surveys of weeds need to be carried out in each of the four seasons. Four times a year I would spend 60 days—a total of 240 days—surveying groups of weeds from Kagoshima in the south to Otoineppu on the island of Hokkaido in the north, sleeping on night trains as I traveled the country. Otoineppu was then the most northerly region of Japan where rice was cultivated. When I graduated from Hiroshima University of Literature and Science, plant physiologist Prof. Yasona Fukuda told me that I needed to study some more and he took me to Tokyo. There I entered the morphology laboratory of Prof. Ken Ogura, part of the graduate school of the old University of Tokyo. I was never very keen on using a microscope, but when I was given a task I put everything into coming to grips with it. I entered the University of Tokyo laboratory in April, and in May I was appointed to the position of assistant at Yokohama National University. For the next six years I spent three days a week at the morphology laboratory of the University of Tokyo, and the other three days teaching at Yokohama National University as an assistant under Prof. Masao Kitagawa, devoting myself to research into weeds. I also wrote two theses in English and one in German, which brought together the research I carried out under Prof. Ogura into morphological and ecological variations in the roots of weeds in relation to differences in the amount of moisture.

Just as Prof. Horikawa had predicted, Japanese scholars did not want anything to do with me. However, one day an airmail letter arrived. Apparently, my work had caught the eye of Prof. Dr. Drs. mult. Reinhold Tüxen, who was then director of the Federal Institute for Vegetation Mapping in Germany. "Weeds are at the point where human activity meets natural vegetation, and are extremely important," he wrote. "I am also working in this area; by all means come and join me." This was in the days when an air ticket to Germany cost 450,000 yen. The salary for an assistant at Yokohama National University was then 9,000 yen a month, while a professor made 20,000 yen a month; going to Germany seemed almost impossible. I was fortunate, though, to receive assistance from the German government and the Humboldt Foundation, and it was arranged for me to study in Germany for nearly two years from the end of September 1958. Professor Tüxen turned out to be the most important teacher I have had.

Vegetation Science and Phytosociology Learned in the Field

I was to study at a vegetation-mapping laboratory in Stolzenau, a small town in Germany where the laboratory was evacuated with a population of 5,000 people. I remember that in late September the bitter winter winds were already blowing in northwest Germany, and it was unpleasantly cold. Right from the day after I arrived, I was taken out every day to carry out field surveys, and I spent the nights drawing up a comparative study of the data the laboratory had on weeds from around the world and the data I had collected in Japan.

I began to wonder if it was really worth spending every day out in the harsh conditions of freezing wind mixed with drizzle just making field surveys of plants and soil profiles, and so after about a month I rather timidly asked Professor Tüxen if I could perhaps do some slightly more scientific research. Professor Tüxen was a grave, imposing figure, like the last of

the great Teutonic warriors. He fixed me with a steely blue eye; "What is scientific?" he asked. I answered, "I want to listen to some professor's lectures in Berlin Technical University and want to read books in Bonn University" Then he said "It's too early for you to listen to people talking or to read books. Get out there into the field—there are three billion years of the history of life out there, there is a real life drama unfolding under our great sun that the German government could never achieve, no matter how many million marks they threw into research. Your own body should be the instrument to measure it—study it by looking at it with your eyes, touching it with your hands, smell it, taste it, feel it!" He drove into me the art of thoroughly scrutinizing plants in the field. Together with Professor Tüxen and the other researchers working there, I carried out exhaustive field studies of every group of plants—from the weeds growing in fields and grasslands to secondary forest, the heaths (heide in German) formed as a result of degradation of the vegetation through long years of human activity, and the homestead woodland and forests of native trees. Fieldwork was the most important thing—always, it was fieldwork.

Around the time I published my first thesis on plant communities, Professor Tüxen said to me, "Weeds are important, but they are just like my beard—they grow because you cut them. The important thing is the concept of 'potential natural vegetation,' in other words what sort of vegetation a given area has the ability to support." Professor Tüxen had published his idea of potential natural vegetation, the unadorned, indigenous vegetation of an area, in 1956, and it was thoroughly instilled into me out in the field. In both Europe and Japan, most of the vegetation has changed under the influence of various different human activities, and most of the real forests made up of native vegetation have been lost. Distinguishing the potential natural vegetation of an area is just like trying to see a body through the clothes it is wearing—you can't really make it out. It is so difficult that I first thought you needed some special, ninja-type skills.

One day, when it was getting near the time to return to Japan, I woke up in the middle of the night and for some reason the image of a festival I attended as a child entered my head. It was the festival of Onzaki Shrine in my hometown, which was held at the beginning of every November and at the time was the sole amusement in my remote village. The traditional Bitchu kagura music and dancing, which started from midnight, was performed at the shrine all through the night. I remembered walking out into the small precinct yard at half past four in the morning when the music and dancing ended and seeing the branches of the trees stretching upwards, jet black against the dawn sky. I had trembled with emotion when I saw those trees all those years ago, and in a flash it struck me—surely they were the primary trees for potential natural vegetation!

My Interest Moves from Weeds to Trees

As soon as I returned to Japan, I visited Onzaki Shrine. The surroundings of the shrine were occupied by secondary forests of broad-leaved trees and plantations of cedar and cypress, but on either side of the steps to the shrine were huge specimens of *Quercus acuta* and *Q. salicina* (see photo). These trees were the primary trees for the potential natural vegetation of areas of the Chugoku region at an altitude of around 400 meters. Whereas I had only been interested in

weeds up until then, after returning to Japan I carried out exhaustive surveys of all types of vegetation. My surveys covered everything from the plants growing in cities and industrial areas, secondary forests such as the mixed woodland around rural settlements, and plantations of cedar, to the groves remaining in village shrines up and down the country. My first thesis in which I freed myself from weeds was a research investigation into the evergreen forest that remains on the island of Amami Oshima.

Big trees of *Quercus acuta* and *Q. salicina* at Onzaki Shrine

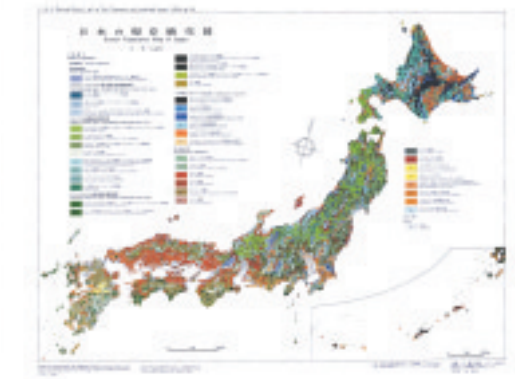
Around that time in Germany, vegetation maps, and in particular, potential natural vegetation maps, were being used for urban planning, regional planning, planning of industrial areas, and even national land conservation. In Japan, however, there was no one who would recognize the value of using vegetation mapping, and there were no requests at all for vegetation surveys. During the roughly 10 years following my return to Japan at the end of 1960, I devoted myself to just going around Japan, carrying out field surveys of vegetation. It was around this time that young people from around the country who were interested in studying under me gathered at Yokohama National University's education department, which at the time did not have the right of awarding degrees. No one who came was turned away, and no one who left was chased after; we were simply absorbed in our work. During the day we went out into the field, surveying every different type of plant community in places ranging from forests to grasslands, even the communities of weeds growing in cities, and at night we compiled and collated our data. This decade was perhaps the most fulfilling period of my life, and I think it was decisive in shaping my later fieldwork-oriented stance on research. We accumulated a mass of data on the vegetation around Japan, which came from the results of surveys carried out by crawling around on the ground, and these data were so important they were practically a census of the nation's greenery.

Fortunately, we started to receive requests from different companies for cooperation over research surveys in the 1970s. Researchers are egoistic people—I politely refused any requests or any assistance that did not benefit my own research. My method was to survey all the vegetation on-site. In other words, using the vegetation science methods that were widely used internationally, I would judge the degree of cover and the degree of community formation of each plant present there, and draw up a census of the greenery. From regional data I made comparisons on a global scale and compiled plant community units and clusters made up of combinations of species; these are termed "associations." By further comparing similar communities to each other, I compiled them into alliances, orders, and classes. My aim was always to make a phytosociological organization of plant communities like this. Furthermore, whenever I received an external request to cooperate over a survey, I would without fail append a text in an European language to the survey or research report—we were studying the world, for the world. I asked them to print over 500 additional reprints, and, gladly or grudgingly, they

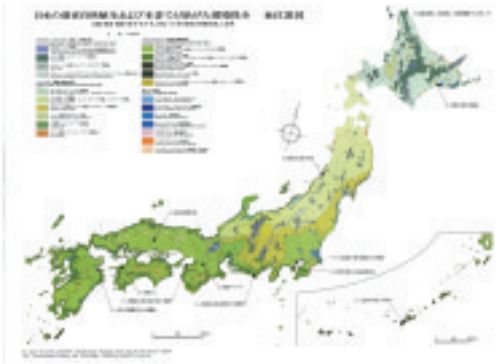
cooperated. As far as I was concerned, a vegetation survey did not end with simply putting out the report; it didn't become a real research survey until it had been subjected to the unforgiving, critical eyes of a great many specialists at international academic gatherings. And if the results were not the scientific research results of real vegetation surveys, they would be of no use in creating real forests for protection against natural disasters and environmental conservation.

The Completion of Vegetation of Japan

So we were completely engrossed in carrying out vegetation surveys up and down the country with the cooperation of companies, municipal governments, central government ministries, and other organizations that all had the necessary foresight. We drew the actual distribution of vegetation communities into diagnostic maps of the current status of greenery, and existing vegetation maps that could be of use to related sciences. The existing vegetation is completely different from the original vegetation, which has been changed by human intervention, and so at the same time I also gained a grasp of the sort of natural vegetation that the sum total of the natural environment could support if all human influence were stopped. This is not necessarily the same as the original vegetation; it is today's potential natural vegetation, and we mapped its spread in the form of potential natural vegetation maps. While comparing existing vegetation maps with potential natural vegetation maps, I made a diagnosis of the natural environment of the area, and made full use of this as a scientific scenario for using potential natural vegetation in the creation of forests where the original forests of the area had been lost. I did not limit the work of drawing up these vegetation data, greenery censuses and vegetation maps just to any given region—my real desire was to draw them up on a nationwide scale that would cover every region of Japan.



Existing vegetation of Japan



Potential natural vegetation of Japan

I was fortunate enough to receive promotional expenses for publicizing the findings of my research from the then Ministry of Education, and I was able to compile and publish them as 10 volumes of Vegetation of Japan, (Vol. 1, Yakushima; Vol. 2, Kyushu; Vol. 3, Shikoku; Vol. 4, Chugoku; Vol. 5, Kinki; Vol. 6, Chubu; Vol. 7, Kanto; Vol. 8, Tohoku; Vol. 9, Hokkaido; Vol. 10, Ogasawara, Okinawa). I sweated blood over this huge task. Vegetation of Japan was published at the rate of one volume

a year starting in 1980. My approach was to compile and collate the vegetation survey data and vegetation maps from the areas of Japan that had been surveyed so far, while at the same time carrying out a thorough field survey of the vegetation of the area to be published the following year. My aim was for a near-perfect collection of vegetation survey data; during the day I worked hard at the fieldwork and at night I sorted through the data. I put a great deal of effort into determining individual plant community units, and organizing and systemizing plant communities that could be compared on a global scale. While I was working on compiling Vol. 1, Yakushima, I was concurrently working on the vegetations surveys for Vol. 2, Kyushu, which was to be published the following year; while I compiled the Kyushu data, I was also carrying out surveys in Shikoku. Working in this way, I completed 10 volumes of Vegetation of Japan over the course of 10 years. The compositional charts of plant communities that are a census of the nation's greenery, the existing vegetation maps that serve as diagnostic maps for the present status of greenery, and the potential natural vegetation maps that serve as a scientific scenario for the regeneration of a new green environment were printed in 12 colors, and an index was appended. The text ran to 6,000 pages, and the whole thing weighed 36 kilograms.

Completed 10 volume Vegetation of Japan

Working under such relentless conditions, I would never have completed the Vegetation of Japan if it were not for the 116 people from universities and research organizations around the country who so generously cooperated on the project. At the very core, though, it was just five or six researchers from the vegetation laboratory of Yokohama National University who carried out the work of determining the plant community units, organizing them on a global scale, and producing vegetation maps. Just as we were approaching the third volume, Assistant Professor Shigetoshi Okuda said to me on behalf of the research team that they wanted me to take a break for a year. If they carried on like that they were all going to die, he said, and did I really want to kill them? It was just at the time that an Southeast Asian plant community survey project was being carried out with overseas survey funds from the then Ministry of Education. I had set my heart on this project, which involved spending three months of the year, from November to January, carrying out overseas surveys in parallel in Borneo, Thailand, Malaysia, and Indonesia. I thought long and hard about it, but I realized that if I broke off the Japanese vegetation project for a year, despite all the effort that had gone into getting it started it would probably just end there. So I told them that I was going to give everything I had, and I wanted them to do the same. We came to a mutual understanding, and in that way we brought all 10 volume of the Vegetation of Japan to completion. I really am enormously grateful to all the members of the research laboratories from that time, to all the researchers around Japan who supported them, and to my senior researchers for their cooperation and for the results of

their splendid efforts.

The distinctive feature of Vegetation of Japan is that not only does it contain the results of vegetation surveys and vegetation maps compiled from a global perspective, it also has a large section on the vegetation ecology approach to the conservation and regeneration of the green environment at the end of each volume. These sections contain specific proposals compiled by region for the preservation of natural vegetation that is close to the original vegetation of the region, and for the creation of disaster prevention and nature conservation forests native to the area, forests that nurture river sources, urban forests, forests in industrial areas, and forests to protect the environment of roads and traffic facilities. From the tall trees that will form the main species of future forests, to the semi-tall trees, the bushes and flowering shrubs, and the species that make up the mantle communities at the forest edge, every tree species is listed by its potential natural vegetation regions. I believe Vegetation of Japan is now being used as the fundamental ecological work for conservation and regeneration of the green environment. Additionally, as Japan stretches for 3,000 kilometers across the central region of the Northern Hemisphere, the completion of the 10 volumes of Vegetation of Japan has received acclaim overseas. All the data is also appended in European languages, so Vegetation of Japan should have a place as a basic text in many universities and libraries across America and Europe.

Research into Non-flowering Vegetation Begins to Attract Attention: Creating Forests Based on Potential Natural Vegetation

Planted area in front of the main gate of Yokohama National University

The main gate of Yokohama National University (five years after planting)

From around the end of the 1960s onward that there was a rapid growth in industry, and there was exploitation of nature on a massive scale. Atmospheric and water pollution became more and more serious, and such hazards came to be addressed as grave social problems. There was an unexpected backlash of public opinion, and civil campaigns opposed to pollution and the destruction of nature spread from the regions. The small laboratory where we weed people worked, which had previously had no connection to society, suddenly had visitors coming one after another. I thought their only real interest in coming was probably just to ask us to plant some greenery to atone for the pollution they had caused. I always answered that I would not help by planting greenery just as a temporary cover-up. I would, though, be very happy to cooperate in creating a real, native forest based on the potential natural vegetation of the area. Most of the people who came to the laboratory said no way, that's just pure cheek, and went home in a huff. But there were

Potted seedlings with well-established root systems *(Machilus)*

Planted area in a shopping center

some people who thought that this Miyawaki person's ideas might just have something to them, and so to find out more they asked me to give lectures at their company headquarters or came back with their company executives in tow to hear again what I had to say. These people seriously looked into creating forests.

The first forest I created was at the request of Nippon Steel Corporation. In 1971, there was a telephone call to the laboratory at seven o'clock one morning from Ken Shikimura, head of the newly-formed environmental division of Nippon Steel Corporation. He had attended one of my lectures at the Japan Association of Corporate Executives in Tokyo, and he wanted my cooperation in creating a forest. This was a period when the big companies were considered the main culprits for the pollution and Yokohama National University was seen as a hotbed of left-wing activity. It was unthinkable for a major company and a university to put together a joint project, but I told him, rather audaciously, "The lives of the trees I plant are at stake. If you are prepared to put your job on the line as well, I will help you." These were the words of a greenhorn assistant professor at a new university, but Mr. Shikimura replied, "Of course I'll do it for real." And so began the creation of a forest at the Oita Steelworks, which was then still under construction.

When I visited the site, I found it was reclaimed land with seawater rising up. The prefectural and municipal authorities had planted various trees, but only the stakes to support them remained. I carried out a vegetation survey of the surrounding area, and found the primary trees for potential natural vegetation such as *Machilus tunbergii*, *Castanopsis cuspidate,* blue Japanese oak, and *Quercus myrsinaefolia,* growing at nearby Usa Shrine to heights of over 20 meters and with trunk diameters at breast height of over 80 centimeters. I proposed that the seeds of these trees—their acorns—be gathered and used for planting.

Japan has heavy rainfall, and if the soil is too wet it is difficult for deep-rooted trees or trees with axial roots to grow. I realized that for the trees to grow well, it would be best to create a mound to improve the drainage and plant the trees on top of the mound. I had all the waste left lying around the vast site, such as waste wood and anything else that was neither poisonous nor difficult to break down, used as a natural resource; it was mixed into soil, and I had this built up into a rounded mound between 30 and 50 meters in width, 10 meters at the narrowest, and about five meters high.

Conifers such as cedar, Japanese cypress, or pine have shallow roots, and if planted as bare seedlings they soon take. However, the trees I wanted to plant were species with deep

Trees planted on the premises of Tokyo Electric Power's Higashi Ohgishima thermal power station immediately after planting

Nature conservation forest grown on the premises of Tokyo Electric Power's Higashi Ohgishima thermal power station

roots or axial root systems, which are difficult to transplant—so difficult that gardeners tend to dislike them. I couldn't create a real forest without full use of these species, and through trial and error I found that planting potted trees worked well. I planted acorns in pots, and after a year and a half or two years there would be 30-centimeter seedlings with well-established root systems. I planted these on the mound, where the topsoil had been restored, together with all the other people working on the project.

The style of planting whereby trees that have already grown big are planted here and there on a lawn, supported by stakes, is used for creating the scenery of parks or gardens and it means creating what is basically a heath-like, wilderness landscape. For a natural plant community (society), the best situation is where the plants compete with each other and have to put up with each other. Our method of planting trees followed the law of the forest, and seedlings whose roots had filled the pot were planted densely, different species mixed together. In a natural forest, between 30 and 50 seedlings sprout per square meter. There are some places in Borneo where there are between 500 and nearly 1,000 seedlings per square meter. We densely planted different species together in the proportion of about three seedlings per square meter.

In a natural forest, seedlings emerge from a covering of fallen leaves, and when creating the forest we spread a thick layer of rice straw on the ground. Three or four kilos of straw per square meter is about right, and we spread it as gently as if we were putting a blanket over a sleeping baby. The straw gradually forms a mulch, which is extremely important; even if there is no rain the seedlings do not have to be watered for 40 days or so, and even if there is a sudden, 150-millimeter deluge one night the soil will not be washed away. The mulch also serves to protect against cold, and makes it difficult for weeds to grow. As the straw rots, it fertilizes the soil.

These days I am rather more timid, but then it was a case of fools rush in where angels fear to tread; I brazenly announced to the Nippon Steel Corporation, said to be the world's number one company, "The primary trees for potential natural vegetation like these species of chinquapin, Machilus, and oak have grown together with the residents of this region over hundreds of years. I want a guarantee that if the trees of these species that we planted at the steelworks all suddenly die off one day, you will turn off your blast furnaces." Nippon Steel Corporation asked for three days to think about it. Mr. Shikimura and Hideaki Nakagawa, the manager of the Administrative Department, got back to me: "OK. We will do everything we

Comparison of classical and new succession theories

Location of disaster-prevention and nature conservation forests created in Japan (1,400 as of September 30, 2006)

can for pollution source control," they said. After that, I worked on the creation of forests not just in Oita but also for all of Nippon Steel's other steelworks in Nagoya, Sakai, Kamaishi, Futtu, Hikari, Muroran, and Yawata.

When the then Ministry of Trade and Industry established the Factory Location Law, which stipulated that 20% of the area of the land on which a new factory was built must be covered with vegetation, many young officials came to us and I gave various different proposals. However, because the law made no reference to the type of trees to be planted, in the end there were many cases in which the greening just took the form of a few fully-grown, non-native trees with insufficient roots planted here and there on a lawn. As a consequence, greening around factories had a bad reputation for costing too much in maintenance fees. However, our way of creating forests using seedlings of trees indigenous to the area with well-developed roots, planted densely and with different species mixed together, gradually became better understood. Electricity companies such as Tokyo Electric Power, Kansai Electric Power, Kyushu Electric Power, and Okinawa Electric Power, and companies such as Toray, Honda Motors, and Mitsui Fudosan—thinking about it now, these were international corporations—all put our ideas for forest creation into practice. Of course, there were a great many small and medium-sized companies, as well as local authorities with foresight, who also started to work to create real forests in different regions. In this way, disaster-prevention and nature conservation forests of trees indigenous to the area took shape around the country.

In the retail industry, Takuya Okada, honorary president of Jusco, part of the Aeon Group, gave his understanding and consent and from 1990 it was decided that all new premises were to carry out forest creation work. Under this plan, the space around new premises, even if only one meter in width, is covered in a three-dimensional forest, centered around the primary trees for potential natural vegetation. Trees with seasonal flowers are good as a sort of cosmetic touch for the marginal trees facing a road, a bit like the patterned hem of a kimono. Along the coastline trees that are resistant to salt water, such as Japanese pittosporum, Indian hawthorn, and *Eurya emarginata*, are planted; inland, it is trees that flower in winter such as snow camellia and sasanqua camellia, or spring-flowering trees such as gardenia or daphne.

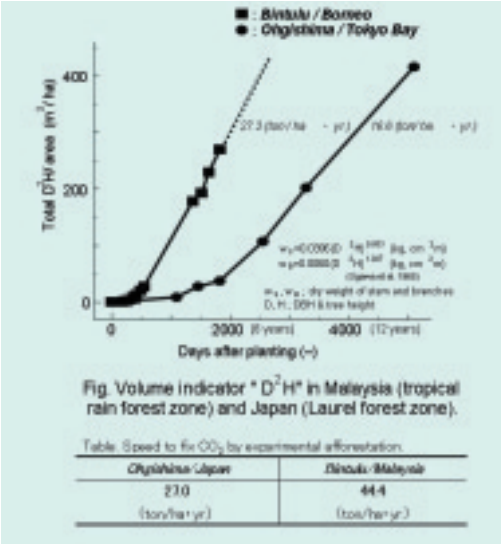


Fig. Volume indicator " D^2H" in Malaysia (tropical rain forest zone) and Japan (Laurel forest zone).

Table. Speed to fix CO_2 by experimental afforestation.

Chigishima / Japan	Bintulu / Malaysia
23.0	44.4
(ton/ha•yr)	(ton/ha•yr)

Comparison of CO_2 absorption and fixation between subtropical rainforest in Malaysia and evergreen forest in Japan (from D^2H)

Satsuki azalea or azalea are planted on south-facing slopes. The trees are mixed together and densely planted, in line with the laws of a natural forest, and mantle communities form. People going to do their shopping always pass through a park with flowers, and dead leaves do not fall outside the group of trees—they decompose with time, and help in the reproduction of the forest. As of August 2006, the Aeon Group has created forest like this at 550 sites, which include places in Malaysia, Thailand, Hong Kong, and China. Over six million seedlings have been planted by local citizens. Magnificent forests have developed where the primary trees for potential natural vegetation were planted, and these are some of the few places in the world where shopping centers surrounded by green forests can be seen standing out in the midst of urban desert.

Regenerating Forests Overseas

(1) Southeast Asia

The established opinion up until the 1970s was that the world's great tropical forests of Southeast Asia, the South American Amazon, and Central Africa could not be regenerated once they had been destroyed, and so they should be preserved without any logging. However,





Clockwise from top left; Seeds of lauan tree botanized in Malaysia, A seed bed in Brunei Forestry Center (June 3, 1991), 2000 people planting 6,000 trees at eight hundred hectares of burnt fields on the Bintulu campus of the Universiti Putra Malaysia in Bintulu, Sarawak State, Malaysia, (July 1991), Planted area on the Bintulu campus of the Universiti Putra Malaysia (July 15, 1991), Planted area at Universiti Putra Malaysia (August 20, 2006)

as I carried out field surveys in Southeast Asia, my assessment was that it was difficult but not impossible to regenerate the ecosystems of the tropical forests, which are a treasure house of every biotic resource. To do this, rather than planting non-native species such as Australian eucalyptus or American pine, it is necessary to densely plant the area with a mix of the primary tree species indigenous to the area. The primary trees could be ascertained by carrying out the necessary field studies.

As luck would have it, Mitsubishi Corporation put forward a proposal and in 1990 I set up the world's first project aiming to regenerate native tropical rainforest. The site for the project was an 800-hectare area of burnt fields on the Bintulu campus of the Universiti Putra Malaysia (UPM) in the Malaysian state of Sarawak. I collected the seeds of indigenous tree species, the primary tree communities for potential natural vegetation, and grew them in pots. Some 2,000 people took part in the first tree-planting festival on July 15, 1991, including students at the UPM and members of the local Iban tribe. We had to dig the holes for planting the trees by hand, so that time we only managed to plant 6,000 trees, but those 30-centimeter seedlings with their sturdy roots that filled the pots have now reached a height of nearly 20 meters and are growing unhindered into a forest that is close to the ecosystem of a natural rainforest (see photo).

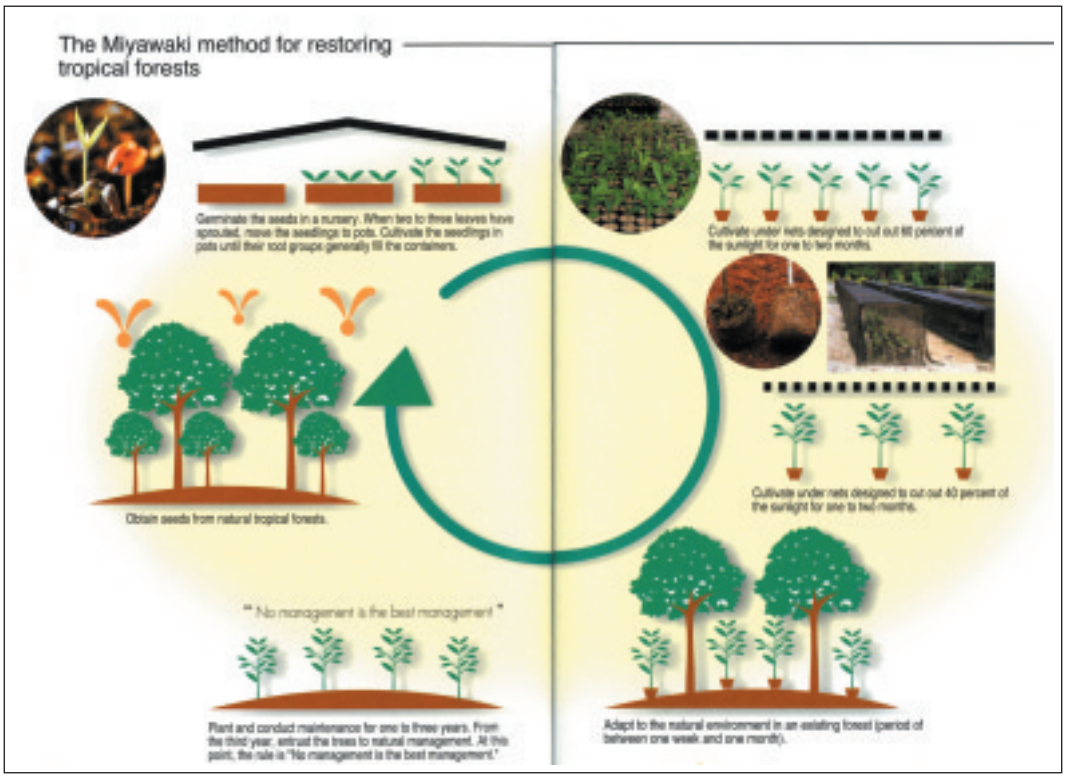
Since then, tree-planting festivals have been held every year right up until the present, and starting 13 years ago around 30 Japanese volunteers have taken part every year; together with local people, they are working on creating forests.

This project to regenerate the rainforest was extremely well received in Malaysia because it was carried out in the form of a joint research project with the UPM, which is the country's oldest university. On July 30, 2006, I was awarded an honorary doctorate in forestry—I was the first foreigner to receive such a degree, and I was deeply honored to receive it from the Sultan in person at a magnificent degree ceremony to mark the university's 75th anniversary. I pledged once again my desire to work even more energetically for the regeneration of natural tropical rainforest in Malaysia and other parts of Southeast Asia together with local people as well as volunteers from Japan and other countries.

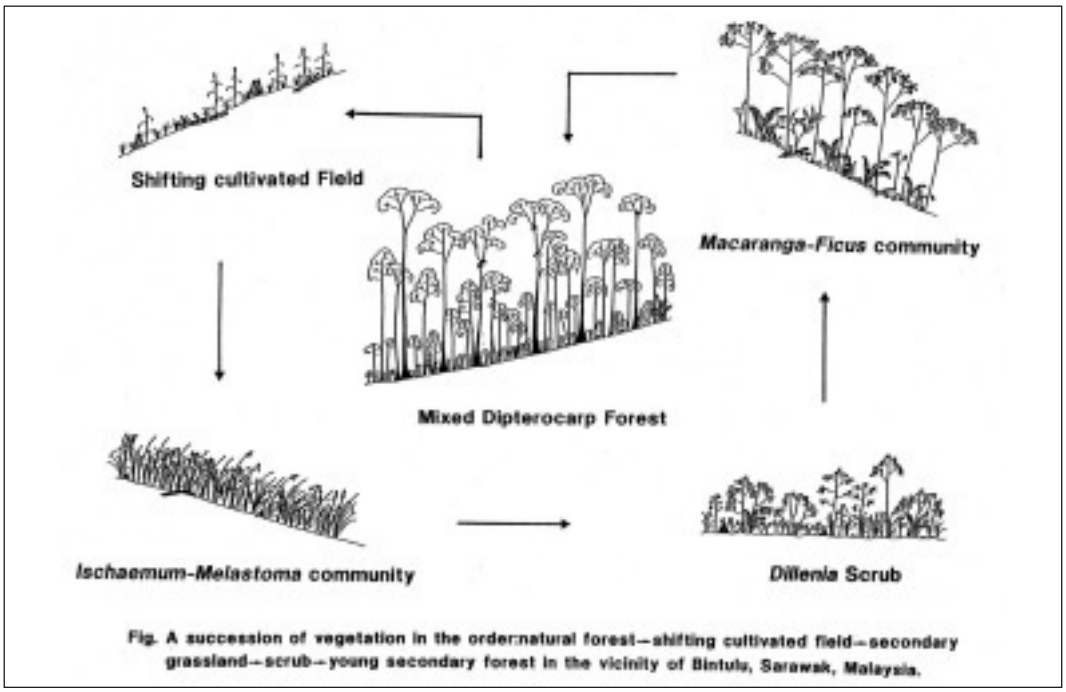
I am now working on regenerating water conservation forest and dry tropical forest in Thailand and Cambodia together with local people and volunteers from Japan by planting seedlings mainly of the primary trees for potential natural vegetation.

(2) The Brazilian Amazon, Kenya in Africa, and China

After the tropical rainforest regeneration project in Borneo, we started a field survey of the vegetation in the Brazilian Amazon on the South American continent in December 1990, with the aim of regenerating lowland tropical forest. We decided to hold the first tree-planting festival ten days before the Earth Summit, which was held in Brazil in 1992. In Southeast Asia we had carried out field surveys over a period of more than 10 years, but we only spent just over a year on the field survey in the Brazilian Amazon. We determined that the primary trees for potential natural vegetation as virola and other trees in the outskirts of Belem, the capital of the State of Para, but it was by no means certain that we had determined all the primary trees in the indigenous forest. We therefore grew seedlings in pots of over 20 species of the tall trees found



The Miyawaki method for regenerating tropical forest



Pattern diagram of secondary succession at a burnt natural rainforest, Malaysia

in the area. We invited then Ambassador Extraordinary and Plenipotentiary Yasushi Murazumi and his wife to the festival, and altogether 1,000 people, including students of University of Agrarian Sciences of Pará (Faculade de Ciencias Agrarias do Para) and local people, planted a total of 10,000 seedlings.

Among the trees we planted, fast-growing species such as balsa at first grew at a tremendous rate. After three years they were six meters high, after five years, 10 meters. From the tenth year onward, however, these trees started to topple over and die, even though there were no strong winds. On the other hand, trees such as the virola, which had been considered one of the primary trees, grew steadily and are now forming a forest that closely resembles a lowland tropical forest ecosystem. This project was carried out in the form of a joint research project with University of Agrarian Sciences of Pará (Faculade de Ciencias Agrarias do Para), with the cooperation of the then Eidai Brazil and the Mitsubishi Corporation.

After successfully regenerating tropical forest in Malaysia and the Amazon, I am currently working on regenerating the tropical forest of Africa, the last of the world's three great tropical forests. I am carrying out the regeneration work in Kenya which lies along the equator. I became involved in this area after Wangari Maathai, the Nobel prizewinner from Kenya who has planted 30 million trees in Africa, asked for advice. She told me that foreign tree species such as eucalyptus, which were planted during the colonial era, were destroying the hills. I went to Kenya twice, in December 2005 and March 2006, to carry out field surveys of the vegetation. I plan to do all I can for the regeneration of the African tropical forests, and I will hold tree-planting festivals in November of this year (2006) and March 2007, together with members of Kenya's Green Belt Movement as well as companies and volunteers from Japan.

I have also been working to create forests in continental China, which is Japan's neigh-

People planting trees in the Brazilian Amazon(above and above right), Planted area in the Brazilian Amazon(right)

bor and also the womb that nurtured Japan's vegetation. This work is based on the results of surveys I carried out with grants for overseas surveys from the former Ministry of Education. I met with Takuya Okada, honorary chairman of the Aeon Environment Foundation, and the Beijing Municipal People's Government, and the decision was made to regenerate the indigenous forests along the Great Wall on the outskirts of Beijing over a three-year period starting in 1998. At the time I was the first Asian to have been elected President of the International Association for Ecology, and with the recommendation of both Japan and China I was appointed to lead the project. From previous surveys I knew that the primary tree around the Great Wall in the province of Yanqing was *Quercus mongolica*, and we proposed to the mayor that we should create forests using mainly this species. However, the head of the city's Forestry Division and others told us, "Those sort of trees disappeared ages ago, we don't have them now. The only ones we do have are poplar, false acacia, willow, and alder." Fast-growing trees like that develop quickly but they do not last a long time. I insisted that if we were going to create a forest it had to be a real forest with indigenous tree species that could withstand disasters and would last a long time.

On three separate occasions between 1998 and 2000 we planted a total of 400,000 seedlings, mainly of the primary tree *Quercus mongolica* and also Chinese arborvitae, Chinese pine, acer and other species, together with 3,200 Chinese people from Beijing and elsewhere, as well as 3,980 volunteers from Japan. Because the trees were planted in very rocky areas with harsh conditions their initial development was rather slow, but a field survey carried out in June of this year (2006), the sixth year since the final planting, showed that with some exceptions the *Quercus mongolica* and other trees have grown over three meters high. Their roots have

Planted area along the Great Wall of China

Tree-planting festival in China

Tree planting in China

Planted area in the Pudong district of Shanghai, China

eaten their way firmly into the rock, binding the slopes like living rope. I was able to confirm that a native forest based on potential natural vegetation is steadily being regenerated.

The same sort of forest creation is being carried out using species indigenous to the area in the Pudong district of Shanghai, which is currently undergoing development, as well as along the Qingdao Expressway, around the Maanshan Steelworks, and other areas. All of these projects have been commissioned by local city authorities or companies, who plant the seedlings together with local residents. Forests are also being created around the Aeon shopping centers at Huhehaote in Inner Mongolia, Linxi, and Guangzhou.

Indigenous Forests and Biodiversity

Tree-planting festivals based on the concept of potential natural vegetation and on ecological field surveys of vegetation have so far been held over 1,500 times in Japan and overseas. I have planted trees with a huge number of people; together we have worked up a sweat on our brows and felt the solid earth with our hands. I believe that there is so much more to planting a tree than just a scientific investigation to take stock of the present conditions—it is the act of planting a tree in the hearts of every individual. The forest is the root of all life; it is the womb that revives our biological instincts, that deepens our intelligence and increases our sensitivity as human beings.

Local forests that have been regenerated or created using trees indigenous to the area on the basis of the concept of potential natural vegetation do not just carry out diverse functions of disaster prevention and environmental protection; at the same time they have an ecological connection to the conservation and maintenance of biodiversity. E.O. Wilson advocated the importance of biodiversity at the 1992 United Nations Earth Summit in Rio de Janeiro, after which the preservation of biodiversity became a worldwide environmental theme. There is now an ever-growing body of thought that we should preserve native and endemic species, preserve all their particular characteristics from their genes to their ecosystems, and ensure their continuity in every region of the world.

We have successfully regenerated forests of multi-layered plant communities that are extremely close to their natural state using the method of densely planting mixed species indigenous to the area. We have worked to regenerate and maintain the diverse forest ecosystems, from the layers of tall trees and semi-tall trees to the short trees, the bottom weeds and even the bacteria in the soil. For us, the protection of biodiversity is a fundamental principle that guides our actions. We started putting our method of forest creation into practice in the 1970s, which means that we pre-empted Wilson's thinking on the preservation of biodiversity by nearly 20 years.

Protecting the environment of indigenous forests is protecting life, protecting genes, and protecting the mind. At the same time, it makes a definite contribution to the regeneration and maintenance of ecosystems and biodiversity native to particular areas. Everyone has a leading role to play in creating forests. Let us go out and create real forests based on potential natural vegetation—not waiting for tomorrow, but starting now from where we are standing and spreading outward to the whole world. I myself am resolved to continue to plant trees based on potential natural vegetation together with you all, starting from where I stand and spreading to the whole world, so long as I have life left in my body. Receiving the Blue Planet Prize has made this resolve stronger still.

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Profile

Dr. Emil Salim

Professor, Faculty of Economics and Post Graduate Course, University of Indonesia
Former Minister of Population and Environment, Republic of Indonesia

Education and Academic and Professional Activities

1930	Born on June 8 in South Sumatra, Indonesia
1958	Graduated from University of Indonesia, Faculty of Economics
1959-1964	University of California at Berkeley, USA, Ph.D. in Economics
1970-1972	Vice Chairperson of the National Development Planning Agency, and concurrently State Minister for State Apparatus Reform
1972-present	Professor, Faculty of Economics, University of Indonesia
1973	Bintang Mahaputera Adiprandana from the Government of Indonesia
1973-1978	Minister of Transportation, Communication and Tourism
1978-1983	Minister of Development Monitoring and Environment
1982	Golden ARK (Commandeur) of the Netherlands 1983-1993 Minister of Population and Environment
1983-1987	Member of the World Commission on Environment and Development
1990	Paul Getty Award, USA
1992-present	Founder and Chairperson of the Board of Trustees of the Sustainable Development Foundation
1993-2003	Founder and Chairperson of the Board of Trustees of the Indonesian Ecolabelling Institute
1994-2003	Founder and Chairperson of the Board of Trustees of the Indonesian Biodiversity Foundation
1994-1999	Co-chair the World Commission on Forests and Sustainable Development
1995-1999	Deputy Chairperson of UN High Level Advisory Council for Sustainable Development
2000-2002	Chairperson of the UN Commission for Sustainable Development
2001-2002	Chairperson of the National Economic Council
2001-2002	Chairperson of the Preparatory Committee of the World Summit on Sustainable Development
2001-2002	Member of Advisory Group for the President of the Republic of Indonesia
2005	Zayed Prize Winner for Environmental Action Leading to Positive Change in Society

Dr. Salim was born in South Sumatra in 1930 and was educated in a Dutch elementary school

during the Dutch colonial period and in a Japanese school under Japanese occupation. He learned the importance of a capacity for logic from his father who was an engineer and acquired an interest in religion from his mother who was a devoted Muslim. He grew to become interested in economics and studied economics at the University of Indonesia.

After graduating from the university, Dr. Salim went to University of California Berkeley in 1959 and studied mainstream economics at that time in the United States, and earned a Ph.D. degree. Later, returning to Indonesia and while teaching at the University of Indonesia, he participated in a team of economics experts for President Soeharto and dealt with the issues in building the nation with a sound management based on macro economics with an emphasis on market principles and began to have influence on the management of the economy.

In 1971 at the age of 41, he became Minister of State for Administrative Reform, and till 1993 for 22 years served four terms the ministerial positions as Minister of Transportation, Communication and Tourism, Minister of Development Monitoring and Environment, and Minister of Population and Environment. He became the first minister of the Environment in Indonesia in 1978 with the strong request of President Soeharto who became concerned of the environmental destruction caused while the country goes through economic development and executed environmental policies which enable economic development consistent with environment conservation.

As minister of Environment, he enacted the Basic Guidance for Environmental Management in 1982 which is Indonesia's first general and comprehensive fundamental law on the environment, and further built the foundation of environmental administration in Indonesia by establishing the Environmental Impact Management Agency.

The foresight Dr. Salim had shown through trying to build a sustainable society gained high international reputation, and from 1984 to 1987, he participated in the United Nations World Commission on Environment and Development (The Brundtland Commission) representing Asia and made a significant contribution in establishing the concept of "Sustainable Development." After the Earth Summit was held in Rio de Janeiro in 1992, as Deputy Chairperson of UN High Level Advisory Council for Sustainable Development, he contributed in coordinating the discussions on sustainable development carried out in the United Nations. In 1994, he became the co-chair of the World Commission on Forests and Sustainable Development which was established modeled after the Brundtland Commission, and in 1999 published the report "Our Forests Our Future" by listening to the voices from worldwide, stressing the need of sustainable development in forest conservation which was facing crisis.

At the Johannesburg Summit which was held ten years after the Earth Summit, Dr. Salim as the chairman of the 10th Commission on Sustainable Development which served as Preparatory Committee for the World Summit made a significant contribution in getting the consensus and in preparing the draft implementation plan.

Dr. Salim addressed from early on the environmental problems in the developing nations region in Asia, and as the chairman of the ASEAN Environment Ministerial Congress, set the target, the scope, the program and the action plan for the ASEAN nations to cooperate in the environment area. He also participated in the meetings of the Asia-Pacific Forum for

Environment and Development (APFED) and made a large contribution in arranging the recommendation to the Johannesburg summit and the final report. It is of great significance that the opinions from the developing nations of Asia were voiced to the world by Dr. Salim being the pioneer, when there were hardly anything raised about environmental problems in the developing nations of Asia in the international arena.

After serving as Minister of the Environment of the Indonesian government, while teaching at the University of Indonesia, Dr. Salim has put his efforts in promoting various environmental NGO activities such as the "Indonesian Biodiversity Foundation," placing himself at the core of various promotion propagation activities. He has also helped and assisted the African nations in its development problems and environmental issues.

Dr. Salim has taken the initiative ahead of the world in consolidating the development plan with environmental consideration. And to realize Sustainable Development, he showed great leadership consistently in Indonesia, in the developing nations of Asia, in the Asia-Pacific region and the whole world, played an active role internationally, and contributed to better the global environment.

Essay

Out of the Poverty Hole

Dr. Emil Salim

October 2006

A woman fell into a deep empty hole. There was no water, only clay and stone and the walls were steep, difficult to climb. There was nothing she could use to pull herself out of the hole, no tools, no ladder, nothing. She shouted loudly to call for help, but nobody listened. The woman got tired and weak. She waited for a miracle, if only somebody knew that there is someone in the hole and by only throwing a rope, she could pull herself out of the hole. But then she is still not safe, because she may fall in another hole that is spread all over the place. Her life is uncertain in a place full of holes.

Profile of the Poor

There are many "poverty holes" in the globe today and many poor people are still trapped in it. At the end of the 20th century their number has reached 2.2 billion out of 6 billion people of the globe. These people are usually the vulnerable poor living in developing countries. The poor live in rural areas but have only small plots of land, not enough to support their basic needs. Muscles are their only "tools" of work. They work in agriculture on land not their own. If they live in cities, they find their living in informal sectors as street traders, to sell whatever they can sell with their limited funds. Most of them earn their living with low cost activities like collecting and recycling garbage, selling newspapers, bottled drinks, cigarettes, and some time even their own body. They live in squatters or slum areas without access to clean drinking water, decent sanitation facilities, and they are forced to use rivers or ponds as toilets. They do not have electricity and telecommunication facilities. Many of them are still illiterate. Few of them have obtained primary education. Some continue to lower level secondary schools, but most of them cannot afford education to higher level secondary schools. The household size of the poor is large, but many of them will not survive long. The girls from poor families, when reaching the marriage age level, drop out of schools to prepare themselves to become housewife. If the wife delivers her baby, she is usually assisted by unskilled midwife, with high risk of loosing her life. The poor suffers high maternal mortality rate and high infant mortality rate. Malnutrition is high among the children of the poor. Many of these children go to school without breakfast and with only few dollar cents to buy cheap food for lunch. Health facilities are poor and inadequate to cope with people's diseases, like malaria, tuberculosis, flu, and infection of respiratory and digestive channels.

Poverty is not inherent in the genetics of the people, but it is strongly affected by the socio-economic conditions of the poor. Most poor family's breeds further poor offspring that

are trapped in the "poverty hole". As poor individuals caught isolated in poverty, they have no one to rely upon and no access to any means to help them out of poverty. But in society as a group the poor can rely on social solidarity for help. In rural areas, the customs of "mutual help" still exist at times of sickness and death. The poor can enjoy community support for weddings and building family houses. The poor can also rely on the available food supply in community's rice storehouse to meet bad seasons. Informal leaders can play effective role to help the poor through social institutions, like collective praying, mosques, churches, religious praying centers, community based organizations and non-governmental organizations.

The strength and effectiveness to uplift the poor depend very much on the quality of social cohesiveness of the society, which is much stronger in rural than in urban communities. Rural society is much closer to their natural surroundings and is more holistic and eco-centric in their environmental worldviews as opposed to the atomistic and individual centered environmental worldviews. According to this eco-centric worldview, human beings are part of and not apart from the community and the ecological processes that sustain all life. Under these circumstances the social cohesiveness fabric becomes strong, which makes possible to uplift the poor from the "poverty hole." With the introduction of industries and the growth of urban cities, the society's link with nature and its surroundings becomes more "human-made" and detached from the natural surroundings, pushing away the holistic eco-centric worldview and replaced by human-centered environmental worldviews. In this view, human beings are the planet's most important and dominant species that manage the planet for their own benefit. This leads towards the atomistic individual centered orientation of behaviors and actions. (*Miller*, 2002, 375-377).

Society is classified into the upper rich class, the middle income group and at the bottom of the poor. To allocate resources most efficiently among alternative wants, the effective vehicle is price mechanism that registers demand and supply signals through the market. This is especially true for non-public resources, non-public goods and services. Markets reveal relative scarcity of resources, goods and services only under very strict assumptions, such as the validity of property rights, the availability of full information, equitable income distribution, free competition and economic efficiency. When market allocates resources in the development process, the rich are more equipped to lay claims on resources that suit their benefits better than the poor. The market cannot cater to the needs of the poor because they have limited accessibility to resources and development capability that determines the outcome of the market. But it also reveals the ingredients for policies to alleviate poverty.

Poverty Alleviation through Sustainable Development

The twentieth century model of development has demonstrated that development along the single path of economy is necessary but not sufficient. Gross World Product has increased with a factor of seven in 2000 compared to 1950. The world of today is better off materially. But the existence of 2.2 billion poor people in the globe is morally not acceptable. The same applies to massive hunger that still persists in Africa. The digital divide between the rich and poor countries is increasing because education and human capacity building are seriously lacking in developing countries. Social development is not moving as fast as economic development.

This is also true with environment. Million hectares of forests have shrunk. Transportation, industries and energy have released green-house gasses with serious impacts on global warming, climate change, increased water scarcity, negative impacts on agriculture and animal husbandry, and the emergence of new diseases, sea level rise, increased typhoons and stormy weather.

Conventional development as conducted in the past is clearly not sustainable and cannot proceed on the "business as usual" basis, when population is climbing from 6 to 9 billion at the end of this 21st century and the proportions of the poor are increasing. Hence, sustainable development must change fundamentally the content of conventional development by embracing simultaneously economic, social and environmental sustainability with as its focus to reach for the goal of poverty alleviation, to get the poor out of the "poverty hole."

Within this context, sustainable development requires that economic development must take deliberate efforts to build human capacity through education. The focus of education must change from education *about* to education *for* sustainable development (Osman, 2005, p.28). Education for sustainable development is focused on building human capacity, individually as well as societal, that raises the quality of life to a balanced level between the physical needs for human survival and the psychological as well as the social needs of human being in a society to live a humane life in harmony with natural environment.

Economic development affects environment as sources for development. The basic notion here is that perpetuity of economic development emphasizes enrichment rather than the exploitation aspects of natural resource development. Science and technology can enrich trees to derive higher value than those of wood by transforming the bark of trees, leaves, fruits and its roots to medicinal ingredients.

Economic development affects horizontal and vertical social mobility that changes the social structure of the society. The movements of the rural poor to the cities are triggered by the image of having a better life in the more developed urban areas. Economic development affects the poor through it's wide repercussion on environment and social development.

Social development on the other hand affects the economy through education, human capacity building, skill formation, knowledge, science and technology development that raises productivity of the society, and it also opens the opportunity to add values to natural and environmental resources. Social development enables us to attack the roots of poverty by opening the accessibility of the poor to acquire economic developmental tools. Social development acts like a "rope" that is thrown into the "poverty hole" to enable the poor to pull themselves out of the hole.

Environmental development assures the sustainability of economic development by maintaining natural eco-systems to function continuously. It assures the conservation of water, clean air, comfortable climate, soil fertility and the diversity of genes, species and microbes in an interconnected and interdependent web of life. Environmental development ensures stability of the "web of natural life" by maintaining diverse eco-systems that on the other hand enables natural environment to sustain also the "web of societal life." Such a healthy "web of natural and social life" will be beneficial for the poor who always suffer first when the reverse happens.

In focusing on poverty alleviation it is important to structure sustainable development policies by taking into account the vice-versa interdependent relationship between economic, social and environmental forces of development affecting the needs of the poor. Because of market failures, such an interdependent approach of sustainable development cannot fully rely on the free market as an appropriate tool for poverty alleviation. Market responds more accurately to demand for private goods and services rather than for public ones. To cater medicines for the rich are more profitable than those for the poor. Private transportations are more lucrative for business than public transportation. Government intervention in the market is therefore required to overcome market failures and to correct price distortions.

But governments in most developing countries are weak, especially in soft states, which cause underdevelopment. This leads to many instances where government's functions in public services, like infrastructure development, human and societal security, are taken over by corporate business groups. Also in general election to elect public officials, the funding of campaigns depends too much on business contributions. It may create collusion and a strong "mutual help" relationship between governments and corporate business groups. Development may then cater too much for the interests of business first and the general public later. This is especially true when the interests of the poor do not coincide with those of business, like the clash of interests in using land, forests, water, and space for the benefit of the poor as against business.

In this context civil society groups can play a balancing role between governments and corporate business groups. Civil society groups, with their close link to the poor, know the needs of the society at the bottom level in the villages much better than the corporate or governments. Through social networks with the poor, civil society groups are able to articulate felt needs of the poor more realistically. With this capacity, civil society can counter-balance the interests of business and politicians in governments to enable a more equitable approach of sustainable development to serve the poor.

The prerequisite for successful sustainable development is the effectiveness of "good governance" that is able to reach an equitable balance between government's political interests with business' commercial interests and civil society societal interests, with special emphasis on the interests of the poor. "Good governance" requires high quality of intimate *trust* between government, corporate and civil society groups. Trust will not come automatically, but must be nurtured to grow towards a common focus of elevating the poor out of the poverty trap through sustainable development.

Pro-poor Sustainable Development Policy

Development is usually indicated by the annual growth rate of Gross Domestic Product (GDP) as it applies to the whole economy on national as well as on per capita basis. High growth rate of GDP per capita is necessary for developing countries to meet the many challenges of underdevelopment. But obtaining high growth rate of income per capita in macro-economic terms does not automatically imply a similar high growth rate of income for the poor. The results can be entirely different when high growth rate of income is achieved through increased output by intensive capital projects and rising exports by modern highly capitalized extractive industries

with no linkages to the people, especially the poor. The popular arguments of "trickle down effect" are here not valid and are not effective to pull the poor out of the "poverty hole." The fact that conventional development of the last fifty years has raised economic growth with increased number of the poor is a clear demonstration that fruits of development have not trickled down effectively to the poor. This trend of unequal growth pattern between the rich and the poor must change into a more equitable growth through pro-poor sustainable development policies.

To what extent aggregate growth process is pro-poor can be derived from the key measurement tool, like the "growth incidence curve," that indicates how growth rates for given quintile vary across quintiles ranked by income. Pro-poor growth is indicated by the growth rate in the mean of the poorest quintile (Ravallion and Chen, 2001, 2).

Such a pro-poor growth requires focusing on several priority sectors: First, is the need of the poorest of the poor to meet their basic needs of food. The greatest portion of spending of the poor is on food. It means that for the poor, the availability, accessibility and the purchasing ability to secure food is of the highest importance. The policy of poverty alleviation must integrate the various factors affecting food, such as price, trade, production, distribution, imports, and storing food policy.

Food is not only an agricultural commodity produced by farmers; it is also a vital commodity that affects heavily the conditions of the poor, who spend most of their income, energy and time to obtain food. It requires a level of price that affects the number of the poor below the poverty line, but it needs also to sustain farmers to earn a decent living. Price formation of food concealed conflict of interests between alleviating poverty and raising farmer's income.

Farmers with mini plots of land that is not enough to sustain their basic needs or farm-labors without land of their own are the majority of the poor living in rural area. These poor are in general net buyers of food and are hence vulnerable to global, national and local price increase of food. Under these circumstances it is not acceptable to give more weight on high price policy of food under the pretext "to protect" the farmers who are not net buyers of food, at the expense of increased number of the poor below the poverty line. Food price policy must favor the interest of the poor. Efforts must be made to make the terms of trade of products the poor sell much higher than what the poor buy.

The urban poor require skill, capital and technology for non-farm development program, since they have only their body and muscle as their "capital" to work. Therefore pro-poor policy must prioritize capacity building of the poor for non-farm, industrial and services development. Most urban poor earn their living as street traders in informal sectors. Urban planning must take these interests of the poor into account and provide urban space to be combined with financial and food health facilities accordingly.

The vulnerable poor and the near poor are living precariously under and close to the poverty line. Among the poor, it is the poorest quintile at the bottom of the poor that suffer the most and carries the highest risk of collapse in times of crisis. They are also the weakest link in the chain of social life. If this link is not strengthening, any small crisis can break the chain and turn the society into disorder. It is therefore important that the pro-poor policy is focused on empowering the poorest of the poor that have a spill over effect in strengthening the fabric

of the whole society. A stable society and an increased purchasing power that starts from below will create a condition that is conducive for sustained development.

The *second* priority area of pro-poor development policy is trade. Developing countries' factor of endowment forms the basis for natural resource development like agriculture and mining. These products are subject to seasonal and price fluctuation. Because of lack of capital, the poor producer looses competition against the wealthier traders. The difference in economic capabilities raises the dependence of the poor to the wealthier traders, who also acts as its "personal financer," off-harvest food supplier, provider of inputs and seller of their output. Under these conditions the traders bargaining position is always stronger than those of the poor and will always reap the benefit of any price increase, while any price drops is passed on to the poor producer.

Pro-poor development policy must raise value added of agricultural and mining development by enabling domestic producer to process raw material into final products. In most cases the poor is trapped to produce raw material only, because they don't master the technology and skill of processing. Hence, government must actively interfere to raise production capability of the poor and to link them in the network of science and technology to joint the trend of change to shift conventional raw material products into higher value added products in the global economy.

Pro-poor policy must also enhance linkages with other producers of similar conditions to raise their economic and social bargaining power. The poor lacks financing and marketing ability. Pro-poor policy must induce cooperation in marketing and develop better financial services for and by the poor.

The *third* area of pro-poor sustainable development policy is energy, especially renewable energy. Micro-hydro power, solar energy, biomass energy, wind energy, natural and steam gas combined with a decentralized local grid system are examples of renewable energy system that need to be coordinated with existing electricity network.

The supply of renewable energy development must be linked with a restructuring of demand side, by designing appropriate transportation, information and communication system, road network, rural, urban and housing architecture with the focus of energy savings and its optimum utilization.

The world is currently facing "green house gas" emitted by fossil fuel based energy, transportation and industrial development. Increased air pollution will raise global warming, climate and level of the sea. This will negatively affect agricultural and especially food production, increases new diseases, raises frequency of storms and floods, which will hit the poor more than any other income groups of population.

This comprehensive renewable energy program must include efforts to correct market failures. Government's taxation, subsidies, licenses, and all other policy tools must necessarily internalize into the cost structures of production all externalities that affect negatively the quality of environment. It must raise prices of items that degrade and reduce prices that improve social and natural environment. All this market corrections are aimed at the goal of "getting the prices right." Removing price distortions through the correction of market failures will improve the quality of the pro-poor sustainable development policy.

There are of course other important focus areas for pro-poor sustainable development policies. However suffice it is to demonstrate the intricate content of pro-poor sustainable development policies that cover agricultural food production, trade and energy. The content will be made more complex because of the fierce competition between developed and developing countries in the global economy.

While leaders of developed countries are preaching for the need of open markets, free competition and economic liberalization to developing countries, the grim reality is that developed countries themselves are not implementing them within their own boundaries and in global negotiations.

Agriculture has the potential to become the main engine of growth in developing countries. It fails because of limited market access into the developed countries market. High import duties, quota system, non-tariff trade barriers, anti-dumping arrangements, special safeguard mechanism, special and differential treatment for developing countries are market access provisions of the *World Trade Organization* framework agreement on agriculture that requires fundamental changes in the current trade system between developed and developing countries.

Developing country exporters in agriculture are facing protection that is four to seven times higher than in manufacturers in the *Organization for Economic Cooperation and Development (OECD)* countries. Domestic support and subsidies for agricultural products in developed countries have made these products artificially competitive against those produced in developing countries. In the *European Union*, *Japan* and the *United States* the combination of quotas, tariffs, and subsidies have made domestic producer to receive more than double the world market price. In sugar for example, OECD governments alone have supported sugar producer at the rate of $6.4 billion annually, which is equal to sugar exports of *all* developing countries. This has made possible for the *European Union* to change from a net importer of sugar in the early 1980s to a net exporter today.

US subsidies to cotton growers of $3.1 billion (2003) were 1.5 times higher than US foreign aid to Africa. These subsidies depress world cotton prices by 10-20% and have reduced income of poor farmers of Western Africa, Central and South Asia and other developing countries. More than 70% of subsidies in developed countries are directed to large farmers, who have reached income that are higher than average incomes in Europe and Japan and to a lesser extent the United States. (*Newfarmer R*, 2006: 17-18). The WTO is currently under severe pressure from developing as well as developed countries to reach for a wise solution. Because voting arrangement of WTO is based on dollar contribution, it will put developing countries in a most disadvantageous position.

On energy, the Final Report of the Extractive Industries Review commissioned by the World Bank has recommended to phase out World Bank Group's investments in oil production by 2008, the year of the first commitment period under the Kyoto Protocol, and devote its limited scarce resources to investments in renewable energy resource development, emissions-reducing projects, clean energy technology, energy efficiency and conservation, and other efforts to delink energy use from greenhouse gas emissions (*Extractive Industries Review*, 2003, 64). This proposal was rejected by the World Bank because the Bank considered that fossil fuel investment will raise export earnings and other economic benefits to developing

countries, and the negative impact of fossil fuel development on the environment is considered lower than the positive impacts of economic development.

Taking these circumstances into account, it is clear that substantial changes are required in international institutions, such as WTO, World Bank and International Monetary Funds, who base their decisions on dollar-vote. Globalization has blurred national boundaries. Greenhouse gas emissions in one country raise their impacts on the global environment affecting all countries. It is hence imperative that international institutions that affect the global economy, society and ecology cannot be based on dollar votes, but must be part of the UN family with decision making on the basis of country vote. This is the logical consequences of the globalization process that affects all walks of life of anyone in every country. But most poorest of the poor are concentrated in developing countries, and they will suffer the most from any decision making process that put them "outside the development voting box" to be left behind suffering in the "poverty hole."

There are too many human beings under the poverty line that are still trapped in "poverty holes" of the globe. It is the moral and humane duty of decent people all over the world to pull the poor out of the "poverty hole" and to enable them to walk on the path of sustainable development towards a life worth living for all.

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Lecture

Plain Living, High Thinking

Dr. Emil Salim

Introduction of the Problems

It was in March 1978 when President *Soeharto* invited me to joint him on a boat ride at the Jakarta Bay. This was the time when the just elected President invited candidates for cabinet position to have a person-to-person talk with him away from the glare of television lights and crowded journalists.

We passed the mouth of the *Ciliwung River* at the Jakarta Bay, when he showed me the polluted dirt entering the sea. The water close to the coast was full with filth. The President told me that he enjoyed fishing here in the past, but he now had to sail further away from Jakarta Bay into the ocean. He told me about his village life when he was a young boy playing with friends in the forests, washing his water buffalo and joyfully swimming in clean rivers. But now not only the Jakarta Bay is heavily polluted, but also the river in his village and all other rivers, the forests have also gone and we have not even started our development yet, he uttered a sigh with anguish.

Then he looked into my eyes and said with a firm voice, that he wanted me to prevent further environmental destruction. We must reconcile development with environmental construction. Development should not be anti environment and environment should not be against development. Development and environment must be merged into one flow of joint effort. I want you as Minister of Environment to assist me.

I was honestly surprised by this offer. I am a trained economist and I have served in the National Development Planning Board. I know somewhat about economics and development but to be frank, I don't know anything about ecology.

The President however argued that because I am a developmental economist, it is easier for me to reconcile development with environment. "Since you are an *economist* it must be somehow related to the same word of *oikos* in *ecologist*, isn't it? Why not reconcile economy with ecology?" And with a smile he extended his hand and shook my hand.

Since then I have traveled the road searching to reconcile development with environment and economy with ecology. In this journey I have gained some wisdom and knowledge from numerous leaders, experts and common people around the globe to make me beginning to understand the idea of sustainable development and ecological economy.

Environment Ministers usually have to attend regular annual meetings organized by *United Nations Environment Program (UNEP)* in Nairobi, Kenya. UNEP was created in Stockholm, Sweden, at the *UN Human Environment Conference* (1972). Since then the word "environment" entered into the world's vocabulary. Some progress has been made in environment, but the negative impacts of development on environment have moved much faster.

UNEP called in 1982 for a Special Session to review progress made ten years after

Stockholm. The general consensus of this session was that environment had to be considered within the framework of development. Based on the proposal made by Japan, the Special Session agreed to set up a *World Commission on Environment and Development* (WCED) to explore efforts to reconcile environment with development in a global agenda for change. Prime Minister of Norway, Gro Harlen Brundtland, was asked to chair and she selected 21 personalities representing different continents of the globe to become members of what became known as the *Brundtland Commission*.

Saburo Okita, who was the oldest, represented Japan but also the most experienced of the group. He was one of the prominent architects of Japan's post war development in the fifties. He shared his experiences with commission members on the good and the bad sides of development when environment was not known at that time. Developing countries can learn from the mistakes made when development neglects the environment. Discussions among commission members were held everywhere and at any occasions. The group celebrated *Saburo Okita's* birthday on the boat while traveling on the Amazon River on the way to Manos, Brazil.

On the basis of discussions within the group as well as in public debates with various stakeholders from all continents that were visited by the commission, ideas were gradually sharpened up and have found its way into the Commission report "Our Common Future" (1987). After the publication of this report, numerous conferences and meetings have taken place in and outside the UN, which contributed to the enhancement of sustainable development concept with distinct differences from the prevailing concept of conventional development.

Almost twenty years after the *Brundtland Commission* has completed its work in Tokyo, February 1987, and the world has moved into the 21st century, the time has come to ask the questions what has development in the globe achieved thus far, what has gone wrong with conventional development model of today and in what direction do we have to go?

To answer these questions we need to revisit the ideas of Sustainable Development, as it was perceived twenty years ago when "*Our Common Future*" was published and to explore efforts, to reconcile "development with environment" and "economy with ecology."

Conventional Development's Achievements

The world of today has pursued in the twentieth century the pattern of "conventional development" that has been able to raise Gross World Product of the year 2000 seven times those in 1950.

The world has witnessed nations, like Ghana, Nigeria, Sierra Leone, Venezuela and others to reach the level of 1999 Gross Domestic Product per capita already in or before 1960 (World Bank, 2003, 149), which put them in a more advanced level than Botswana, Republic of Korea or India at that time. Now however the positions of these countries have been reversed, the latter countries have surpassed the former indicating the non-sustainability of former countries' development.

Conventional development has been able to raise income, education and health condition of developed countries but it has failed to do the same in developing countries. Out of 6 billion-world populations in 2000 more than 2.2 billion people were living on less than two

dollars a day. In many countries of Africa, Asia, Latin America and the Caribbean more people are suffering undernourishment, high infant mortality rates, low education quality, inferior health facilities, lack of clean drinking water and poor housing. In the meantime developed countries on the other hand, have to cope with increased obesity, aging population, underutilized class rooms, highly sophisticated disease control, abundant clean drinking water and increased demand for second summer housing.

In San Francisco the Vermont Meeting (1995), chaired by *Mikhail Gorbachev*, has voiced the concern that the current trend of global development is leading towards a world of 20/80, implying that 20% of the global population of developed countries will control 80% of global resources, while 80% of global population of developing countries will control only 20% of global resources, because of continued economic and technology strengthening of developed countries at the expense of weakening developing countries in the world of globalization, open market and free competition.

This gap between developed and developing countries is also increasing because of lack of capital and limited transfer of financial resources from the rich to the poor countries. It is recorded by the *Organization for Economic Cooperation and Development* that during 2000-2002 in the European Union, domestic subsidies to agriculture have reached up to $105 billion compared to $25 billion of net official development assistance; in the United States, $95 billion total agricultural support is accompanied by less than $10 billion net official development assistance; in Japan $58 billion total agricultural support is match by almost $5 billion net official development assistance. (World Bank, 2005, 184).

It indicates that funds are actually available in developed countries to assist developing countries, but the political will is seriously lacking. While in developing countries globalization, open market and free competition are widely promoted, in developed countries however, protection and unequal competition in subsidized agricultural products still persist.

Growth of Gross Domestic Product in developed countries also requires larger inputs of natural resources. *World Wildlife Fund* has estimated in 1999 the "ecological footprints" as "the amount of productive land needed per person to support patterns of consumption", which in US was 9.7 hectares compared to Japan (4.3 hectares), the global economy (2.2 hectares), People's Republic of China (1.5 hectares), Asia Pacific (1.3 hectares), Indonesia (1.2 hectares), India (0.8 hectares) and Bangladesh (0.6 hectares). (Asian Development Bank, 2005, 3). This "ecological footprint" is currently much deeper and is expected to be worse in this 21st century, if development continued to proceed along the path of "business as usual".

The main features of conventional development as promoted by the *World Bank* were to build infrastructure, import machines, protect industries from competition, invest in human capital, technology transfer, liberalize markets, free the exchange rate, privatize state-owned industries and expose them to competition. This model is widely supported by the *US Treasury* and the *International Monetary Fund*, and is popularly known as the "*Washington Consensus*." Under these conditions the main engine of sustained economic growth is private enterprise operating through the market. (World Bank, 2005, 45-46).

There is a rational logic in this development model that makes sense. Private enterprises will flourish in a market that is geared up for growth. It assumed however, that those pri-

vate enterprises are of similar strength and operate in a global market of equal level playing field. The grim reality is that competition between developed and developing countries is conducted with unequal strength, as if we are watching a boxing match between the heavy weight US champion, Mohammad Ali, against the heavy weight Indonesian champion, Elias Pical. It is obvious that the Indonesian champion with nutrition intake, training facilities, body weight and boxing skills far below the US champion, looses the fight.

The world has no facility in agriculture, industry or trade to close the gap between developed and the developing countries. The weak has to compete against the strong in a free competitive market. The results are that the gap has grown in the past and it will grow further in the future if no drastic change is made in the currently prevailing development model.

Market, Policy and Institutional Failures

When the *Brundtland Commission's* report "Our Common Future" was published in 1987, total World Gross Domestic Product was about U$33 trillion. In 2006 it has reached around $60 trillion, a doubling of World GDP in a time span of less then 20 years. In spite of such a growth, most shocking are the facts that the Commission's evaluation of the world situation 20 years ago is for the most part still valid today.

The world of today is still suffering poverty, hunger, low education and health facilities with ravaging effects on the quality of life in developing countries. On the other hand developed countries are much better off, although suffering from "rich country's diseases" like obesity, hearth diseases, overcrowded cities, traffic jams and lower birth rate. The gap between developed and developing countries is still widening, because of un-equal growth that still prevails today.

The basic flaw of the conventional development model is that it relies heavily on the market but fails to cope with market failures. Social and environmental goods are public goods, which the market cannot sell. Public vaccination against infectious diseases, for instances, is a social service whose values are not registered by the market. Clean air, rivers, mountains, forests, comfortable climate are environmental goods that have no market value.

Development that relies solely on the market will necessarily put economic values of goods and services on the forefront, while ignoring the values of social and environmental goods and services.

The market is also not accommodating externalities, in which one's action creates negative effects or externalities to "outsiders" and therefore raises their costs. One's action may create positive effects and positive externalities that raise benefits to "outsiders". Both negative and positive externalities are not revealed in the market and are therefore not accommodated in the cost structure of the producer and price structure for the consumer. With a distorted cost and price structure in the market, those products that pollute, like fossil fuel, will be overvalued, while those that are clean, like solar energy, will be under-valued. Under these conditions of price distortions, fossil fuel and other non-renewable energy sources are flourishing, while solar and other renewable energy sources are dwindling.

Private enterprises are oriented towards the interests of shareholders first and stakeholders later. Financial returns on investment dominate, while social and environmental inter-

ests play a subordinated role. With this outlook, it is not surprising if conventional development produces rapid economic growth, at the expense of social deterioration and environmental degradation as demonstrated by development indicators of the globe thus far.

Looking closer to resource use, conventional development model does not explicitly take into account the different nature of natural resources as renewable and non-renewable resources. Renewable resources have a threshold beyond which its regeneration will *not* take place. In utilizing renewable resources, development must therefore take this threshold into account. It also means that the choice and the use of technology must not exceed the threshold level for regeneration of renewable resources.

When renewable resources are located in public domain, like fish, we must apply principle of "sustained yield." Adequate and enforceable restrictions must be effective to avoid the validity of the "*tragedy of the common*"; in which everybody will face the tragedy of loosing if everybody wants to use freely common property.

Resource use management is different when using non-renewable resources that are subject to resource depletion and produce as by-product pollution and waste. These factors are not taken into the conventional development model and will then necessarily raise pollution and waste. When non-renewable resources are depleted, like in mining, the company usually leaves the place after paying some "farewell money" to the people left behind. There are no plans in the company's budget to deal properly with appropriate compensation to locally affected people who lost their livelihood. No time frame is drawn for the period before resources are used up to develop alternative substitutes to enable development to sustain beyond the time of depletion.

Factories ignore to deal comprehensively with wastes, especially hazardous and toxic waste, by not internalizing them in factories' costs structure and by not managing well its negative impacts. Unless the government and the corporate strictly enforce the environmental and pollution laws, these external costs will *not* be internalized in the conventional development model.

To cope with pollution and waste, the company should from the beginning and all the way through the life cycle of production take into account the choice of clean technology. The corporate must cope with all costs related to social and environmental degradation at all stages of production.

Closely linked to the externality problem is "property right," which according to the *Coase Theorem* posits that assigning property rights to any good, even if externalities are present, makes bargaining between affected parties and reaching efficient solution possible. (Callen and Thomas, 2000, 87).

The second basic flaw in conventional model of development is the use of scales, such as the time and size scale. Practically most conventional developmental issues are of short-term duration, highly influenced by the usual 5-year time frame of elected government officials. This limited and short-term period influences the way we conceive development, which has the tendency to be myopic and to deal only with developmental issues as observed through a tunnel vision. Only the short-term issues are caught on the radar screen, while the longer-term issues are outside the purview of conventional development. Social and environmental issues

are typical long-term issues. Its impacts are felt after sufficient time has elapsed. In the short-term model of economic policy, these long-term issues are insignificant because, as Keynes likes to say, on the long run we are all dead.

Another scale-issue is size. Most experiments of social and environmental development are initially conducted on a pilot project of limited scale. When it proves to be successful, the inclination is to blow these small-scale pilot projects into bigger size, with the risk of failures. Rice production, which was successfully experimented in Indonesia on peat-soil as pilot project in a scale of less than 10 hectares was blown up into 1 million hectares of peat-soil. The results have been disastrous.

Government bureaucrats are eager to reach for quick results. Small scale projects are trapped in the "fallacy of scale", where it is believed that the multiplication of small into larger scale of these projects will also multiply the results in growing proportions. This is not realistic.

The pressure for large and quick results has induced governments to launch development with a big push approach. Countries that have the ambition to jump on the ladder of technology development from low to high-technology in a short period of time have to pay highly subsidized costs. With economic crises these high-tech projects become easily the victim of bankruptcy.

After decades of centralization and strong central authority, under the spell of democracy, Indonesia has decentralized government's central power straight to the districts and bypassing provinces. When decentralization is executed with a big bang approach in 1999, it has created a stinginess effect that is still felt today. The adjustment from a highly centralized into a highly decentralized model of governance within a too short time period has created waves of confusions and instability that have now not been subdued.

The third basic flaw is that main actors in conventional development model are too limited to governments as regulators and policy makers with only businesses as executors of economic development. The government's task is to provide legal structure to create a healthy climate for businesses to flourish and grow. Other non-governmental and non-business actors are not playing a significant role.

In democratic system that has been widely promoted in developing countries, top decision making leaders are elected through general elections. Since campaigning and running political parties are quite expensive, candidates for top ranking government's positions are inclined to look for financial support from business people. The formation of illicit collusion between elected government and business leaders are the bitter consequences of such political alliances. It makes elected government leaders obliged to conduct policies that are very much pro-business and pro-free market to enable businesses to obtain a profitable rate of return on their political investments.

Currently a growing tendency emerges that successful and rich business people are actively striving for top positions in governments.

Under these circumstances it is difficult to expect government to be objective in intervening and correcting market forces for the benefit of the whole society. There are numerous examples of governments' policies that are very much pro-business while ignoring the inter-

ests of the small, the weak, the vulnerable and the poor.

The content of "development" is steadily eroded from its initial ideal goal of sustained livelihood and social welfare for the common people, to the content that is becoming increasingly commercial to raise material wealth and money. "Development" becomes now the general commodification of economic goods to be followed later of environment and social goods. (Rist in Development Dialogue, 2006, 71).

The market is increasingly replacing the state as the primary means of allocating resources that reduces also its executive capacity, its mandate and scope of its activities. The more the market dominates and the less the state regulates the better. This seems to be the hidden assumption of the Washington Consensus.

Under these circumstances it is of crucial importance to induce civil society groups that are non-governmental and non-business to grow into countervailing powers to push government and businesses to strive for policies and development that are very much pro-poor and pro-environment. With the dominance of neo-liberal paradigm that has pushed development away from the road to improve conditions of the poor, civil society organizations are increasingly growing in opposition to the state and to corporate capital. (Hyden in Development Dialogue, 2006, 183).

Since the *World Summit on Sustainable Development* (2002), a range of partnership among various actors has sprung up vividly to execute jointly the "Johannesburg Plan of Implementation". These partnerships follow in general the pattern of the triangle of equal actors comprising of government as regulator and policy maker, businesses as implementers with economic interests and civil society as balancing power to articulate societal interests, especially of the deprived citizens. The emerging triangle of equal partnership among government, business and civil society groups opens the opportunity to correct the various basic flaws in conventional development and opens the way towards sustainable development.

After 20 years of conventional development, it is clear that radical change is necessary to move development away from the pattern of "business as usual", to cope with its basic flaws and to follow the correct pattern of sustainable development.

Main Features of Sustainable Development

Conventional development model is used to follow a single linear line of approach to deal with economic developmental issues only, while other non-economic variables are frozen. When environment deteriorates, it cannot supply the needed resources to sustain development. Similarly if social factors are ignored and erupt into social conflicts, the sustainability of development will also be at risk.

It is clear that sustainable development requires a bundle of triple lines, consisting of economic, social and environmental lines moving in a spiral upwards of poverty alleviation, higher quality of human development with social cohesion, within a perpetuating life supporting eco-system.

This triple approach is to be formulated into "sustainable development matrix," that reveals dimensions of economic, social and environment in vertical and horizontal columns. Sustainable development requires an inter-disciplinary approach combining economic, social

and environment in a "three column and three row matrix" simultaneous development.

To pursue poverty alleviation through employment creation as the goal of *economic* development, will raise impacts on social and environmental development that must be managed.

Similarly, to raise human quality through education, health and human resource development with efforts to improve social cohesion as the goal of *social* development, will exert its impacts on economic and environmental development.

By the same token, to assure the sustained functioning of eco-systems to support life, such as water, land, air, climate, and genetic resources as the goal of *environmental* development will affect economic and social development.

With the application of "*inter-sector impact analysis*" the interrelationship and interactions between economic, social and environmental factors can be pursued. By managing the triple sector impacts within and between each factor, this comprehensive and holistic approach can ensures the sustainability of development.

In economic theory, *growth* was initially considered as moving along a singular linear line of economics only. Since the fifties "growth" has to make way for a wider concept of "development," which involves economic and social dimensions along a two linear lines. With the introduction of "sustainable development," however, development covers now a broader field of economic, social and environmental development. Development has left the single approach to shift into the triple lines along an upward spiral of sustainable development "that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Our Common Future, 1987, 430)

Requirements for Sustainable Development

This "triple lines" of sustainable development require strong management that is able to coordinated government, business and civil society through the triangle of equal partnership. Sustainable development can however be hampered by the weakest line in the bundle of triple lines. This calls for a management that strengthens and empowers the weakest link, which refers currently to the social and environmental dimensions of sustainable development.

Sustainable development model recognizes five modes of capital: namely natural, human, social, financial and human-made capital.

- The quality of *natural* capital is determined by the sustained function of networks of interlocking ecosystems;
- *Human* capital is affected by raising the quality of human resources through education, cultural, spiritual and human health development;
- *Social* capital depicts the quality of togetherness, the social relationships and networking among individuals that are strongly affected by the quality of the "*we-ness*" or "*Wirheit*" approach. Interesting is the fact that the Indonesian language has two words for "we", namely "*kami*" implying "*we-without-you*" and "*kita*" meaning "*we-with-you*." Investment in social capital implies strengthening togetherness of "*kita*" that enable inclusion of all members of society in a "*we-with-you*" togetherness regardless of differences in race, ethnic, religious beliefs, culture, custom law, language and political ideologies. Social cohe-

sion requires value formation and value strengthening of "unity in diversity";

- *Financial* and *human-made* capital is both creation of human beings that requires investments in hard and software.

With the proper combination of all these capital and recognizing constraints of nature's as well as societal carrying capacity or the "*Plimsoll line*," depicting the limits of cargo carrying capacities of ships, we can pursue sustainable production and consumption as the twin pillars of sustainable development.

Sustainable production can be achieved if in terms of *natural resources*, renewable resources are used below the threshold level and non-renewable resources recycled and used.

In terms of *energy*, priority must be given to maximize energy efficiency, to actively stimulate and promote the use of renewable energy, to reduce pollution by non-renewable resources through the use of clean technology with full awareness that "green house gas emissions" must be controlled in accordance with the *Kyoto Protocol* allowable limits to prevent climate change. On the demand side, we must launch cleaner and more efficient transportation modes, environment friendly urban development plans that are able to cope with floods, sanitation, and waste, pollution while assuring distribution of safe drinking water, clean air and healthy public open spaces. Construction of tropical architecture and building codes must promote energy efficiency and energy savings.

In terms of *spatial use*, through effective enforcement of spatial plan we must optimize the use of land and other natural resources within the constraints of eco-systems' carrying capacities. Spatial planning serves to prevent and solve social conflicts in resource use between resource exploiting companies and local people.

In terms of *technology*, it can optimize natural resource use and raise value added especially of biological resources, it eliminates hazardous and toxic wastes, and it recycles, reduces and reuses pollution and waste for further production. Biotechnology, genetic engineering, marine technology and nano-technology are most effective in raising value added of biological and marine resources.

Sustainable consumption requires that government's policies, taxation, subsidies, budget spending, laws and regulations are geared toward making available goods and services that are produced along the sustainable production patterns as close as possible to the consumer's purchasing power ability. Examples are by shifting tax burden away from immaterial human mind creativity towards material intensive human made consumption goods. Human mind creativity, such as science and technology development, creative arts and culture as well as spiritual endeavors will satisfy social-cultural demand that are using less material compared to material intensive consumption goods.

Similarly with government's policies of financial incentives in fiscal, trade and industry, we can promote renewable resource and recyclable non-renewable based consumption goods and services, such as in automotive industries that make more use of light, recyclable non-renewable material in construction of cars.

By imposing health regulations of the World Health Organization, government can promote requirements to reduce harmful and unhealthy substances in consumption goods, like nicotine in cigarettes or pesticides in food.

To assist consumer to choose healthy and environmentally friendly consumer goods, countries must impose eco-label, ISO 14000 and ISO 28000 and other international standards for environmentally friendly products.

To ensure sustainable consumption, we must apply transparency and disclosure of information on the content and quality of consumption goods.

Since markets fail to register social and environmental preferences, environmental valuation techniques have been developed to substitute for failures in "getting the prices right" (The Wealth of Nature, 2003, 116-126) as the basis "to get the incentives right".

To deal with pollution problems, emission charges are instruments to reduce the quantity of pollution. Under the Kyoto Protocol permits are issued equal to the permissible total emissions in the region. Polluters that are not using their allowable emission levels can sell this unused emission level as *tradable pollution permits* with scarcity values that provide incentives to create a market for these permits.

There are two methods for valuing in environmental resources, namely the *indirect* method in estimating the use value of resources by means of *travel cost method* and *hedonic pricing*, and the *direct* method through the *contingent valuation methods*.

Travel cost method uses the amount of expenditure spent on the trip and transport charges as well as the average time spent on the trip in reaching the sites of recreational forests, which reveals the total value of the forests. (Environmental Valuation, 2000, 140-141 and Natural Resources and Environmental Economics, 2003, pp.411-438).

Hedonic pricing, for instance, reveals to particular characteristic of a building to obtain high value because of its contribution to environmental benefits, such as the hotel rooms with ocean view compared to hotel rooms looking to the wall of its neighbors.

Contingent valuation methods assess the economic value of environmental services through surveys on the "willingness to pay" for demanding a given environmental service to be harmonized with the "willingness to accept" its compensation. The equilibrium between the "willingness to pay" and the "willingness to accept" determines the value of the environmental services.

Realizing that market failures persist in the economy, government policies can make the necessary corrections required by interfering in the market through fiscal, trade, industrial policies, regulations, licensing and by creating values for environmental goods and services through tradable permits, travel cost method, hedonic pricing and contingent valuation methods. More instruments are expected to become viable for valuing environment in the future.

By managing these inter-sector impact analysis, and by dealing with market failure combined with valuing environmental service, this comprehensive approach makes possible the change of conventional into sustainable development.

To manage sustainable development properly, the crucial prerequisite is the creation of *good governance* as revealed in the triangle of equal partnership between government, business and civil society.

It is not the government's scale of preference per se, or the businesses companies desired objectives only, but it is bundling up of the combined preferences of governments, businesses and civil societies that enable balanced management of sustainable development.

This is especially true when democracy has not been matured and government's institutions as well as the corporate are not yet functioning properly. Check and balance by civil society components in conjunction with improving maturity in democracy on the path of developing *good governance* make sustainable development more realistically feasible.

It enables social and environmental services to obtain appropriate compensation by interfering and correcting market prices. This interference requires institutional arrangements that make possible to capture the appropriate societal scale of preferences through the triangle of equal partnership between government, businesses and civil society.

It requires also an aspiration of striving for a common goal in a long-term time perspective that emerges through democratic deliberations from below with people's participation.

A goal that is not emphasizing long run economic achievements only, but is balanced by social and environmental achievements that enables sustainability of life for mankind and society within a life supporting natural ecosystem most feasible and desirable.

Implication of Sustainable Development on the World

At the international forum there are no similar national government's operating institutions, which make market corrections difficult on global level.

This will be made more complicated if powerful governments and international institutions are enforcing unilaterally their own convictions and economic ideologies of liberalism, free trade and private enterprises in a world with inequality.

International conventions are normally used to substitute for global governance but to be effective it must be based on multilateralism.

Since the world is differentiated in unequal economic, technology and political strength between the rich and the poor countries, developing countries adhere to the principle of "common but differentiated responsibilities". All countries have common responsibilities to enhance sustainable development, but these responsibilities must be differentiated in accordance with the differences in economic strength and development capacities between the two groups of countries.

Because the fruits of development are not equally shared between the rich and the poor countries, the burden of development cannot be distributed even. Unless developed and developing countries have equal rights, especially in influential world institutions when the dollar votes dominate such as the World Bank, International Monetary Fund and the World Trade Organization, the validity of "common but differentiated responsibilities" is its logical outcome.

On the other hand if this goal of equally sharing the benefits between the rich and the poor are not achieved, the danger will be that social and armed conflicts will perpetuate, as revealed in the current battles in developing countries of Afghanistan, Lebanon, Iraq and Palestine against the armed forces of developed countries of US and United Kingdom, making the world unsafe and unsustainable.

This calls for the need to strive for the essentials of sustainable development to live within the carrying capacity of the global economic, social and eco-systems.

The world has enough natural, human, social, financial and human made capital to support a humane sustained livelihood. Based on the accumulation of knowledge, science, wisdom and technology, human and social life can be sustained within a healthy ecological system.

The needs of the world today are in changing the course of development from an increased materially based style of life into an increased enrichment of immaterial, cultural, spiritual, knowledge and science based humane livelihood within the purview of human needs that is able to suppress human greed.

There are increased efforts today to critically review the economically based Gross Domestic Product and to strive for Green GDP to make the necessary corrections through internalizing externalities, by incorporating resource depletion and by including social and environmental benefits.

The life style of tomorrow does not imply reducing consumption, but consuming *differently*. What is needed is changing the quantity of consumption from resource exhaustion with finite energy inefficiency to raising the quality of consumption with resource enrichment and sustained by perpetual energy efficiency.

To strive for this different life style, *plain living* is the most ideal paradigm supported by the creativity of *high thinking* on the basis of science, technology, cultural and spiritual development.

Agenda for Actions

To reach for this goal of changing life style, the following efforts are required:

First, to educate and enrich human capacity to understand the interdependent net-working processes of the economy, society and ecology on the basis of symbiotic relationship of *natural sciences* (biology, ecology, physics and chemistry) that interact with *social sciences* (economics, sociology, psychology, anthropology, political science) to give substance to sustainable development, among others by making use of ideas developed by "Blue Planet Prize Laureates" during these last 15 years;

Second, to change the orientation of development from an "*I*" or "*aku*" and "*we-without-you*" or "*kami*" into a "*we-with-you*" or "*kita*" outlook. This is important to consider within the Asian context, since this region is expected to become the main "locomotive" of global growth in the 21st century. Unlike in the West, in Asia there is a strong urge to ascertain harmonious relationship between human being and God the Creator, between human being and nature and between human being and society. These Asian values are crucial in sustainable development and needs to be nurtured through moral persuasion, education, intellectual, cultural and spiritual enhancement;

Third, incentives, disincentives, punishment and rewards must be created through government policies, law enforcement and institutional development to shift paradigms of resource exploitation to resource enrichment by applying science, technology and local wisdom that

add value to social and natural resources;

Fourth, governance in sustainable development requires the involvement of government, businesses and civil society leaders in a triangle of equal partnership to enable maximum participation of all people to reach for poverty alleviation through full employment, raising quality of human development within a cohesive society and sustaining essential life supporting ecosystem;

Fifth, global partnership among nations on equal basis in decision making are necessary requirements to reach for Millennium Development Goals and the Johannesburg Plan of Implementation of Sustainable Development.

On the basis of these five-points it is possible to draw the essence of sustainable development, which is revealed in the notion of *plain living, high thinking* as the basis of a sustained life style for global survival with God's blessing.

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