



**2006 Blue Planet Prize
Commemorative Lectures**

財団法人 旭硝子財団

THE ASAHI GLASS FOUNDATION

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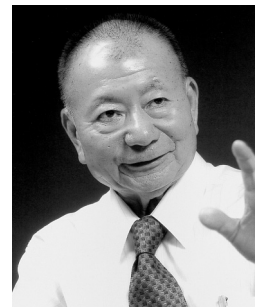
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Dr. Akira Miyawaki (Japan)

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



Selection rationale: For establishing a theory to restore and to reconstruct forests based on the concept of "Potential natural vegetation" and by implementing the theory succeeded in reconstructing disaster-preventing environment-conserving forests and tropical forests, contributed in restoring the green on earth.

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
1973-1993	Professor, Institute of Environmental Science and Technology, Yokohama National University
1985-1993	Director, Institute of Environmental Science and Technology, Yokohama National University
1993-present	Professor Emeritus, Yokohama National University
1993-present	Director, Japanese Center for International Studies in Ecology

Major Awards Received

1970	Mainichi Publication Cultural Prize for "Plants and Human"
1990	Asahi Shimbun Prize
1990	Goldene Blume von Rheydt Prize, Germany
1992	Purple Ribbon Medal, Japanese Government
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 papers 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 in 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 thunbergii*, 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 tropical 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 prove 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.

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.

1. 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 exist a great many people who feel 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, the 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?

2. 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 having 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 making 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 of the people for the creation of culture and give rise to their 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.

3. Specialty in the ecology of weeds

I was born the fourth son of a farming family in Kibi Kogen, Okayama Prefecture, a mountainous area some 400 meters above sea level. 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 them 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 get 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 from Okayama along the coastline of the Sea of Japan. 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 massive air raid 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 during elementary 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 Mr. 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 more. However, I did not want to return to the hunger experienced in 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 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 it and came to grips with it. I entered the University of Tokyo laboratory in April, and in May I was appointed to the position of an 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. 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 the 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.

4. 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 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 such professor's lectures in Berlin Technical University and want to read such books in Bonn University" Then he said "It's too early for you to listen to people's talk 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.

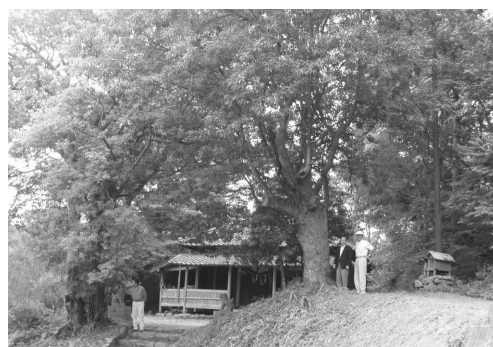
Around the time I published my first thesis on plant communities, Professor Tüxen said to me, "Weeds are important, but they are just like my beard—they grow because you cut them. The important thing is the concept of 'potential natural vegetation,' in other words what sort of vegetation a given area has the ability to support." Professor Tüxen had published in 1956, his idea of potential natural vegetation, the unadorned indigenous vegetation of an area, 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 the 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 Bit-chu 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!

5. 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 remained 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

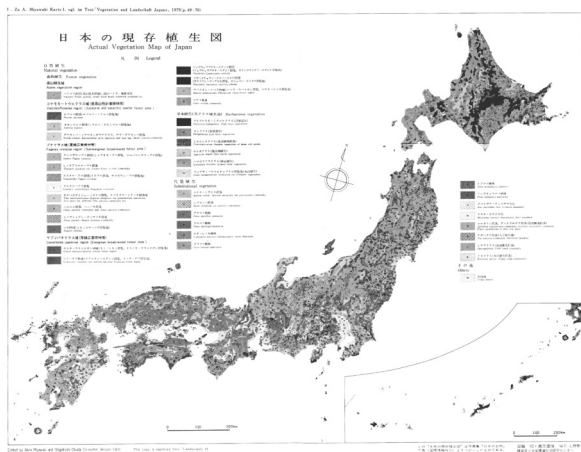
a mass of data on the vegetation around Japan, which came from the results of surveys carried out by crawling around on the ground, and these data were so important they were practically a census of the nation's greenery.

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.

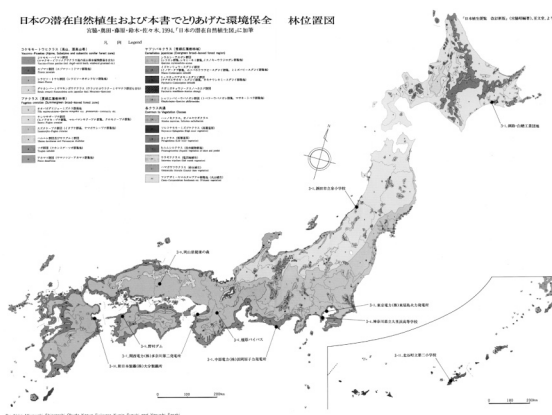
6. The completion of Vegetation of Japan

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.

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 per 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



Existing vegetation of Japan

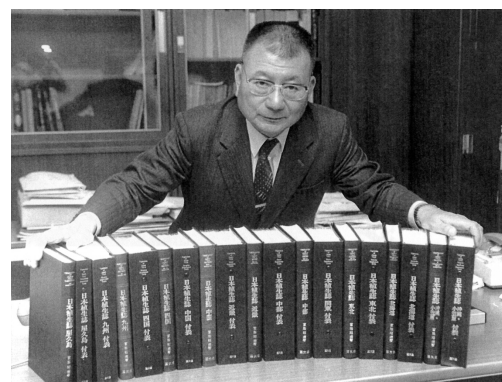


Potential natural vegetation of Japan

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 when the 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 volumes of the Vegetation of Japan to completion. I really am enormously grateful to all the members of

was for a near-perfect collection of vegetation survey data; during the day I worked hard doing 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.

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



Completed 10 volume Vegetation of Japan

the research laboratory 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.

7. 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 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 Mr. 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 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.



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

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



Planted area in a shopping center



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

1,000 seedlings per square meter. We densely planted different species together in a 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 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 Mr. Hideaki Nakagawa, the manager of the Administrative Department, got back to me: "OK. We will do everything we 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, Mr. Takuya Okada, honorary president of the supermarket store Jusco, part of the Aeon Group, gave his understanding and consent and from 1990 it was decided that all the premise of the new stores

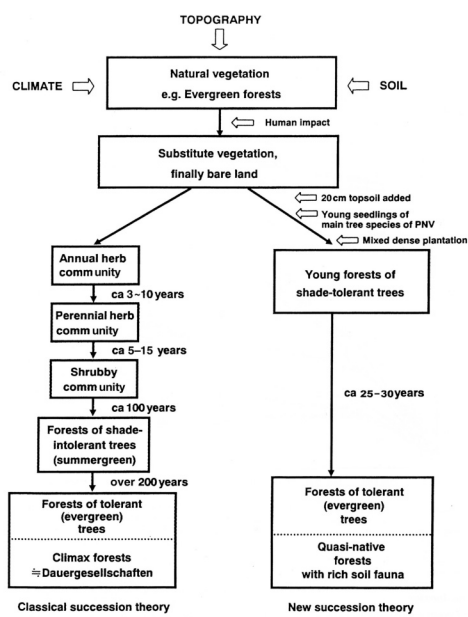


Fig. 4. Comparison between new and classical succession theory in laurel forest area of Japan.

Comparison of classical and new succession theories

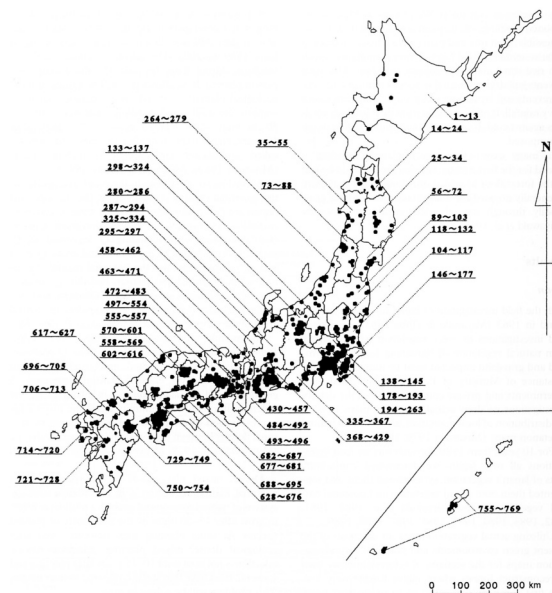


Fig. 2. Location of constructed environment protection, disaster mitigation forests in Japan as of 1 February 2003. Numbers show each planting spot.

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

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. 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.

8. 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, 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.

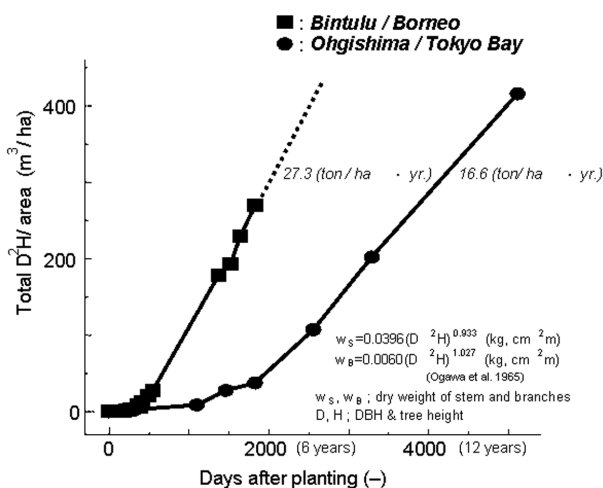


Fig. Volume indicator "D²H" in Malaysia (tropical rain forest zone) and Japan (Laurel forest zone).

Table. Speed to fix CO₂ by experimental afforestation.

Ohgishima/Japan	Bintulu/Malaysia
27.0	44.4
(ton/ha·yr.)	(ton/ha·yr.)

Comparison of CO₂ absorption and fixation between subtropical rainforest in Malaysia and evergreen forest in Japan (from D²H)

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.

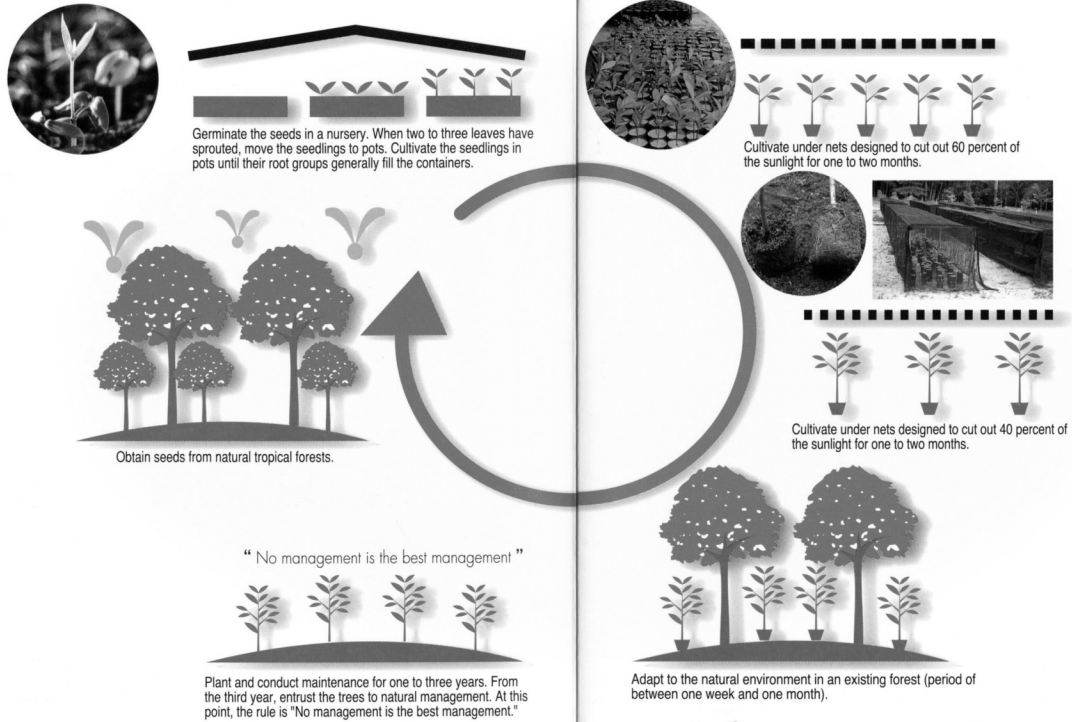
This project to regenerate the rainforest was extremely well received in Malaysia because it was carried out in the form of a joint research project with the UPM, which is the country's oldest university. On July 30, 2006, I was awarded an honorary doctorate in forestry—I was the first foreigner to receive such a degree, and I was deeply honored to receive

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 holes for planting 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 an ecosystem of a natural rainforest (see photo).



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)

The Miyawaki method for restoring tropical forests



The Miyawaki method for regenerating tropical forest

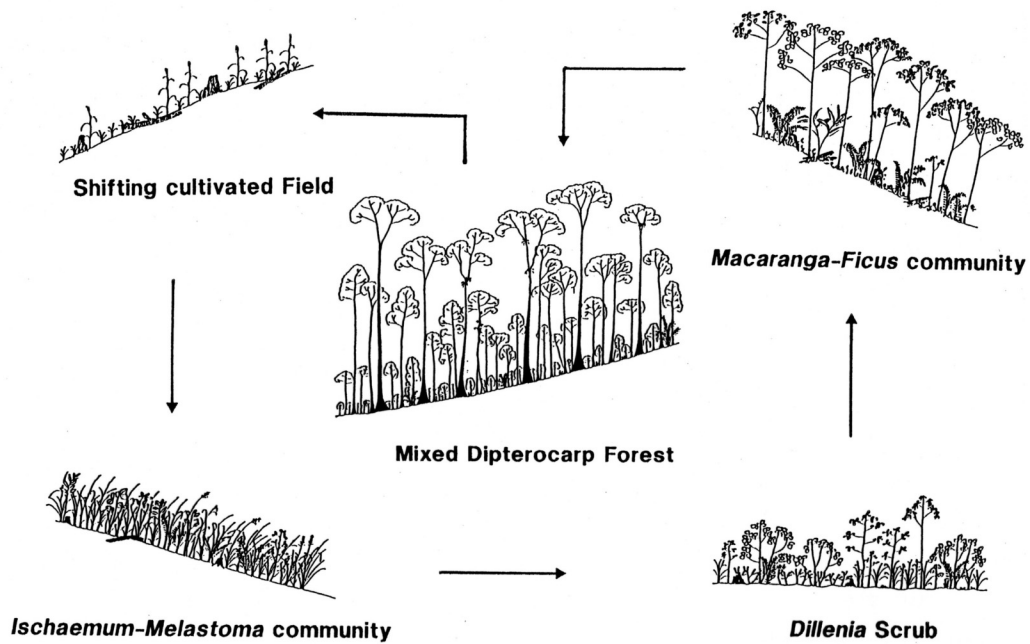


Fig. A succession of vegetation in the order:natural forest—shifting cultivated field—secondary grassland—scrub—young secondary forest in the vicinity of Bintulu, Sarawak, Malaysia.

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

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 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 in the area. We invited then Ambassador Extraordinary and Plenipotentiary Mr. 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.



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



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 Prof. Wangari Maathai, the Nobel prizewinner from Kenya who had 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 neighbor 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 survey from the former Ministry of Education. I met with Mr. 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 long. 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 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.



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

9. 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 with 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.

Dr. Emil Salim (Indonesia)

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



Selection rationale: For contributing in establishing the concept of sustainable development and furthering global environmental policies through various United Nations' committees especially as the chairman of the Preparatory Committee for the World Summit on Sustainable Development.

Education and Academic and Professional Activities

1930	Born on June 8 in South Sumatra, Indonesia
1958	Graduated University of Indonesia, Faculty of Economics
1959-1964	University of California at Berkeley, USA, PhD in Economics
1970-1972	Vice Chairperson of the National Development Planning Agency, and concurrently State Minister for State Apparatus Reform
1972-	Professor, Faculty of Economics, University of Indonesia
1973-1978	Minister of Transportation, Communication and Tourism
1978-1983	Minister of Development Monitoring and Environment
1983-1993	Minister of Population and Environment
1983-1987	Member of the World Commission on Environment and Development
1992-	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

Major Awards Received

1973	Bintang Mahaputera Adiprandana from the Government of Indonesia
1982	Golden ARK (Commandeur) of the Netherlands
1990	Paul Getty Award, USA
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 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 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 PhD 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 87, 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.

PLAIN LIVING, HIGH THINKING

Dr. Emil Salim

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*, 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 small 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 Programme (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*.

Japan was represented by *Saburo Okita*, who was the oldest 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 the development model that we have pursued 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 with the hope for a better future.

THE WORLD OF "OUR COMMON FUTURE" REVISITED

The world has witnessed that nations, like Ghana, Nigeria, Sierra Leone, Venezuela and others have reached 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 population 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 increase of 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 the developed countries at the expense of the weakening of 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 agricultural 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 is 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 footprints" is currently much deeper and is expected to be worst 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 private 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 are 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, loses 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.

When the *Brundtland Commission's* report "Our Common Future" was published in 1987, total World Gross Domestic Product was about US\$33 trillion. In 2006 it has reached around \$60 trillion, a doubling of World GDP in a time span of less than 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, heart 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 has 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 over-valued, 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 interests 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 in the conventional development model and will then necessarily raises 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 external 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).

A 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 has the ambition to jump on the ladder of technology development from low to high-technology in a short period of time has 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 by-passing 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 has now not been subdued.

A 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 interests 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 aside development 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 follows 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, if working effectively, opens the possibilities to make proper corrections of market failures on the way of sustainable development.

After 20 years of conventional development as pursued in the past, it is clear that radical change is necessary

to move development away from the pattern of "business as usual" and in to 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 ensure 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).

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: natural capital, human capital, social capital, financial capital and human-made capital. The quality of natural capital is influenced by the sustained function of networks of interlocking eco-systems. Water, air, climate, soil, forests and biological resources are elements of natural capital, whose quality and quantity depends fully on the sustained function of eco-system.

Human capital is accumulated by raising the quality of human resources through education, cultural, spiritual and health development.

Social capital depicts the quality of togetherness, social relationships and networking among individuals, which is affected by the quality of the "*We-ness*" or "*Wir-heit*" approach. Interesting is the fact that the Indonesian language has two words for "we", namely "*kami*" implying the mode of togetherness of "we *without* you", and "*kita*" as the mode of togetherness of "we *with* you" (Kita and Kami, 2005, 19-22). Investment in social capital means the strengthening of togetherness of "*kita*" that enable inclusion of all members of society in a "we *with* you" togetherness, regardless of race, ethnic, religious belief, culture, custom-law, language and political differences. Social cohesion requires value formation and value strengthening of "unity in diversity".

Financial and human made capital are both creation of human beings, which requires investment in hard as well as soft ware.

With the proper combination of all these capital and recognizing the constraints of resources carrying capacity or the "*Plimsoll line*" (mark on a ship indicating the water level limit that a full loaded ship may reach), we can pursue patterns of sustainable production and consumption.

Sustainable production can be achieved if in terms of *natural resources*, renewable resources are used below the threshold level; non-renewable resources are limited to the use of those resources that are recyclable and recoverable.

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 to 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 optimize the use of land and other natural resources within the constraints of eco-systems' carrying capacities. Spatial planning serves to prevent and solves social conflicts in resource use between resource exploiting companies and local people.

In terms of *technology*, it can optimize natural resource use and raises value added especially of biological resources, it eliminates hazardous and toxic wastes, and it recycles, reduces and reuses pollution and waste for further production. Bio-technology, 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 interference through 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.

Through health regulations, government can impose requirements in accordance to the *World Health Organization* conventions to reduce harmful and unhealthy substances in consumption goods, like nicotine in cigarettes or pesticides in vegetables.

To assist consumer to choose healthy and environmental friendly consumers goods, eco-label, ISO 14.000 and ISO 28.000 and other international standards for environmental friendly products must be imposed by countries.

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-economics have developed instruments to overcome market failures through efforts in "getting the prices right" (The Wealth of Nature, 2003, 116-126).

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 spend 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.

THE ESSENCE OF SUSTAINABLE DEVELOPMENT

At the international forum there are no similar national government's operating institutions, which makes market corrections difficult on global level. This will be more complicated if powerful governments and international institutions are enforcing their own convictions and economic ideologies of liberal economy, free trade and private enterprise in a world where the level playing field is not equal among developed and developing countries. Under these circumstances, international conventions can do the job but to be effective, it requires the involvement of all nations, rich and poor.

Since the world is differentiated in 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 to 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 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. There is basically enough for everyone in the world as long as we apply the features of sustainable development.

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 is 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 style of life.

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 reach for this different life style, plain living is the most ideal, supported by the creativity of high thinking on the basis of science, technology, culture and spiritual ideas.

To strive for this goal, the following efforts are required:

First, to educate and enrich human capacity to enhance the understanding of 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 interacts with *social* sciences (economics sociology, psychology, anthropology, political science) to give substance to sustainable development;

Second, to deliberate strategy of sustainable development to change the orientation from "*aku*" ("I") and "*kami*" ("*we without you*") into "*kita*" ("*we with you*"). This is most important to consider within the Asia context, which is expected to become the main locomotive of global growth in this 21st century. In Asia there is a strong urge to ascertain harmonious relationship between person and God the Creator, between person and nature, and between person and society. These are basic values in sustainable development and needs to be strengthened through moral persuasion, social marketing, 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, local indigenous wisdom that is aimed at adding values to social and natural resources;

Fourth, leadership in sustainable development requires the involvement of government, corporate and civil society in a triangle of equal partnership to enable maximum participation of all citizens to reach for poverty alleviation through full employment, raising quality of persons within a cohesive society and perpetuating life support ecosystem.

Fifth, global partnership among nations to strive for the fulfillment of the Millennium Development Goals and Johannes Plan of Implementation of Sustainable Development towards a prosperous, just and sustainable society.

On the basis of these five points of efforts, it is essential to draw the essence of sustainable development, which is revealed in the notion of *plain living, high thinking*.

Jakarta, September 17, 2006.

Emil Salim

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“PLAIN LIVING, HIGH THINKING”

By Emil Salim, Indonesia
esalim@rad.net.id

1

THE PROBLEMS

Main theme:

To reconcile development with environment and economy with ecology.

The questions:

1. What has development achieved thus far?;
2. What is wrong with conventional development model of today?;
3. In what direction do we have to go?;

2

CONVENTIONAL DEVELOPMENT'S ACHIEVEMENTS

1. Unequal growth between developed and developing countries towards a world of 20/80;
2. Unequal growth between economic and non-economic sectors (social and environment);
3. Unequal flow of domestic support for agriculture in developed countries compared to aid flow;
4. Unequal “ecological footprints” between developed and developing countries;
5. Private enterprises operating through markets are main engines of growth;

3

MARKET, POLICY AND INSTITUTIONAL FAILURES

1. Market fails to function for public goods and services, to internalize externalities (social services, pollution, waste);
2. Conventional development policy fails to consider long term and scale of size;
3. Institutions in conventional development fail to balance civil society's interest at the same footing with private enterprise's and government's interests;

4

MAIN FEATURES OF SUSTAINABLE DEVELOPMENT

1. Bundling up economic, social and environmental development lines moving upwards to reach for poverty alleviation, higher quality of human development with social cohesion, within a sustained life support eco-system;
2. It requires an inter-disciplinary approach through “sustainable development matrix” to reach for combined economic, social and environmental goals simultaneously;

5

REQUIREMENTS FOR SUSTAINABLE DEVELOPMENT

1. Good governance through the triangle of equal partnership between government, business and civil society;
2. The proper combination of natural capital, human capital, social capital, financial capital and human-made capital within the constraint of societal and ecological carrying capacity;
3. Equilibrium between sustainable production and sustainable consumption;
4. Valuation of environment to correct the market;

6

IMPLICATION OF SUSTAINABLE DEVELOPMENT ON THE WORLD

1. To strive for equity in economic, social and environmental development between developed and developing countries requires the validity of *common but differentiated responsibilities* between the two;
2. It calls for changing the course of development from increasing materially based life style to increasing enrichment of immaterial, cultural, spiritual, knowledge and science based life style;
3. To reach for the goal: "plain living, high thinking"

7

AGENDA FOR ACTIONS (1)

1. Enrich human capacity to develop interdependent societal and ecological net-working process on the basis of symbiotic relationship of natural science interacting with social science;
2. Ascertain harmonious relationship between person with God, nature and society through moral persuasion, social marketing, cultural and spiritual enhancement;
3. Shift paradigms from resource exploitation to enrichment through incentives and punishment with government policies and law enforcements;

8

AGENDA FOR ACTIONS (2)

4. Leadership in sustainable development requires triangle of equal partnership between government, business and civil society to reach for poverty alleviation, human resource quality development with social cohesion and sustained life supporting ecological system;
5. Global partnership through international institutions on the basis of country votes in democratic decision making for a prosperous, sustainable and just global society.

9

LIFE STYLE FOR GLOBAL SURVIVAL

Essence of Sustainable Development is
"Plain living, high thinking"

This is achievable if we all strive together
with God's blessings

10

THE BLUE PLANET PRIZE

The Blue Planet Prize is an annual award given in recognition of individuals and organizations that have contributed to solving global environmental problems through outstanding achievements in scientific research and its application. The Foundation awarded the first prize in 1992 to express its appreciation for the achievements of the winners and to help raise awareness of and interest in environmental issues throughout the world. Each year two award recipients are chosen, and each winner receives a certificate of merit, a commemorative trophy, and a supplementary award of ¥50 million.

Areas for Recognition

Global environmental problems in general such as global warming, acid rain, ozone depletion, deforestation, desertification, oceans and fresh water resources, ecosystems and biodiversity conservation.

Environmental issues related to energy, population, food, water resources and environmental policies, and issues extending into multiple areas which are closely related to conservation and regeneration of the global environment and are useful in realizing a sustainable society.

Candidacy Eligibility

All persons, irrespective of nationality, gender, or religion, are eligible to be nominated for this award.

The award is open to individuals, groups, and organizations. Groups will be nominated under the name of one of the group members.

Selection Process

Each year, from August to October, nominations are accepted from nominators around the world.

The Selection Committee meets several times over an approximate six-month period to choose candidates. The candidates are then passed on to the Presentation Committee, which comprises Directors, for its opinion and approval. Next, the Board of Directors and Councillors reach a final decision on who the winners shall be.

Past Blue Planet Prize Winners

1992 Dr. Syukuro Manabe (U.S.A.) Member of the Senior Executive Service of the Geophysical Fluid Dynamics Laboratory at the National Oceanic and Atmospheric Administration
Selection rationale: Pioneering research for predicting climate change by numerical models and quantifying the effects of greenhouse gases

International Institute for Environment and Development (IIED) (Founded in the U.K.)

Selection rationale: Pioneering scientific research and implementation activities for the realization of sustainable development in a wide range of fields, including agriculture, energy, and urban planning

1993 Dr. Charles D. Keeling (U.S.A.) Professor, Scripps Institution of Oceanography at the University of California, San Diego
Selection rationale: Many years of research into atmospheric and oceanic carbon dioxide levels and their precise measurement and analysis, yielding a vast body of data on global warming

IUCN---The World Conservation Union (Headquartered in Switzerland)

Selection rationale: Outstanding research and the application of scientific strategies to the conservation of natural resources and the promotion of biological diversity on an international scale

1994 Prof. Dr. Eugen Seibold (Germany) Professor Emeritus at the University of Kiel
Selection rationale: Major contributions to the understanding of global environmental problems through research in the field of marine geology, including the analysis of ocean sediments, the study of the exchange of carbon dioxide between the oceans and the atmosphere, and predictions of regional desertification

Mr. Lester R. Brown (U.S.A.) Founder and President of the Worldwatch Institute

Selection rationale: Formulation of solutions to global environmental problems based on scientific analysis and contributions to international awareness of food shortages, sustainable energy resources, and the need for an "environmental revolution"

1995 Dr. Bert Bolin (Sweden) Professor Emeritus at the University of Stockholm; Chairman of the Intergovernmental Panel on Climatic Change (IPCC)
Selection rationale: Pioneering research into the carbon cycle, which affects the oceans, the atmosphere, and ecosystems, and major contributions to worldwide climate policy formation

Mr. Maurice F. Strong (Canada) Chairman of the Earth Council

Selection rationale: International leadership in conceptualizing sustainable development and forming global-scale implementation strategies based on findings of scientific research into environmental problems

- 1996 Dr. Wallace S. Broecker** (U.S.A.) Newberry Professor of Geology, Lamont-Doherty Earth Observatory of Columbia University
Selection rationale: The discovery of the global ocean current known as the "great conveyor belt" and other pioneering research into global ocean currents, ocean chemical cycles, especially the carbon cycle, and the ocean's influence on global climate changes
- M.S. Swaminathan Research Foundation** (Founded in India)
Selection rationale: Leading the way toward the realization of sustainable agriculture and rural development through research into soil improvement and genetic engineering of plant species and the application of these findings
- 1997 Dr. James E. Lovelock** (U.K.) Honorary Visiting Fellow of Green College, Oxford University
Selection rationale: Pioneering the detection and measurement of trace substances in the atmosphere in addition to formulating the Gaia Hypothesis of earth science, which has helped stimulate interest in the environment
- Conservation International (CI)** (Headquartered in Washington, D.C., U.S.A.)
Selection rationale: Protecting the earth's biological diversity through research into ways to conserve ecosystems while improving the lives of local people
- 1998 Prof. Mikhail I. Budyko** (Russia) Head of the Division for Climate Change Research, State Hydrological Institute
Selection rationale: Founding the field of physical climatology, the quantitative analysis of climate change, and making early predictions of global warming
- Mr. David R. Brower** (U.S.A.) Chairman of the Earth Island Institute
Selection rationale: Pioneering in environmental activism, educating the general public about the science of environmental conservation and setting an important precedent for international environmental non-profit organizations
- 1999 Dr. Paul R. Ehrlich** (U.S.A.) Director of the Center of Conservation Biology, Stanford University
Selection rationale: Co-founding the new science of conservation biology, co-authoring the theory of co-evolution and promoting environmental conservation by warning of a population explosion
- Prof. Qu Geping** (P.R.C.) Chairman of the Environmental Protection and Resources Conservation Committee of the National People's Congress of China
Selection rationale: Establishing the legal framework for environmental protection in China based on scientific research and his conservation efforts throughout that vast country
- 2000 Dr. Theo Colborn** (U.S.A.) Senior Scientist and Director, Wildlife and Contaminants Program, World Wildlife Fund
Selection rationale: Systematic research revealing the risk that "endocrine disruptors" pose to humans and wildlife and warning about the threat of these synthetic chemicals
- Dr. Karl-Henrik Robèrt** (Sweden) Chairman of The Natural Step (NGO)
Selection rationale: Scientifically formulating the principles and theoretical framework required to establish a sustainable society and enhancing the environmental awareness of businesses, municipalities and others
- 2001 Lord (Robert) May of Oxford** (Australia) President of Royal Society of London
Selection rationale: For developing mathematical ecology, the means to predict changes in animal populations that serves as a fundamental tool for ecological conservation planning
- Dr. Norman Myers** (U.K.) Honorary Visiting Fellow of Green College, Oxford University
Selection rationale: For ongoing leadership in warning about new environmental problems, such as the mass extinction of species, and stating the criteria for a society that attaches importance to environmental conservation
- 2002 Dr. Harold A. Mooney** (U.S.A.) Professor, Department of Biological Sciences, Stanford University
Selection rationale: For pioneering work in field of plant physiological ecology, for providing objective measures of how plant ecologies are influenced by their environments, and for his conservation efforts
- Prof. J. Gustave Speth** (U.S.A.) Dean and Professor, School of Forestry and Environmental Studies, Yale University
Selection rationale: For a lifetime of creative and visionary leadership in the search for science-based solutions to global environmental problems and for pioneering efforts to bring these issues, including global climate change, to broad international attention
- 2003 Dr. Gene E. Likens** (U.S.A.) President and Director, Institute of Ecosystem Studies
Dr. F. Herbert Bormann (U.S.A.) Oastler Professor, of Ecosystem Ecology, Emeritus, Yale University
Selection rationale: For pioneering an approach that has become a model for the scientific world, and for the comprehensive understanding of ecosystems through long-term measurement of the flows of water and chemical substances in watersheds
- Dr. Vo Quy** (Vietnam) Professor, Center for Natural Resources Management and Environmental Studies, Vietnam National University, Hanoi
Selection rationale: For investigating the war-damaged forests of Vietnam and for the dedication to its restoration and conservation, as well as for the development of environmental laws and the contributions to the conservation of wildlife

- 2004 Dr. Susan Solomon** (U.S.A.) Senior Scientist, Aeronomy Laboratory, National Oceanic and Atmospheric Administration
Selection rationale: For pioneering work in identifying the mechanism that produces the Antarctic ozone hole and momentous contributions towards the protection of the ozone layer
- Dr. Gro Harlem Brundtland** (Norway) Chairman WCED (World Commission on Environment and Development)
Former Prime Minister of Norway/Director-General Emeritus, WHO
Selection rationale: For putting forward globally the innovative concept of sustainable development, an idea that aims to balance environmental conservation with economic growth
- 2005 Prof. Sir Nicholas Shackleton** (U.K.) Emeritus Professor, Department of Earth Sciences, University of Cambridge
Former Head of Godwin Laboratory for Quaternary Research
Selection rationale: For his contributions to palaeoclimatology, particularly in identifying the glacial - interglacial climatic cycles and identifying the role of carbon dioxide as well as changes in the Earth's orbit in causing them; this aids us in better predicting future climate changer
- Dr. Gordon Hisashi Sato** (U.S.A.) Director Emeritus, W. Alton Jones Cell Science Center Inc.
Chairman of the board, A&G Pharmaceutical, Inc.
President, Manzanar Project Corporation
Selection rationale: For developing a new mangrove planting technology in Eritrea and through its utilization thus showing the possibility of building a sustainable local community in the poorest area of the world

(Information on past Blue Planet Prize winners corresponds to their titles and positions at the Prize was received.)

Objectives

By developing science and technology through its grant and commendation programs, the Foundation strives to contribute to the creation of a richer, more vibrant society.

Activities

1. Grant Program

Natural Sciences Research Assistance	Overseas Research Assistance
Human and Social Sciences Research Assistance	Presentation of Research Findings
Comprehensive Research Assistance	

2. Commendation Program

Annual Blue Planet Prize

Other Environment-Related Activities:

- Commemorative Lectures by Blue Planet Prize recipients
- Survey Projects

Each year, the Foundation conducts a survey on environmental issues titled, "Questionnaire on Environmental Problems and the Survival of Humankind," which asks government officials, nongovernmental organization officers, researchers and so on about their opinions on environmental concerns.

3. Related Activities

Publications Related to Foundation Activities

The Foundation regularly issues the following periodicals:

- Annual Report
- af News (a semiannual newsletter available in English and Japanese covering Foundation activities)
- Report of Granted Research, The Asahi Glass Foundation
- Blue Planet Prize Commemorative Lectures Report
- Results Report of the "Questionnaire on Environmental Problems and the Survival of Humankind"

Internet Home Page

- The Foundation's home page offers news and information about its activities, events, and publications.
- Blue Planet Update is an online source of information about global environmental issues and related events and publications (available in Japanese only).
- Home page address (URL) <http://www.af-info.or.jp>

History of the Foundation

1933 To commemorate its 25th anniversary (1932), the Asahi Glass Co., Ltd. establishes the Asahi Glass Foundation for Chemical Industry Promotion.

1934 The Asahi Foundation for Chemical Industry Promotion begins providing research assistance to university researchers in the field of applied chemistry.

1961 The Foundation changes its name to the Asahi Glass Foundation for Industrial Technology.

1982 The Foundation begins providing overseas research assistance to Chulalongkorn University in Thailand.

1988 The Foundation begins providing overseas research assistance to the Institute Technology Bandung in Indonesia.

1990 The Foundation expands its research assistance program and institutes its commendation program, changing its name to the Asahi Glass Foundation.

1992 First annual Blue Planet Prize awards ceremony

First annual "Questionnaire on Environmental Problems and the Survival of Humankind"

1993 Holds first annual seminar presenting findings from Foundation-assisted research in Tokyo.

1996 The Foundation opens its home page on the World Wide Web of the Internet.

1997 The Foundation issues *A Better Future for the Planet Earth*, a publication commemorating the five-year anniversary of the Blue Planet Prize.

2000 The Foundation issues an Eight-Year Synopsis of its environmental survey.

2002 The Foundation commemorates the 10th anniversary of the Blue Planet Prize.

- Publication: *Toward the Future of the Blue Planet* 10-Year History of the Blue Planet Prize
- Commemorative lectures
- Publication: *A Better Future for the Planet Earth Vol. II*

Financial Information

Total assets as of March 31, 2006: ¥12.0 billion

Budget for activities in fiscal 2006: ¥655 million

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(as of August 1, 2006)

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MEMO

MEMO



財団法人 旭硝子財団

〒102-0081 東京都千代田区四番町5-3 サイエンスプラザ2F

THE ASAHI GLASS FOUNDATION

2nd Floor, Science Plaza, 5-3, Yonbancho
Chiyoda-ku, Tokyo 102-0081, Japan

Phone 03-5275-0620 Fax 03-5275-0871

E-Mail post@af-info.or.jp

URL <http://www.af-info.or.jp>

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